Biological and Commercial Catch Statistics from the Chippewa Inter-Tribal Gill Net Fishery within Michigan Waters of Lake Superior During 1999

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ABSTRACT

The 1999 commercial inter-tribal fishery in the 1842 treaty-ceded waters of Michigan consisted of five (5) large boats and 17 small boats, representing 22 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 4.7 million feet of gill net and harvesting 654,650 round pounds of fish. Whitefish was the primary target species, making up 66% of the total, followed by lake trout (21%), siscowet (8%), and lake herring (4%). Other species harvested either incidentally or through targeting efforts included salmon, walleye, chubs, and round whitefish (menominee).

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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, Mattes et al. 1999).

Biological and commercial fishery statistics were summarized for calendar year 1999 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 five (5) large boats and 17 small boats, representing 22 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[1]	1990-1994[2]	1995-1999[3]
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

[1] GLIFWC. 1987.
[2] Ebener et al. 1989b.
[3] 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.

Species	Conversion
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 Natural Resources Department, 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 4.7 million feet of gill net and harvesting 548,422 dressed pounds (654,650 round pounds) of fish (Tables 1, 2, and 3). Lake whitefish, the primary target species, made up 66% of the total followed by lake trout (21%), siscowet (8%), and lake herring (4%). Other species harvested either incidentally or through targeting efforts included salmon, walleye, chubs, and round whitefish (menominee).

Unit MI-2

Effort. Eleven percent of the total effort was expended in MI-2 (Table 1). Fishing effort was 0.50 million feet with gill nets of 4 ½ inch mesh accounting for 71% (0.35 million feet) of the unit effort (Table 3, Figure 2). The remaining 29% (0.14 million feet) of the effort consisted of a unspecified mix of 4 ½ and 5 inch mesh. Fishing occurred in seven grids grouped into four general areas: Misery Bay (grids 1120, 1219, and 1220), Union Bay (grid 1314), Black River (grids 1413 and 1414), and Saxon Harbor (grid 1512) (Figure 1). Sixty-six percent of the effort occurred around Misery Bay followed by Black River (19%), Union Bay (8%), and Saxon Harbor (7%).

Harvest. Fifteen percent of the total harvest (83,517 dressed or 98,721 round pounds) was taken in MI-2. Whitefish made up 85% and lake trout 6% of this harvest (Tables 1 and 3). The majority of harvest occurred around Misery Bay. For whitefish, 56% of the harvest was from grids near Misery Bay followed by Black River (26%), Union Bay (10%), and Saxon Harbor (8%) (Table 1). Harvest of lake trout was highest around Misery Bay (77%) followed by Saxon Harbor (11%), Union Bay (8%) and Black River (3%). Siscowet were harvested near Misery Bay (52% of the total) followed by Black River (21%), Saxon Harbor (16%), and Union Bay (11%).

Target Effort and Harvest. All fishing effort in MI-2 was targeted for whitefish and lake trout (Table 4). Target effort (495,700 feet) and harvest (70,938 pounds) of whitefish declined considerably from 1998 (128,169 pounds) (Table 5). Target lake trout harvest (5,013 pounds) was the lowest reported since 1992 and 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 seven grids of MI-2 that were reportedly fished varied from 118-305 pounds for whitefish (average: 143 pounds) and 0-15 pounds for lake trout (average: 10 pounds) (Table 4). For whitefish, the CPE in the grids fished near Black River Harbor was highest (average: 202 pounds), followed by the grids fished at Saxon Harbor (165 pounds), Union Bay (average: 165 pounds) and Misery Bay (average: 121 pounds). For lake trout, CPE was highest in grid 1512 near Saxon Harbor (15 pounds) followed by Misery Bay (average: 12 pounds), Union Bay (10 pounds), and Black River (average: 2 pounds).

Unit MI-3

Effort. Thirty percent of the total effort was expended in MI-3 (Table 1). Fishing effort was 1.40 million feet (Table 5, Figure 2). All nets fished were 4 ½ inch mesh. Fishing has become more confined within the area over the past few years. In 1999, fishing occurred in three grids grouped into two general areas: Redridge/West Entry (grids 1121 and 1122) and 5 Mile Point (grid 1023) (Figure 1). In past years fishing also occurred near Eagle River (grid 1024) and Copper Harbor (grids 925, 926, and 1027). The percent of total MI-3 effort fished at Redridge/ West Entry was 87% and at 5 Mile Point was 13%.

Harvest. Twenty-nine percent of the total harvest (157,778 dressed or 185,924 round pounds) was taken in MI-3. Of harvest in this unit, whitefish made up 89%, lake trout 6%, and siscowet 5% (Tables 1 and 3). The percent of whitefish and lake trout taken from the two general areas followed the pattern for effort. For whitefish and siscowet, 89% were taken from Redridge/West Entry and 11% from 5 Mile Point. For lake trout, 72% were taken from Redridge/West Entry and 28% from 5 Mile Point.

Target Effort and Harvest. All fishing effort in MI-3 was targeted at whitefish and lake trout (Table 4). Target effort in 1999 (1.40 million feet) decreased by 332,800 feet compared to 1998. However, target harvest of whitefish (141,013 pounds) decreased by only 8,104 pounds compared to 1998. Target harvest of lake trout (9,147 pounds) decreased by 2,668 pounds.

Catch per effort. CPE for targeted fishing in the three grids of MI-3 that were reportedly fished varied from 88-114 pounds for whitefish (average: 101 pounds) and 3-15 pounds for lake trout (average: 7 pounds) (Table 4). For whitefish, CPE was 103 pounds at Redridge/West Entry and 88 pounds at 5 Mile Point. For lake trout, CPE was 15 pounds at 5 Mile Point and 5 at Redridge/West Entry.

Unit MI-4

Effort. Since 1986 this unit has received the majority of tribal effort (1986-1999 average: 66%). In 1999, 55% 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 13 grids grouped into four general areas: Traverse Bay to Bete Grise (grids 1026, 1124, 1125, 1126, and 1225), Traverse Island (grids 1223 and 1224), Keweenaw Bay (grids 1323, 1324, and 1423) and Huron Islands (1325, 1326, and 1424) (Figure 1). In contrast to 1998 when only 19% of the fishing effort occurred in the Traverse Bay to Bete Grise area, most of the effort occurred there in 1999 (33% or 0.85 million feet), followed by Keweenaw Bay (24% or 0.61 million feet), Traverse Island (22% or 0.56 million feet), and Huron Islands (21% or 0.53 million feet). As in 1998 a fifth general area, Keweenaw Point (grid 1028), was not fished in 1999.

Harvest. Forty-eight percent of the total harvest (262,432 dressed or 315,499 round pounds) were taken in MI-4 (Table 1). Of this harvest, whitefish made up 56%, lake trout 28%, siscowet 10%, herring 5%, 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 respective areas were 46% and 22%. Respective percentages were 17% and 35% for lake trout, and 86% and 13% for siscowet. Sixty-four percent (7,208) of herring were harvested from Keweenaw Bay followed by 35% (3,947 pounds) from the Huron Islands area. Ninety-seven percent of the salmon harvest (1,010 pounds) was from Keweenaw Bay (Table 4).

Target Effort and Harvest. The majority of fishing effort (94%) was targeted at whitefish and lake trout with the remainder directed at siscowet (3%) and lake herring (3%) (Table 4). Target effort in 1999 (2.39 million feet) was similar to that of 1998 (2.20 million feet). In turn, target harvest of both whitefish (144,883 pounds) and lake trout (72,696 pounds) was similar to 1998 (136,100 and 60,014 pounds respectively). For siscowet target harvest (14,920 pounds) and effort (79,400 feet) were the lowest recorded during the last 14 years (1986 and 1999).

Catch per effort. CPE for targeted fishing in the 13 grids of MI-4 varied from 24-123 pounds per 1000 feet for whitefish (average: 61 pounds) and 8-65 pounds for lake trout (average: 30 pounds). For the 4 grids where siscowet were targeted CPE ranged from 18-307 pounds (average: 188 pounds). For the 4 grids with effort directed at herring CPE ranged from 34-400 pounds (average: 168 pounds). For the 3 grids with effort directed at salmon CPE ranged from 29-107 pounds (average: 90 pounds).

For whitefish, CPE was highest from Traverse Bay to Bete Grise (average: 82 pounds) and lowest in Traverse Island grids (average: 37 pounds). For lake trout, CPE was highest in Keweenaw Bay (average: 50 pounds) followed by Traverse Island (average: 40 pounds), the Huron Islands (average: 24 pounds) and Traverse Bay to Bete Grise (average 15 pounds). CPE for siscowet was highest from grid 1125 in the Traverse Bay to Bete Grise area (307 pounds) where 53% of the target harvest occurred, followed by the Keweenaw Bay area (average: 58 pounds) with 43% of the target harvest.

Other Species. Herring and salmon continued to be important target species of the small boat fishery. Harvest of herring was 19,558 dressed pounds which was below the fourteen year average (1986-1999: 25,465 pounds) and over 20,000 pounds below the 1991 to 1994 average of 41,610 pounds (Figure 5). Salmon harvest was 4,652 dressed pounds only 216 pounds above the 1986 to 1999 average (4,436 pounds). Fifty-eight percent of the herring and 86% of the salmon harvests were caught by the small boat fishery in grids 1323, 1324, and 1423 (Table 1).

Unit MI-5

Effort. Four percent of the total effort was fished in MI-5 (Table 1). Fishing effort was 209,000 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 three 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 (44,695 dressed or 54,506 round pounds) was taken from MI-5. Whitefish made up 29%, lake trout 44%, siscowet 9%, herring 15%, and salmon 3% of the harvest (Table 1).

Target Effort and Harvest. Targeted whitefish harvest was 12,213 dressed pounds which was below 1986-1999 average of 20,464 pounds (Table 5). Targeted lake trout harvest was 18,342 dressed pounds, about 7,000 pounds above the 1986 to 1999 average (11,057 pounds). A total of 4,038 dressed pounds of siscowet, 6,757 dressed pounds of herring, and 1,263 pounds of salmon were harvested (Table 1).

Catch per effort. Catch per effort for targeted fishing in the three grids varied from 59-77 pounds per 1,000 feet for whitefish (average: 69 pounds) and 53-135 pounds for lake trout (average: 103 pounds). Siscowet were targeted in two grids with an average CPE of 79 pounds and herring were targeted in two grids with an average CPE of 470 pounds (Table 4).

Biological Statistics

Lake Trout MI-2

Lake trout catch from management unit MI-2 were composed of four year classes of hatchery fish (1991-1995) and fifteen year classes of wild fish (1977-1995) (Table 6). Of the 114 fish sampled 91% were wild trout. Percent wild fish ranged from 50 to 100% among year classes. Mean age for hatchery and wild fish was 6.7 and 8.7 years, respectively. Fish ten years and older made up 34% of the wild component of the catch. Mean length and weight of all fish sampled was 23.1 in and 4.0 lbs round, respectively. The average size of hatchery fish was 20.0 in and the average size of wild fish was 23.4 inches.

Average lamprey marking rates were 0.9 wounds and 12.3 scars/100 fish (Table 7), with fish greater than 25 inches exhibiting the highest scarring rates.

Annual total mortality was estimated to be 23% (± 16%) for wild fish of ages 7-13 (Table 8). Mortality of wild and hatchery fish combined for ages 7-13 was 25% (± 16%).

Lake Trout MI-3

Ten year classes of hatchery fish (1985-1995) and seventeen year classes of wild fish (1977-1995) were represented in the 341 lake trout sampled (Table 9). Mean age for hatchery and wild fish was 8.5 and 9.8 years, respectively. Wild trout composed 90% of the catch. Percent wild fish ranged from 67 to 100% among year classes.

Mean length and weight of all fish sampled was 23.3 inches and 4.5 pounds round, respectively. Average size of wild fish (23.4 inches) was greater than that of hatchery fish (22.7 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 2.9 wounds and 9.4 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 9 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, 7 in 1997 and 13 in 1998.

Annual total mortality rates were estimated to be 20% (± 10%) for wild fish for ages 7-16 (Table 8). Mortality of wild and hatchery fish combined for ages 7-16 was also 20% (± 9%).

Lake Trout MI-4

Sixteen year classes of hatchery fish (1971-1997) and fifteen year classes of wild trout (1981-1996) were represented in a sample of 623 lake trout (Table 10). Mean age of hatchery and wild fish was 7.2 and 8.1 years, respectively. Wild fish, age ten and older, composed 28% of all wild trout. Overall, wild fish composed 69% 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 22.3 inches and 3.7 pounds, similar to values for 1992-1998. The average size of wild fish was generally greater than hatchery fish.

Average length of wild and hatchery fish at ages 7-10 has been tracked since 1985 (Figure 3). The variation in the average length of wild fish at ages 7-10 has become narrower since 1985. Average length of hatchery fish has fluctuated greatly primarily due to low numbers of fish sampled.

Lamprey marking rates were 0.8 wounds and 4.7 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 2 marks/100 fish.

Annual total mortality was estimated to be 18% (± 7%) for wild fish ages 7-12 (Table 8), a decrease from 20% (± 17%) in 1998. Mortality rates have declined steadily from the rate of 60% (± 13%) calculated in 1988. Mortality of ages 7-12 wild and hatchery fish combined was 22% (± 3%), compared with 26% (± 13%) in 1998, 29% (± 12%) in 1997, 43% (± 15%) in 1996, 22% (± 17%) in 1995, 27% (± 9%) in 1994, 26% (± 24%) in 1993, 36% (± 8%) in 1992, 44% (± 10%) in 1991, 45% (± 9%) in 1990, 51% (± 22%) in 1989 and 42% (± 28%) in 1988 (Table 9).

Lake Trout MI-5

Of the 25 lake trout sampled, four year classes of hatchery fish (1989-1995) and eight year classes of wild fish (1987-1996) were found (Table 11). Mean age of hatchery and wild fish was 7.0 and 6.9 years, respectively. Wild trout composed 80% of the sample. Fish ten years and older made up 29% of the wild component. Mean length and weight of all fish sampled was 22.1 and 3.7 pounds, respectively. Average length of hatchery and wild fish was 21.6 and 22.3 inches, respectively.

Overall lamprey marking rates were 8 wounds and 12 scars/100 fish (Table 7). Annual mortality was not estimated due to the small sample size.

Whitefish MI-2

Eleven year classes (1983, 1986-1994) were represented in the 178 fish aged (Table 12). The 1988-90 year classes were dominant (ages 9-11) and comprised 49% of the aged sample. The mean age was 9.6 years. Average length and weight of whitefish was 20.9 inches and 3.5 pounds. Annual total mortality was estimated at 38% for ages 10-13.

Whitefish MI-3

Ten year classes (1985-1994) were represented in the harvest (Table 12). The 1989-91 year classes were dominant (ages 8-10) in MI-3 and composed approximately 69% of the aged sample. The mean age was 9.0. Average length and weight of whitefish was 20.0 inches and 2.8 pounds round based on a sample size of 1,784 fish. Annual total mortality was estimated at 49% for ages 7-13.

Whitefish MI-4

Eleven year classes (1985-1995) were represented in the 668 fish aged. The 1990-92 year classes were dominant (ages 7-9) in MI-4 and composed approximately 65% of the aged sample. The mean age was 8.0 years. Average length and weight were 20.4 inches and 3.0 pounds based on a sample size of 770 fish. The mean length in 1999 was higher than the 3 previous years and tied the highest for an eleven year data set. Mortality was estimated to be 49% for ages 7-13.

Statistic	1989	1990	1991	1992	1993	1993	1995	1996	1997	1998	1999
Mean Age	6.6	6.7	6.8	6.7	7.0	6.6	7.3	6.8	7.0	7.6	8.0
Mean Length	19.6	20.1	20.1	20.1	19.7	20.2	20.4	19.3	19.3	19.4	20.4

Whitefish MI-5

Twelve year classes (1976, 1979-80, 1986-1994) were represented in the 98 fish aged (Table 12). The mean age was 8.2 years. Average length and weight were 21.7 inches and 2.6 pounds. A total annual mortality rate could not be calculated for this management unit.

Siscowet

There were twenty year classes (1976-1995) represented in the harvest from MI-2, MI-3, and MI-4 (Table 13). The mean age for siscowet was 12.8 years. Mean age was 8.3 in MI-2, 9.8 years in MI-4 and 15.3 years in MI-3. Overall the mean size for siscowets was 22.1 inches and 4.3 pounds. Mean size by management unit was as follows; MI-2, 20.2 inches and 2.6 pounds; MI-3, 23.2 inches and 4.4 pounds; MI-4, and 20.4 inches and 4.3 pounds. 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 ten year classes (1987-1996) were represented in the 180 fish aged (Table 14). The 1990-92 year classes were most dominant (68.9%) in the sample. The mean age was 8.1 years. The mean size of herring was 17.1 inches and 1.6 pounds. The total annual mortality was calculated at 50% for ages 8-12.

One menominee whitefish was sampled in 1999 representing the 1993 year class. It was aged at 6 years. The mean length was 13.4 inches and mean weight was 0.7 pounds.

Coho and Chinook Salmon

All salmon sampled from the tribal harvest were taken from MI-4 (Table 15). Four year classes (1994-97) of coho salmon were represented in the 7 fish aged with a mean age of 3.6 years. The mean size was 18.4 inches and 3.1 pounds. Two year classes (1994-95) of chinook salmon were represented in the 6 fish aged with a mean age of 4.3 years. The mean size was 23.5 inches and 5.7 pounds.

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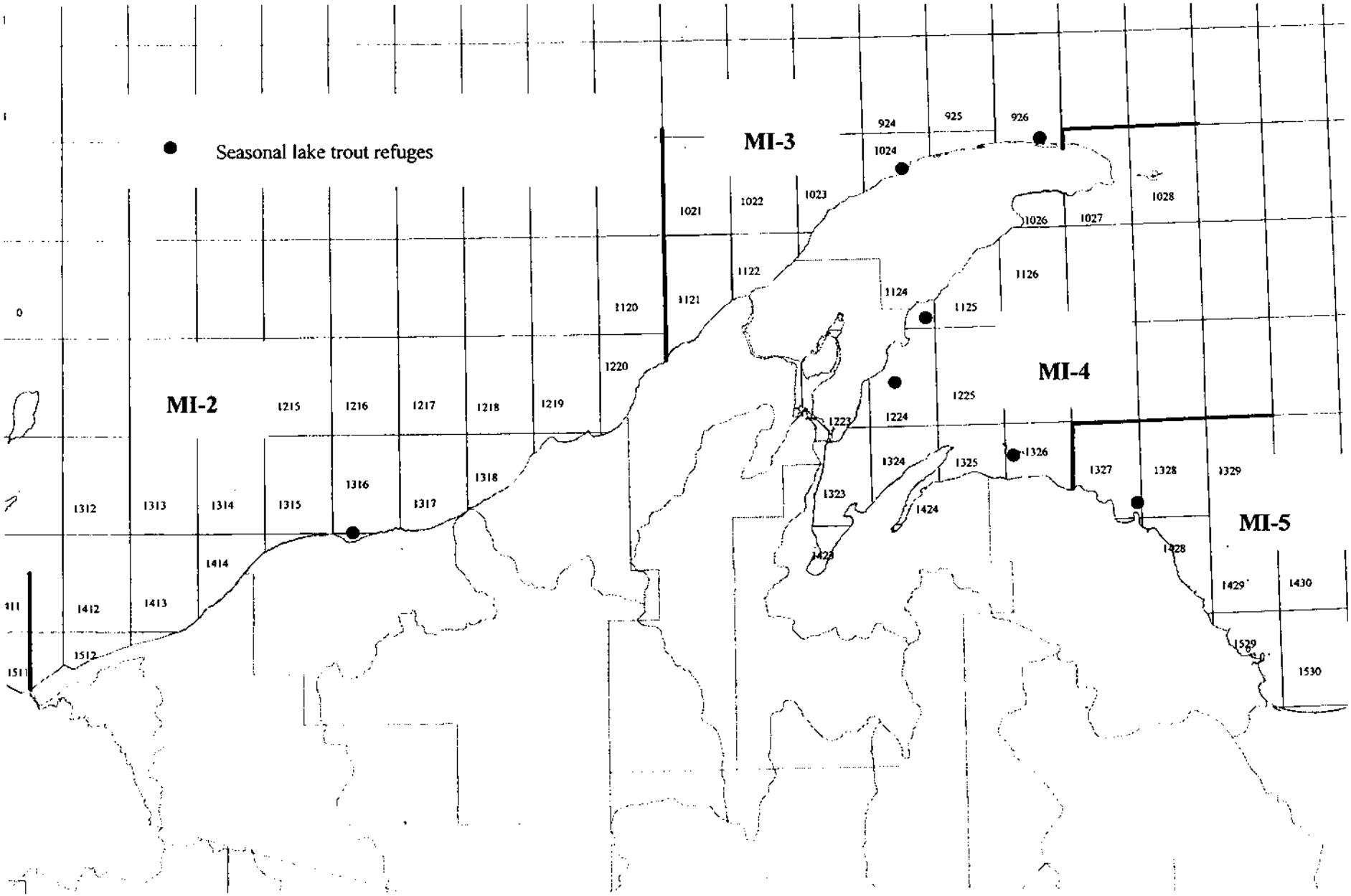


Figure 1. Management units and statistical grids in the 1842 treaty ceded area within Michigan waters of Lake Superior.

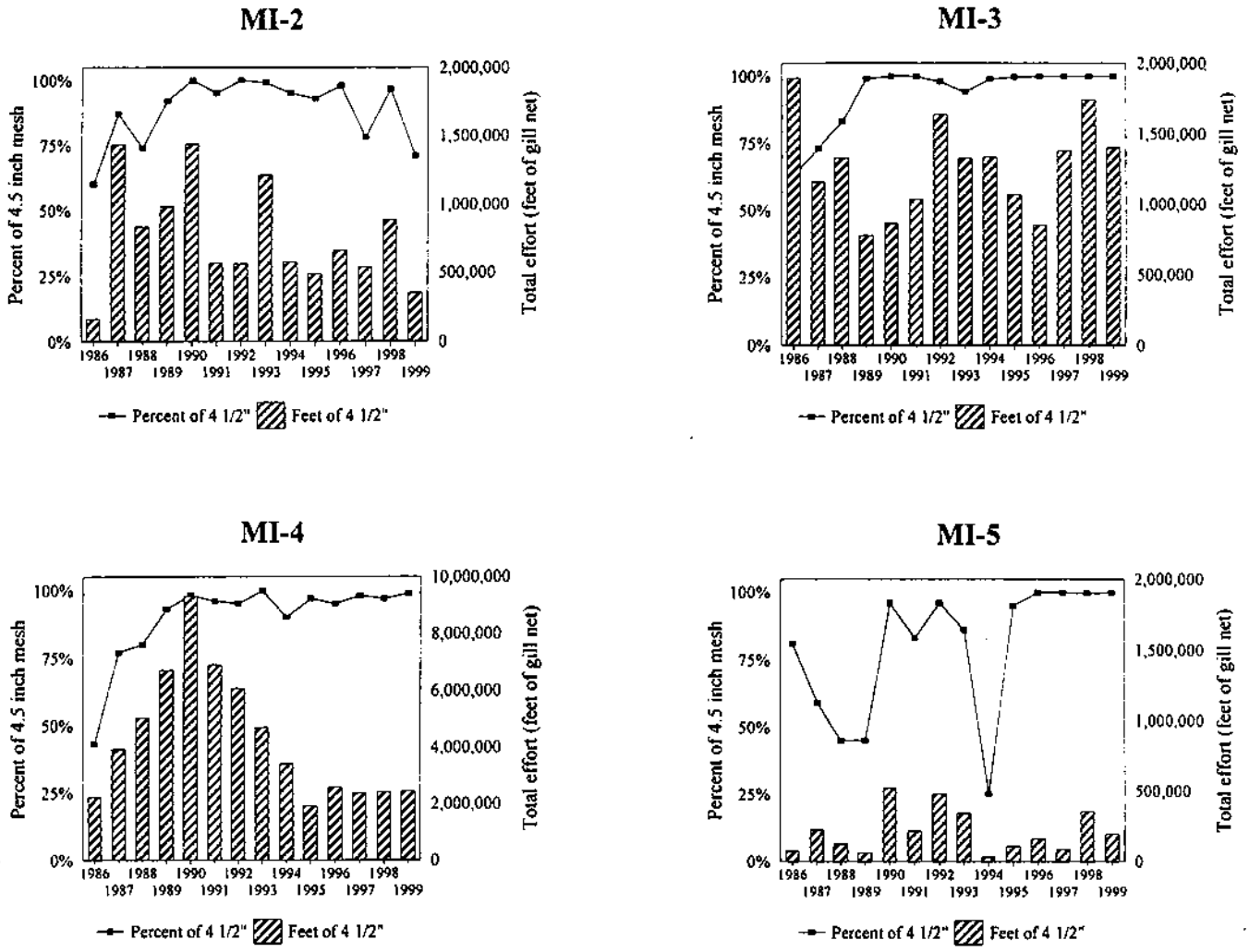


Figure 2. Proportion and total tribal large mesh gill net effort composed of 4 1/2 inch mesh by management unit, 1986 to 1999.

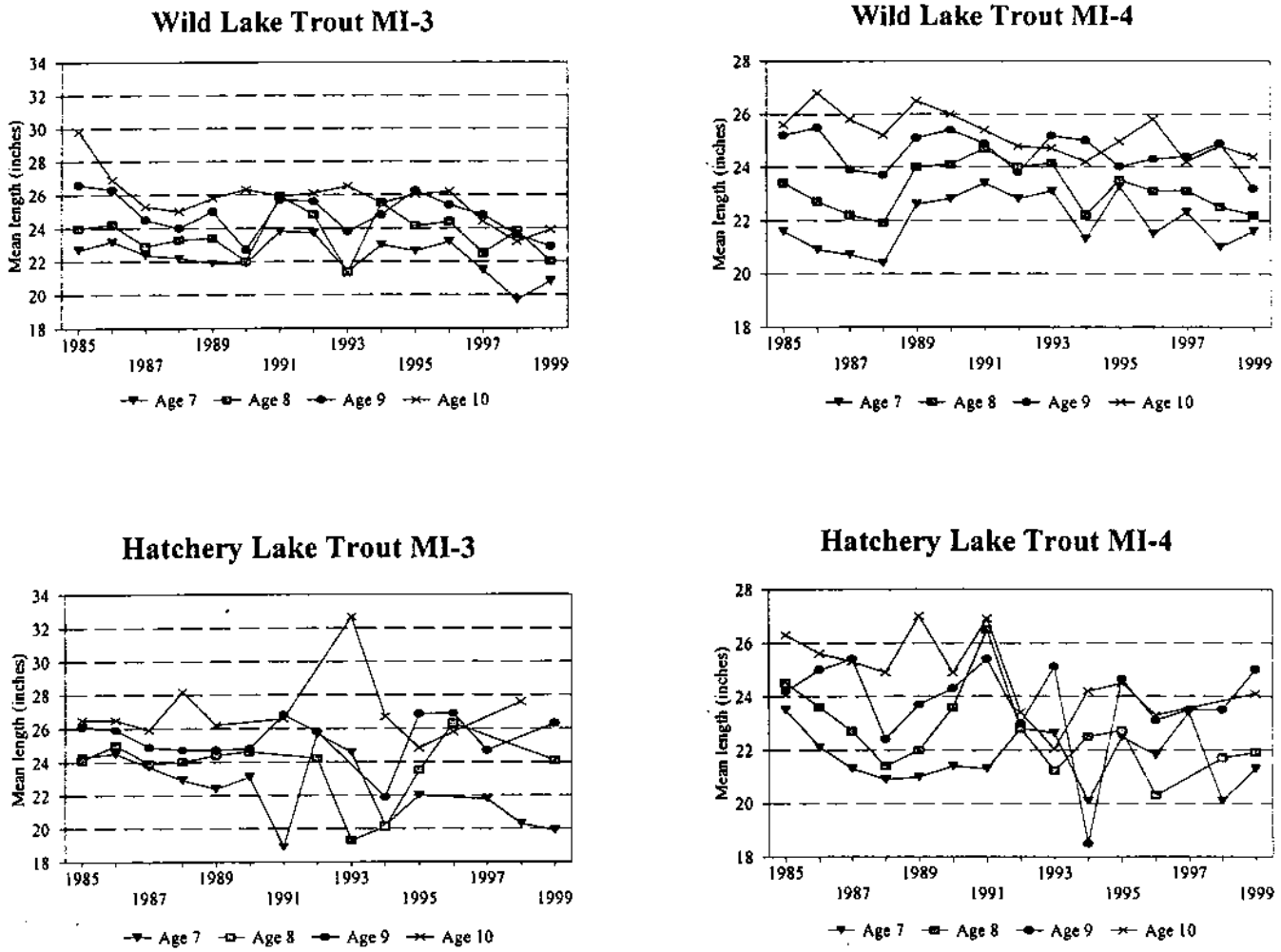
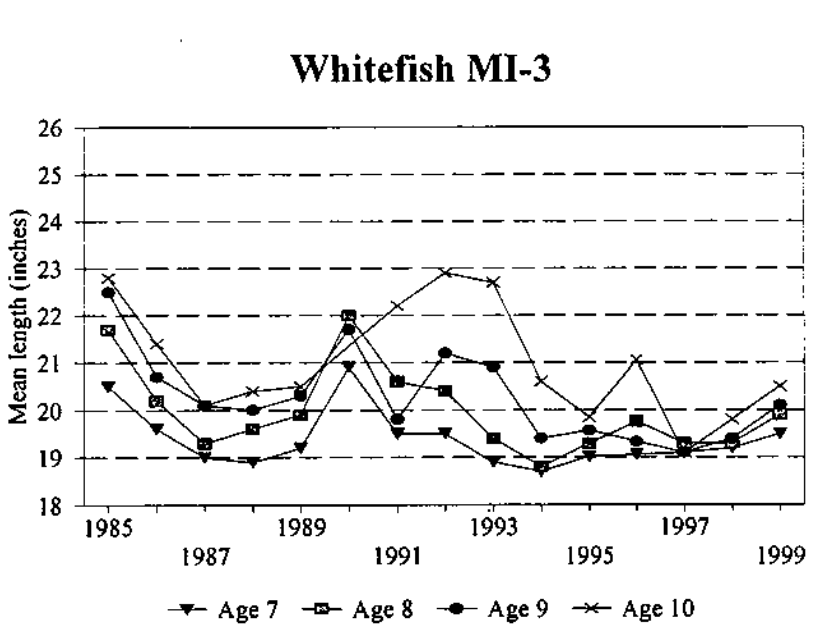


Figure 3. Trends in average length (inches) of hatchery and wild lake trout (ages 7-10) in Michigan management units MI-3 and MI-4, from 1985-1999.



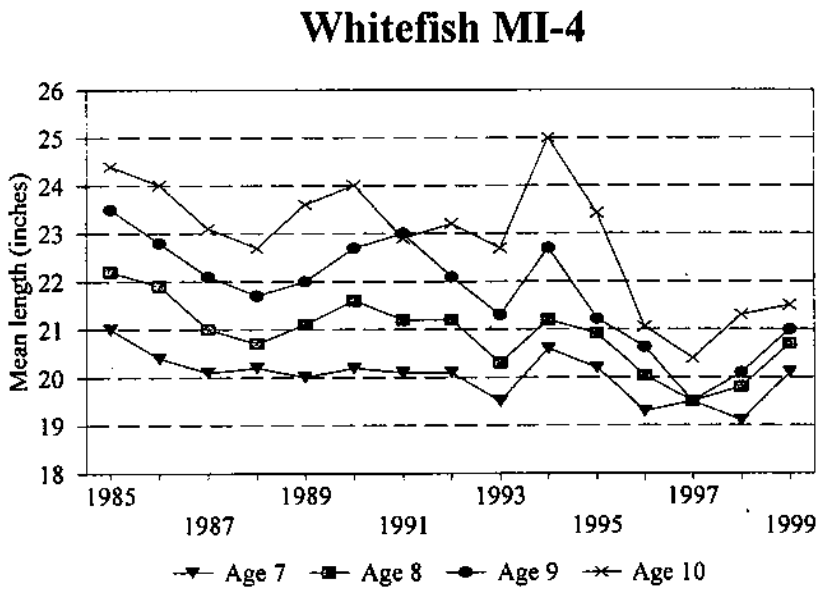


Figure 4. Trends in average length (inches) of whitefish (ages 7-10) in Michigan management units MI-3 and MI-4, from 1985-1999.

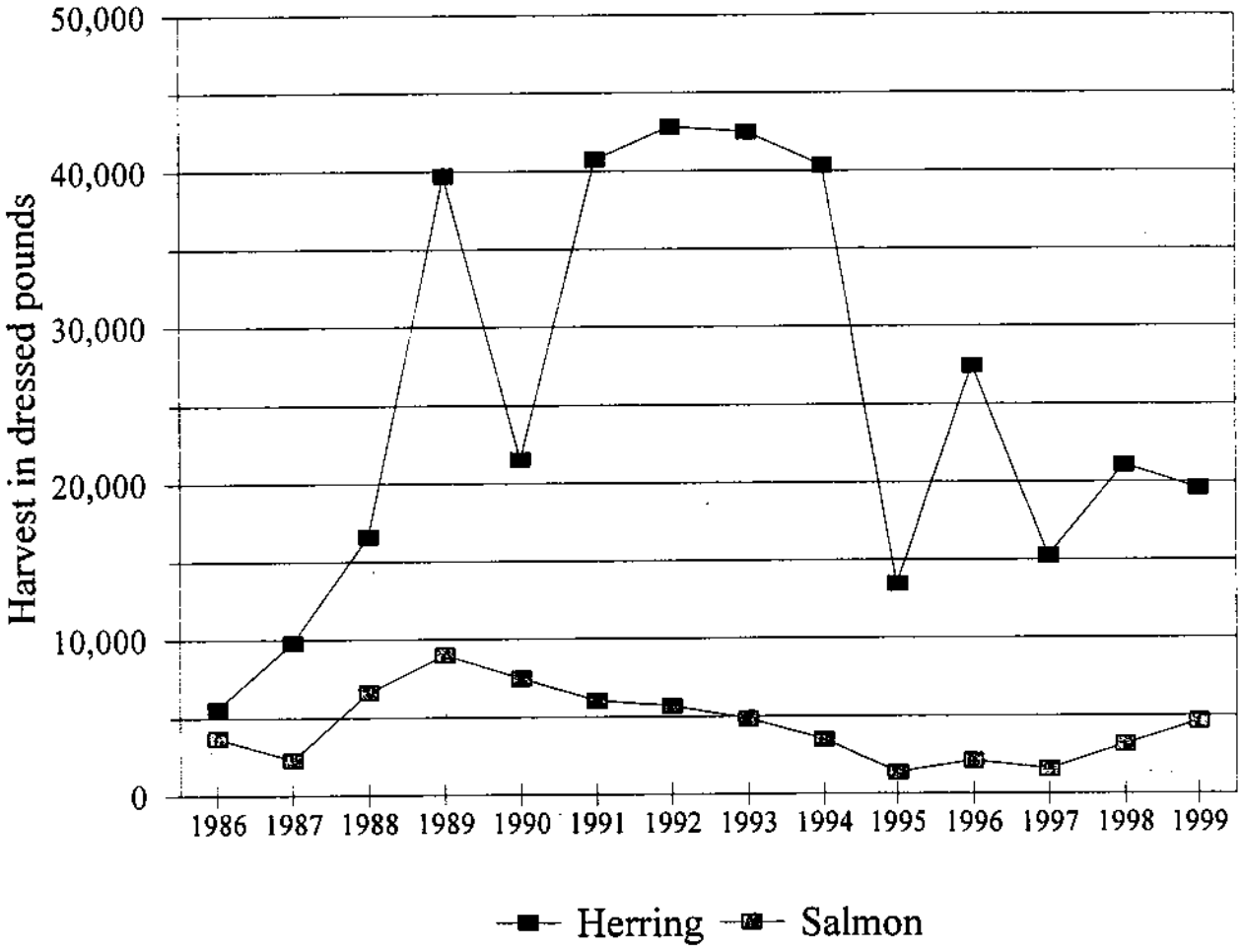


Figure 5. Trends in harvests of lake herring and salmon in Michigan management units from 1986-1999.

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 1999. 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	1120	13,500	187	2,272	679	0	0	0	0	0	0	0
	1219	285,100	3,559	33,706	2,914	0	28	0	0	0	0	0
	1220	27,000	137	3,494	317	0	0	0	0	0	0	0
	1314	42,000	421	6,934	813	0	0	0	0	0	0	0
	1413	90,000	156	17,945	1,615	0	0	0	0	0	0	0
	1414	2,100	0	640	0	0	0	0	0	0	0	0
	1512	36,000	553	5,947	1,200	0	0	0	0	0	0	0
Subtotal		495,700	5,013	70,938	7,538	0	28	0	0	0	0	0
MI-3	1023	175,000	2,550	15,437	840	0	0	0	0	0	0	0
	1121	905,000	2,950	89,527	755	0	3	0	0	0	0	0
	1122	316,700	3,647	36,049	5,950	0	0	0	0	0	70	0
Subtotal		1,396,700	9,147	141,013	7,545	0	3	0	0	0	70	0
MI-4	1026	160,800	1,334	19,766	303	0	0	0	0	0	0	0
	1124	38,000	959	4,191	0	0	0	0	0	0	45	0
	1125	466,000	4,304	23,851	14,504	979	0	0	0	0	67	0
	1126	133,600	2,556	15,862	1,571	0	0	0	0	0	0	0
	1223	113,200	3,915	2,713	470	0	22	0	0	0	0	0
	1224	449,800	18,701	18,196	75	138	5	0	0	0	44	0
	1225	48,000	3,090	2,550	48	0	0	0	0	0	0	0
	1323	205,300	12,285	14,785	3,342	30	2,125	0	0	0	0	0
	1324	108,000	3,411	6,312	1,425	0	12	0	0	0	0	0
	1325	289,700	4,200	9,322	715	152	450	0	0	0	0	0
	1326	223,600	7,452	16,087	584	3,916	0	0	0	0	0	0
	1423	293,800	11,180	11,314	2,117	7,409	740	1	14	0	0	0
	1424	14,000	534	1,493	0	177	4	0	0	0	0	0
Subtotal		2,543,800	73,921	146,442	25,154	12,801	3,358	1	14	0	156	0
MI-5	1327	53,200	2,624	2,941	1,613	0	386	0	0	0	0	0
	1428	80,100	7,063	4,911	2,348	5,857	258	0	0	0	0	0
	1429	75,700	10,137	4,961	77	900	619	0	0	0	0	0
Subtotal		209,000	19,824	12,813	4,038	6,757	1,263	0	0	0	0	0
Grand Total		4,645,200	107,905	371,206	44,275	19,558	4,652	1	14	0	226	0

Table 2. Total and target harvest and effort statistics by tribe for lake trout, whitefish, and siscowet in Michigan waters of Lake Superior in 1999. 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.

		TOTAL HARVEST							TARGET HARVEST							
			Whitefish		Lake trout		Siscowet			Whitefish		Lake trout			Siscowet	
Unit	Tribe	Effort	pounds	CPE	pounds	CPE	pounds	CPE	Effort	pounds	CPE	pounds	CPE	Effort	pounds	CPE
MI-2	Bad River	2,100	640	305	0	0	0	0	2,100	640	305	0	0	0	0	0
	Keweenaw Bay	57,100	7,817	137	2,268	40	14	0	57,100	7,817	137	2,268	40	0	0	0
	Red Cliff	436,500	62,481	143	2,745	6	7,524	17	436,500	62,481	143	2,745	6	0	0	0
	subtotal	495,700	70,938	143	5,013	10	7,538	15	495,700	70,938	143	5,013	10	0	0	0
MI-3	Bad River	394,000	33,733	86	5,039	13	1,683	4	394,000	33,733	86	5,039	13	0	0	0
	Keweenaw Bay	71,200	5,810	82	1,655	23	400	6	71,200	5,810	82	1,655	23	0	0	0
	Red Cliff	931,500	101,470	109	2,453	3	5,462	6	931,500	101,470	109	2,453	3	0	0	0
	subtotal	1,396,700	141,013	101	9,147	7	7,545	5	1,396,700	141,013	101	9,147	7	0	0	0
MI-4	Bad River	337,200	19,863	59	13,797	41	707	2	334,800	19,863	59	13,797	41	0	0	0
	Keweenaw Bay	1,431,000	68,040	48	51,497	36	7,732	5	1,317,300	66,481	50	50,272	38	37,400	2,035	54
	Red Cliff	775,600	58,539	75	8,627	11	16,715	22	733,600	58,539	80	8,627	12	42,000	12,885	307
	subtotal	2,543,800	146,442	58	73,921	29	25,154	10	2,385,700	144,883	61	72,696	30	79,400	14,920	188
MI-5	Bad River			0		0		0	0	0	0	0	0	0	0	0
	Keweenaw Bay	209,000	12,813	61	19,824	95	4,038	19	178,000	12,213	69	18,342	103	15,500	1,222	79
	Red Cliff			0		0		0	0	0	0	0	0	0	0	0
	subtotal	209,000	12,813	61	19,824	95	4,038	19	178,000	12,213	69	18,342	103	15,500	1,222	79
Total	Bad River	733,300	54,236	74	18,836	26	2,390	3	730,900	54,236	74	18,836	26	0	0	0
	Keweenaw Bay	1,768,300	94,480	53	75,244	43	12,184	7	1,623,600	92,321	57	72,537	45	52,900	3,257	62
	Red Cliff	2,143,600	222,490	104	13,825	6	29,701	14	2,101,600	222,490	106	13,825	7	42,000	12,885	307
	All Tribes	4,645,200	371,206	80	107,905	23	44,275	10	4,456,100	369,047	83	105,198	24	94,900	16,142	170

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 1999. 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	351,700	4,065	45,086	4,469	0	28	0	0	0	0	0
	4.5-5.O	126,000	709	23,892	2,815	0	0	0	0		0	0
	5.0	18,000	239	1,960	254	0	0	0	0		0	0
	subtotal	495,700	5,013	70,938	7,538	0	28	0	0	0	0	0
MI-3												
large mesh	4.5	1,396,700	9,147	141,013	7,545	0	3	0	0	0	70	0
MI-4												
small mesh	2.5625	11,200	0	0	0	2,335	0	0	0		0	0
	2.625	5,400	0	0	0	600	0	0	0		0	0
	2.75	2,100	0	0	0	149	44	0	0		0	0
	3.0	46,400	0	189	0	8,061	250	0	0	0	0	172
	subtotal	65,100	0	189	0	11,145	294	0	0	0	0	172
large mesh	4.5	2,448,700	73,812	140,857	25,154	1,656	3,064	1	14	0	111	413
	4.5-5.25	30,000	109	5,396	0	0	0	0	0		45	0
	subtotal	2,478,700	73,921	146,253	25,154	1,656	3,064	1	14	0	156	413
MI-5												
small mesh	2.75	14,000	565	39	163	6,582	219	0	0		0	0
large mesh	4.5	195,000	19,259	12,774	3,875	175	1,044	0	0		0	0
	Total	4,645,200	107,905	371,206	44,275	19,558	4,652	1	14	0	226	585

Table 4. Harvest and effort statistics for target species by grid and management unit in Michigan waters of Lake Superior in 1999. 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.

		Whitefish			Lake trout			Siscowet			Herring			Salmon		
Unit	Grid	Effort	pounds	CPE	Effort	pounds	CPE	Effort	pounds	CPE	Effort	pounds	CPE	Effort	pounds	CPE
MI-2	1120	13,500	2,272	168	13,500	187	14									
	1219	285,100	33,706	118	285,100	3,559	12									
	1220	27,000	3,494	129	27,000	137	5									
	1314	42,000	6,934	165	42,000	421	10									
	1413	90,000	17,945	199	90,000	156	2									
	1414	2,100	640	305	2,100	0	0									
	1512	36,000	5,947	165	36,000	553	15									
	subtotal	495,700	70,938	143	495,700	5,013	10	0	0	0	0	0	0	0	0	0
MI-3	1023	175,000	15,437	88	175,000	2,550	15									
	1121	905,000	89,527	99	905,000	2,950	3									
	1122	316,700	36,049	114	316,700	3,647	12									
	subtotal	1,396,700	141,013	101	1,396,700	9,147	7	0	0	0	0	0	0	0	0	0
MI-4	1026	160,800	19,766	123	160,800	1,334	8									
	1124	38,000	4,191	110	38,000	959	25									
	1125	424,000	23,851	56	424,000	4,304	10	42,000	12,885	307						
	1126	133,600	15,862	119	133,600	2,556	19									
	1223	113,200	2,713	24	113,200	3,915	35									
	1224	445,800	18,196	41	445,800	18,701	42				4,000	135	34			
	1225	48,000	2,550	53	48,000	3,090	64									
	1323	175,300	14,109	80	175,300	11,336	65	21,000	1,250	60				9,000	960	107
	1324	108,000	6,312	58	108,000	3,411	32									
	1325	284,900	9,277	33	284,900	4,155	15	3,600	65	18				1,200	35	29
	1326	214,000	16,087	75	214,000	7,452	35				9,600	3,842	400			
	1423	228,100	10,857	48	228,100	11,034	48	12,800	720	56	51,500	7,208	140	1,400	50	36
	1424	12,000	1,112	93	12,000	449	37				2,000	105	53			
	subtotal	2,385,700	144,883	61	2,385,700	72,696	30	79,400	14,920	188	67,100	11,290	168	11,600	1,045	90
MI-5	1327	43,700	2,592	59	43,700	2,332	53	8,000	463	58				1,500	70	47
	1428	60,600	4,674	77	60,600	6,048	100	7,500	759	101	12,000	5,788	482			
	1429	73,700	4,947	67	73,700	9,962	135				2,000	794	397			
	subtotal	178,000	12,213	69	178,000	18,342	103	15,500	1,222	79	14,000	6,582	470	1,500	70	47
Grand Total		4,456,100	369,047	83	4,456,100	105,198	24	94,900	16,142	170	81,100	17,872	220	13,100	1,115	85

statistics for whitefish, lake trout and siscowet by management unit and year from the 1842 ceded area within Michigan waters of Lake Superior from 1984-1999. Target effort for whitefish and lake trout was combined.

		Whitefish				Lake trout				Siscowet			
Unit	Year	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
	1999	495,700	70,938	143	70,938	495,700	5,013	10	5,013	0	0	0	7,538
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
	1999	1,396,700	141,013	101	141,013	1,396,700	9,147	7	9,147	0	0	0	7,545
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	21,781	311	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
	1999	2,385,700	144,883	61	146,442	2,385,700	72,696	30	73,921	79,400	14,920	188	25,154

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.

		Whitefish				Lake trout				Siscowet			
Unit	Year	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
	1999	178,000	12,213	69	12,813	178,000	18,342	103	19,824	15,500	1,222	79	4,038
All	1984	0	0	0	187,786	0	0	0	113,773	0	0	0	0
units	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
	1999	4,456,100	369,047	83	371,206	4,458,500	105,198	24	107,905	94,900	16,142	170	44,275

Table 6. Age and size composition of hatchery and wild lake trout in tribal commercial harvests from unit MI-2 during 1999. Weight is in round pounds, sd=standard deviation. (Totals include 1 unaged hatchery fish and 7 unaged wild fish).

		Hatchery					Wild					Total					
Year			length (in)		weight (lb)			length (in)		weight (lb)			length (in)		weight (lb)		Percent
Class	Age	N	mean	sd	mean	sd	N	mean	sd	mean	sd	N	mean	sd	mean	sd	wild
1995	4	1	19.5	0.0	1.9	0.0	1	15.6	0.0	1.2	0.0	2	17.5	2.0	1.6	0.4	50
1994	5	0	---	---	---	---	11	19.5	0.9	2.3	0.4	11	19.5	0.9	2.3	0.4	100
1993	6	2	19.2	0.1	2.1	0.1	12	21.4	0.9	2.7	0.5	14	21.1	1.2	2.6	0.5	86
1992	7	4	19.0	1.5	2.2	0.6	17	22.3	1.2	3.3	0.5	21	21.7	1.9	3.1	0.7	81
1991	8	2	22.2	1.6	3.4	0.4	16	23.7	1.8	4.1	0.9	18	23.5	1.8	4.0	0.8	89
1990	9	0	---	---	---	---	7	23.7	2.2	4.0	1.0	7	23.7	2.2	4.0	1.0	100
1989	10	0	---	---	---	---	12	25.7	2.1	5.5	1.4	12	25.7	2.1	5.5	1.4	100
1988	11	0	---	---	---	---	5	24.5	2.6	5.0	2.3	5	24.5	2.6	5.0	2.3	100
1987	12	0	---	---	---	---	7	27.4	2.7	7.0	2.2	7	27.4	2.7	7.0	2.2	100
1986	13	0	---	---	---	---	3	28.1	4.3	7.9	3.3	3	28.1	4.3	7.9	3.3	100
1985	14	0	---	---	---	---	1	23.4	0.0	3.6	0.0	1	23.4	0.0	3.6	0.0	100
1984	15	0	---	---	---	---	2	25.1	0.7	4.9	0.6	2	25.1	0.7	4.9	0.6	100
1983	16	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1982	17	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1981	18	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1980	19	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1979	20	0	---	---	---	---	1	23.3	0.0	3.6	0.0	1	23.3	0.0	3.6	0.0	100
1978	21	0	---	---	---	---	1	27.5	0.0	6.4	0.0	1	27.5	0.0	6.4	0.0	100
1977	22	0	---	---	---	---	1	30.4	0.0	10.3	0.0	1	30.4	0.0	10.3	0.0	100
Sample Size		10					104					114					
Means			20.0	1.8	2.5	0.7		23.4	3.1	4.2	2.0		23.1	3.2	4.0	2.0	91
Mean Age		6.7					8.7					8.6					

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 1999.

		Type AI, AII, AIII Wounds						Scars					
Unit		<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	Total
MI-2	Marks observed	0	0	0	1	0	1	0	0	2	1	11	14
	No. fish examined	1	30	55	20	8	114	1	30	55	20	8	114
	No. marks/100 fish	0.0	0.0	0.0	5.0	0.0	0.9	0.0	0.0	3.6	5.0	137.5	12.3
MI-3	Marks observed	0	0	4	4	2	10	0	0	11	12	9	32
	No. fish examined	4	68	184	71	14	341	4	68	184	71	14	341
	No. marks/100 fish	0.0	0.0	2.2	5.6	14.3	2.9	0.0	0.0	6.0	16.9	64.3	9.4
MI-4	Marks observed	0	0	1	0	4	5	0	2	5	6	16	29
	No. fish examined	32	195	275	88	33	623	32	195	275	88	33	623
	No. marks/100 fish	0.0	0.0	0.4	0.0	12.1	0.8	0.0	1.0	1.8	6.8	48.5	4.7
MI-5	Marks observed	0	0	0	2	0	2	0	0	1	1	1	3
	No. fish examined	0	9	12	3	1	25	0	9	12	3	1	25
	No. marks/100 fish	0.0	0.0	0.0	66.7	0.0	8.0	0.0	0.0	8.3	33.3	100.0	12.0

Table 8. Catch curve mortality and survival rates of lake trout from management units in the 1842 ceded area within Michigan waters of Lake Superior for data collected January-December 1988-1999.

Management Unit	Year	Ages	Instantaneous total mortality Z	95% confidence limit for Z	Annual total mortality A	Annual Survival S
				Wild Lake Trout		
MI-2	1999	7-13	0.256	+/- 0.157	0.229	0.771
	1998	7-13	0.385	+/- 0.111	0.316	0.684
	1990	8-11	0.750	+/- 0.416	0.528	0.472
	1988	9-13	0.406	+/- 0.306	0.334	0.666
MI-3	1999	7-16	0.215	+/- 0.099	0.197	0.803
	1997	7-11	0.176	+/- 0.212	0.165	0.835
	1996	8-13	0.238	+/- 0.267	0.213	0.787
	1995	8-11	0.522	+/- 0.325	0.405	0.595
	1991	8-11	0.469	+/- 0.353	0.375	0.625
	1989	8-12	0.723	+/- 0.084	0.513	0.487
	1988	9-13	0.651	+/- 0.396	0.478	0.522
MI-4	1999	7-12	0.202	+/- 0.069	0.181	0.819
	1998	7-12	0.220	+/- 0.166	0.197	0.803
	1997	7-12	0.455	+/- 0.182	0.369	0.631
	1996	7-12	0.556	+/- 0.162	0.429	0.571
	1995	7-12	0.200	+/- 0.226	0.181	0.819
	1994	7-12	0.281	+/- 0.103	0.244	0.756
	1993	6-11	0.349	+/- 0.334	0.295	0.705
	1992	5-11	0.430	+/- 0.105	0.349	0.651
	1991	6-11	0.592	+/- 0.130	0.446	0.554
	1990	6-11	0.723	+/- 0.153	0.513	0.487
	1989	7-11	0.786	+/- 0.395	0.546	0.454
	1988	9-13	0.912	+/- 0.134	0.598	0.402
MI-5	1991	5-8	0.744	+/- 0.563	0.523	0.477
				Wild and Hatchery Lake Trout Combined		
MI-2	1999	7-13	0.287	+/- 0.162	0.252	0.748
	1998	7-13	0.389	+/- 0.106	0.323	0.677
	1990	8-12	0.706	+/- 0.247	0.508	0.492
MI-3	1999	7-16	0.039	+/- 0.090	0.197	0.803
	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	1999	7-12	0.254	+/- 0.030	0.221	0.779
	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, 1999. Weight is in round pounds, sd=standard deviation. (Totals include 13 unaged hatchery fish and 57 unaged wild fish).

		Hatchery					Wild					Total					
Year			length (in)		weight (lb)			length (in)		weight (lb)			length (in)		weight (lb)		Percent
Class	Age	N	mean	sd	mean	sd	N	mean	sd	mean	sd	N	mean	sd	mean	sd	wild
1995	4	1	17.7	0.0	---	---	2	16.6	0.8	2.3	0.5	3	17.0	0.9	2.3	1.0	67
1994	5	1	18.6	0.0	2.1	0.0	15	19.2	1.2	2.6	0.5	16	19.2	1.2	2.5	0.5	94
1993	6	3	22.6	0.9	4.2	1.8	20	20.5	1.2	3.0	0.8	23	20.8	1.3	3.1	0.9	87
1992	7	4	19.9	1.2	3.0	1.4	23	20.8	2.2	3.1	1.5	27	20.7	2.1	3.1	1.5	85
1991	8	4	24.1	2.8	5.3	2.3	32	22.0	2.3	3.7	1.9	36	22.3	2.4	3.9	2.0	89
1990	9	3	26.3	0.6	5.4	0.2	34	22.9	2.3	4.2	1.7	37	23.2	2.4	4.3	1.7	92
1989	10	0	---	---	---	---	33	23.9	2.3	4.9	2.2	33	23.9	2.3	4.9	2.2	100
1988	11	1	24.8	0.0	4.4	0.0	27	24.4	2.4	5.1	2.1	28	24.4	2.3	5.1	2.1	96
1987	12	1	25.4	0.0	5.1	0.0	20	25.0	1.7	5.3	2.4	21	25.0	1.7	5.3	2.3	95
1986	13	1	24.0	0.0	4.5	0.0	18	25.1	2.2	5.1	2.1	19	25.0	2.1	5.0	2.1	95
1985	14	2	26.4	1.5	4.5	1.2	7	23.9	1.4	4.8	1.0	9	24.4	1.8	4.7	1.1	78
1984	15	0	---	---	---	---	8	25.7	2.0	6.4	2.0	8	25.7	2.0	6.4	2.0	100
1983	16	0	---	---	---	---	4	26.0	3.0	6.3	2.8	4	26.0	3.0	6.3	2.8	100
1982	17	0	---	---	---	---	1	23.0	0.0	---	---	1	23.0	0.0	---	---	100
1981	18	0	---	---	---	---	1	28.9	0.0	7.5	0.0	1	28.9	0.0	7.5	0.0	100
1980	19	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1979	20	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1978	21	0	---	---	---	---	2	27.0	3.0	6.4	1.7	2	27.0	3.0	6.4	1.7	100
1977	22	0	---	---	---	---	3	28.0	3.0	7.1	2.0	3	28.0	3.0	7.1	2.0	100
Sample Size		34					307					341					
Means			22.7	2.7	4.2	2.2		23.4	3.1	4.5	2.3		23.3	3.0	4.5	2.3	90
Mean Age		8.5					9.8					9.7					

Table 10. Age and size composition of hatchery and wild lake trout in tribal commercial harvests from MI-4, 1999. Weight is in round pounds, sd = standard deviation. (Totals include 20 unaged hatchery fish and 43 unaged wild fish).

		Hatchery					Wild					Total					
Year			length (in)		weight (lb)			length (in)		weight (lb)			length (in)		weight (lb)		Percent
Class	Age	N	mean	sd	mean	sd	N	mean	sd	mean	sd	N	mean	sd	mean	sd	wild
1997	2	1	10.9	0.0	0.3	0.0	0	---	---	---	---	1	10.9	0.0	0.3	0.0	0
1996	3	4	17.1	3.4	1.8	0.9	2	14.9	0.4	1.0	0.0	6	16.4	2.9	1.5	0.8	33
1995	4	21	16.6	2.8	1.6	0.8	18	18.0	1.3	1.8	0.4	39	17.2	2.4	1.7	0.7	46
1994	5	14	20.3	1.8	3.0	1.2	43	20.4	1.8	2.8	1.1	57	20.4	1.8	2.8	1.2	75
1993	6	37	20.6	2.3	3.1	1.6	62	20.6	1.7	2.9	1.1	99	20.6	1.9	3.0	1.3	63
1992	7	44	21.3	1.7	3.3	1.5	59	21.6	2.0	3.4	1.5	103	21.5	1.9	3.4	1.5	57
1991	8	22	21.9	2.1	3.9	1.9	52	22.2	2.3	3.6	1.6	74	22.1	2.3	3.7	1.7	70
1990	9	3	25.0	3.3	6.0	2.5	42	23.2	2.1	4.2	1.7	45	23.3	2.3	4.3	1.7	93
1989	10	1	24.1	0.0	4.3	0.0	40	24.4	2.8	4.9	2.4	41	24.4	2.8	4.9	2.4	98
1988	11	10	23.8	2.6	4.6	1.9	24	25.2	2.5	5.2	2.1	34	24.8	2.6	5.0	2.1	71
1987	12	5	25.5	1.1	5.1	0.8	23	26.6	3.2	5.6	2.5	28	26.4	3.0	5.5	2.3	82
1986	13	5	24.6	2.9	4.0	1.6	6	27.6	2.1	6.8	3.4	11	26.2	2.9	5.7	2.9	55
1985	14	1	29.9	0.0	---	---	6	27.7	3.9	5.2	2.4	7	28.0	3.7	5.2	2.3	86
1984	15	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1983	16	0	---	---	---	---	5	30.6	3.2	8.5	3.5	5	30.6	3.2	8.5	3.5	100
1982	17	1	22.2	0.0	3.3	0.0	2	28.6	0.8	5.5	2.8	3	26.4	3.1	4.4	2.3	67
1981	18	2	28.0	4.3	4.0	2.0	4	32.1	1.5	8.6	3.9	6	30.7	3.4	7.4	4.0	67
1980	19	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1979	20	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1978	21	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1977	22	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1976	23	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1975	24	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1974	25	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1973	26	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1972	27	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1971	28	1	38.0	0.0	---	---	0	---	---	---	---	1	38.0	0.0	---	---	0
Sample Size		192					431					623					
Means			21.3	3.5	3.3	1.7		22.8	3.6	3.8	2.0		22.3	3.6	3.7	1.9	69
Mean Age		7.2					8.1					7.9					

Table 11. Age and size composition of hatchery and wild lake trout in tribal commercial harvests from MI-5, 1999. Weight is in round pounds, sd = standard deviation. (Totals include 1 unaged hatchery fish and 3 unaged wild fish.).

		Hatchery					Wild					Total					
Year			length (in)		weight (lb)			length (in)		weight (lb)			length (in)		weight (lb)		Percent
Class	Age	N	mean	sd	mean	sd	N	mean	sd	mean	sd	N	mean	sd	mean	sd	wild
1996	3	0	---	---	---	---	3	19.9	1.3	2.8	0.5	3	19.9	1.3	2.8	0.5	100
1995	4	1	20.1	0.0	2.3	0.0	3	19.5	0.2	2.4	0.2	4	19.7	0.3	2.4	0.2	75
1994	5	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1993	6	1	21.0	0.0	2.8	0.0	1	20.6	0.0	2.8	0.0	2	20.8	0.2	2.8	0.0	50
1992	7	0	---	---	---	---	2	20.9	0.4	2.9	0.6	2	20.9	0.4	2.9	0.6	100
1991	8	1	24.9	0.0	4.5	0.0	2	22.5	0.3	3.6	0.2	3	23.3	1.1	3.9	0.5	67
1990	9	0	---	---	---	---	1	24.1	0.0	3.9	0.0	1	24.1	0.0	3.9	0.0	100
1989	10	1	23.6	0.0	4.4	0.0	4	24.7	0.6	4.9	0.7	5	24.5	0.7	4.8	0.7	80
1988	11	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	---
1987	12	0	---	---	---	---	1	31.5	0.0	10.5	0.0	1	31.5	0.0	10.5	0.0	100
Sample Size		5					20					25					
Means			21.6	2.4	3.2	1.1		22.3	2.9	3.8	1.8		22.1	2.8	3.7	1.7	80
Mean Age		7.0					6.9					7.0					

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 1999. Weight is in round pounds, sd = standard deviation.

		MI-2					MI-3					MI-4					MI-5				
Year			length (in)		weight (lb)			length (in)		weight (lb)			length (in)		weight (lb)			length (in)		weight (lb)	
class	Age	N	mean	sd	mean	sd	N	mean	sd	mean	sd	N	mean	sd	mean	sd	N	mean	sd	mean	sd
1995	4	0	---	---	---	---	0	---	---	---	---	2	14.5	3.9	1.5	0.9	0	---	---	---	---
1994	5	3	19.6	1.0	2.7	0.3	2	19.6	0.7	2.6	1.1	8	19.3	2.1	1.9	0.8	1	17.4	0	1.8	0
1993	6	16	20.7	0.7	3.2	0.3	41	19.2	1.1	2.4	1.0	70	18.8	1.3	2.3	1.0	20	20.0	1.5	2.7	0.7
1992	7	17	21.2	1.2	3.3	0.6	188	19.5	1.2	2.4	1.0	211	20.1	1.5	2.9	1.2	34	20.7	1.4	2.9	0.6
1991	8	22	21.3	1.6	3.5	0.7	367	19.9	1.1	2.7	1.2	192	20.7	1.3	3.2	1.4	18	20.9	1.5	3.2	0.7
1990	9	23	21.5	1.4	3.5	1.0	346	20.1	1.1	2.9	1.3	94	21.0	2.7	3.2	1.5	6	23.2	0.5	4.2	0.4
1989	10	34	20.9	1.8	3.4	1.1	267	20.5	1.1	3.0	1.4	49	21.5	2.0	3.4	1.5	2	24.3	0.1	5.0	0.5
1988	11	30	21.0	1.7	3.4	1.0	135	20.6	1.3	3.0	1.3	25	22.1	2.1	3.4	1.7	9	24.6	1.1	5.0	0.8
1987	12	19	21.1	1.7	3.4	1.1	54	20.8	1.2	3.2	1.4	10	22.5	1.4	4.1	2.0	4	26.1	1.4	5.4	1.3
1986	13	8	21.2	1.0	3.3	0.6	14	21.2	0.8	3.3	1.4	4	23.5	2.0	4.7	1.1	1	26.5	0.0	6.7	0.0
1985	14	2	19.4	0.8	2.4	0.5	7	20.9	1.0	3.2	1.0	4	26.8	5.3	5.8	2.5	0	---	---	---	---
1984	15	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
1983	16	1	26.4	0.0	6.7	0.0	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
1982	17	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
1981	18	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
1980	19	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	1	27.6	0.0	7.7	0.0
1979	20	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	1	28.5	0.0	7.7	0.0
1978	21	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
1977	22	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---
1976	23	0	---	---	---	---	0	---	---	---	---	0	---	---	---	---	1	30.5	0.0	11.0	0.0
Sample size		487					1,784					770					98				
Means			20.9	1.5	3.5	1.9		20.0	1.4	2.8	1.3		20.4	2.0	3.0	1.5		21.7	2.6	3.6	1.5
Sample size- age		178					1420					668					98				
Mean Age		9.6					9.0					8.0					8.2				

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 1999. Weight is in round pounds, sd = standard deviation.

		All					MI-2					MI-3					MI-4				
Year			length (in)		weight (lb)			length (in)		weight (lb)			length (in)		weight (lb)			length (in)		weight (lb)	
class	Age	N	mean	sd	mean	sd	N	mean	sd	mean	sd	N	mean	sd	mean	sd	N	mean	sd	mean	sd
1995	4	13	16.3	2.1	1.4	0.6	1	19.3	0.0	2.2	0.0	0	---	---	---	---	12	16.1	2.1	1.3	0.5
1994	5	12	18.0	2.0	2.8	2.6	1	18.6	0.0	2.2	0.0	1	17.0	0.0	2.4	0.0	10	18.0	2.2	2.9	2.8
1993	6	7	18.5	3.1	2.8	1.5	0	---	---	---	---	0	---	---	---	---	6	19.6	1.8	2.8	1.4
1992	7	13	19.2	1.6	2.7	1.1	0	---	---	---	---	6	19.0	1.2	2.7	0.3	7	19.3	1.9	2.9	1.5
1991	8	8	19.5	2.7	5.2	6.4	3	20.1	1.7	2.7	0.9	0	---	---	---	---	5	19.0	3.0	7.0	7.8
1990	9	8	19.2	2.6	3.4	1.8	0	---	---	---	---	7	19.3	2.7	3.4	1.8	0	---	---	---	---
1989	10	5	23.4	2.4	6.1	2.7	0	---	---	---	---	4	23.6	2.6	7.6	2.6	0	---	---	---	---
1988	11	5	22.9	4.1	3.2	1.4	1	22.0	0.0	2.8	0.0	0	---	---	---	---	0	---	---	---	---
1987	12	12	20.0	1.5	6.9	6.7	0	---	---	---	---	7	20.3	1.7	2.8	1.1	5	19.5	0.9	8.6	8.4
1986	13	6	21.4	2.8	9.2	7.6	0	---	---	---	---	5	22.0	2.7	6.9	6.0	0	---	---	---	---
1985	14	7	22.2	1.1	3.6	1.7	1	21.8	0.0	3.1	0.0	3	22.3	1.6	3.9	2.0	3	22.1	0.5	3.6	1.7
1984	15	11	22.2	1.7	3.5	1.2	0	---	---	---	---	8	22.3	1.7	3.6	0.8	3	21.9	1.7	3.1	1.5
1983	16	6	23.0	2.3	3.2	1.2	0	---	---	---	---	6	23.0	2.3	3.2	1.2	0	---	---	---	---
1982	17	8	24.5	3.2	4.7	2.6	0	---	---	---	---	6	24.7	3.5	4.2	2.4	2	24.2	2.2	5.7	2.0
1981	18	6	25.6	4.1	5.3	3.8	0	---	---	---	---	3	23.3	2.7	2.9	1.4	3	27.9	3.9	7.7	4.7
1980	19	14	24.4	2.7	4.5	2.5	0	---	---	---	---	10	24.1	2.9	4.4	2.4	4	25.3	1.9	4.9	2.1
1979	20	11	26.4	2.3	5.5	2.3	0	---	---	---	---	9	25.8	2.2	5.3	1.8	2	28.9	0.1	7.3	3.6
1978	21	5	26.8	2.9	5.5	2.4	0	---	---	---	---	5	26.8	2.9	5.5	2.4	0	---	---	---	---
1977	22	5	24.4	2.6	4.5	1.8	0	---	---	---	---	4	23.2	1.2	3.6	0.6	1	29.2	0.0	7.9	0.0
1976	23	2	28.2	0.7	7.5	0.8	0	---	---	---	---	2	28.2	0.7	7.5	0.8	0	---	---	---	---
Sample size		200					8					117					75				
Means			22.1	4.1	4.3	3.5		20.2	1.5	2.6	0.6		23.2	3.7	4.4	2.7		20.4	4.2	4.3	4.6
Sample size- age		167					7					92					68				
Mean Age		12.8					8.3					15.3					9.8				

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 1999. Weight is in round pounds, sd = standard deviation.

		Herring MI-4					Menominee MI-4				
Year			length (in)		weight (lb)			length (in)		weight (lb)	
class	Age	N	mean	sd	mean	sd	N	mean	sd	mean	sd
1996	3	3	10.3	0.5	0.4	0.1	0	--	--	--	--
1995	4	1	17.8	0.0	2.5	0.0	0	--	--	--	--
1994	5	7	15.1	2.7	0.6	0.3	0	--	--	--	--
1993	6	17	16.7	1.9	1.1	0.5	1	13.4	0.0	0.7	0.0
1992	7	31	16.3	2.2	1.3	0.9	0	--	--	--	--
1991	8	58	16.3	2.1	1.6	2.0	0	--	--	--	--
1990	9	35	16.8	3.3	2.1	1.9	0	--	--	--	--
1989	10	17	17.2	1.4	1.7	1.1	0	--	--	--	--
1988	11	7	18.4	1.2	2.8	1.0	0	--	--	--	--
1987	12	4	17.7	1.2	1.1	0.5	0	--	--	--	--
1986	13	0	--	--	--	--	0	--	--	--	--
1985	14	0	--	--	--	--	0	--	--	--	--
Sample size		469					1				
Means			17.1	1.9	1.6	1.0		13.4	0.0	0.7	0.0
Sample size- age		180					1				
Mean Age		8.1					6.0				

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 1999. Weight is in round pounds, sd = standard deviation.

		Chinook Salmon MI-3 & MI-4					Coho Salmon MI-4				
Year			length (in)		weight (lb)			length (in)		weight (lb)	
class	Age	N	mean	sd	mean	sd	N	mean	sd	mean	sd
1997	2	0	0	0	0	0	2	15.1	1.5	1.4	0.4
1996	3	0	0	0	0	0	1	14.4	0	1.6	0
1995	4	4	20.8	2.5	4.2	0.7	2	20.6	0.3	4.5	0.2
1994	5	2	28.8	0.2	8.7	2.3	2	21.4	0.9	4.1	0.7
Sample size		6					7				
Means			23.5	4.6	5.7	2.6		18.4	3.4	3.1	1.6
Mean Age		4.3					3.6				