

# 2008 SPAWNING LAKE TROUT ASSESSMENT

## INTRODUCTION

Recovery of historical spawning populations has been an essential component of lake trout rehabilitation in the Wisconsin waters of Lake Superior. Creation of refuges/special use areas adjacent to spawning shoals, more restrictive fishing regulations, stocking of fertilized lake trout eggs in astro-turf bundles, and sea lamprey control has increased lake trout abundance. Although wild lake trout abundance has increased dramatically since the 1960s and stocking was concluded in 1995 for WI-2, maintaining or continuing to increase spawner biomass is essential to a self-sustaining population. The objective of this assessment is to monitor lake trout abundance on historically important spawning shoals and to collect lake trout eggs for the Les Voight Fish Hatchery for lake trout and splake stocking programs.

## METHODS

The standard index gang set on Gull Island Shoal (GIS) was 2,700 ft of 5.5-in and 6-in (stretch measure) monofilament mesh (6, 5.5, 6, 5.5, 6, 5.5, 6, 5.5, 6). Each net within the gang was 300 feet long. The standard index gang off Northeast Michigan Island (NMI) was divided: 1,500 ft (6, 5.5, 6, 5.5, 6) set off Michigan Island, and 1,200 ft (6, 5.5, 6, 5.5) set off Gull Island.

The standard index gang set on Sand Cut Reef (SCR) was 3,900 ft of graded monofilament mesh. Each net was 300 ft long and meshes were arranged in the following sequence: 6, 5.5, 7, 4.5, 6.5, 5, 6, 5, 6.5, 4.5, 7, 5.5, 6. On SCR the gang was divided between the two humps: 1,800 ft on the west hump and 2,100 ft on the east hump.

An index gang (3,900 ft of graded monofilament mesh) was set on Cat Island Shoal (CIS) and the southwest corner of North Twin Island (SWNTI). Each net was 300 ft long and meshes were arranged in the following sequence: 6, 5.5, 7, 4.5, 6.5, 5, 6, 5, 6.5, 4.5, 7, 5.5, 6.

All fish were measured to the nearest tenth of an inch, sexed, inspected for sea lamprey marks, and inspected for fin clips and t-bar tags. Live lake trout were marked with individually numbered t-bar tags and released. Otoliths and scales were removed from the dead, wild fish.

Fish ages were estimated by examining sectioned sagittal otolith planes.

## Results/Discussion

### GULL ISLAND SHOAL

In 2008, 1,085 spawning lake trout were sampled on GIS and 96% were wild fish. Seventeen percent of the lake trout captured were female. Catch-per-unit-effort (CPUE) from 5.5 and 6 in

mesh increased from 2007 to 2008 (Table 1) and total CPUE increased (Figure 1). Spawning lake trout CPUE has increased dramatically since 1960, when no fish were caught during the spawning assessments (Figure 1). Mean lengths of male and female lake trout were 28.2 in (SD=3.0) and 30.5 in (SD=3.0), respectively.

#### NORTHEAST MICHIGAN ISLAND

In 2008, 310 lake trout were sampled on NMI. Wild fish constituted 99% of the catch and female lake trout comprised 30% of the catch. Lake trout CPUE decreased from 2007 to 2008 (Table 1). Mean lengths of male and female lake trout were 27.2 in (SD=2.6) and 29.3 in (SD=2.7), respectively.

#### GULL ISLAND SHOAL - MICHIGAN ISLAND COMPLEX

The GIS-NMI data for wild and hatchery-origin female lake trout were combined to monitor trends. Lake trout CPUE for fish >29.0 in increased from 2007 to 2008 (Table 2). Although variable between 1985 and 1995, the abundance of wild female lake trout has increased gradually since 1964 (Figure 2). The annual proportion of female lake trout in the catch, also highly variable, has not consistently increased since the 1970s (Figure 3). The annual proportion of hatchery lake trout in the catch continues to decrease, however hatchery fish were a large component of the catch during assessments in the 1960s and 1970s (Figure 4).

Lake trout caught in 2006 through 2008 were combined to evaluate the age distribution of spawning fish at GIS complex (Figure 5). Thirty lake trout year classes were represented in the sample of GIS complex (Figure 5). Average age of spawning lake trout at GIS was 19 (range 7-42).

Fresh sea lamprey wounds (per 100 fish) were generally highest for lake trout sampled at GIS complex (Table 3).

#### SAND CUT REEF

In 2008, 97 lake trout were sampled on SCR. Wild fish comprised 96% of the catch and female lake trout comprised 30% of the catch. Catch-per-effort of spawning lake trout decreased from 2007 to 2008 (Table 4; Figure 6). Mean lengths of male and female lake trout were 26.7 in (SD=3.3) and 26.5 in (SD=2.6), respectively

Marking rates of lake trout captured from SCR were higher than those from GIS (Table 3). In previous years marking rates at SCR were much lower than at GIS. Close proximity to a major sea lamprey spawning river (Bad River) and low wounding rates indicated that sea lamprey apparently do not feed near the river or the lake trout that spawn on SCR do not spend substantial time near the river when not spawning.

### CAT ISLAND SHOAL

In 2008, 163 lake trout were captured on CIS of which 96% were unclipped, wild fish. Cat Island Shoal CPUE decreased from 2007 to 2008 (Table 5). Mean lengths of male and female lake trout were 26.7 in (SD=3.3) and 26.5 in (SD=2.6), respectively.

Lake trout caught in 2007 and 2008 were combined to evaluate the age distribution of spawning fish at CIS (Figure 7). The spawning lake trout population at CIS was composed of primarily of young fish. Although the sample size was low (51) the oldest lake trout captured was estimated at 22 years old.

Sea lamprey wounding rates from CIS were lower than at GIS complex (Table 3).

### SOUTHWEST CORNER OF NORTH TWIN ISLAND

In 2008, 46 lake trout were captured from the SWNTI, 96% were wild fish. Twenty-four percent of the lake trout captured were female. Mean lengths of male and female lake trout were 27.9 in (SD=1.9) and 29.6 in (SD=5.5), respectively. This location was sampled because it had been identified as a historical spawning shoal used by lake trout.

### 2008 EGG HARVEST

Lake trout eggs were collected by the Les Voight Fish Hatchery for the lake trout (130,432) and splake (189,621) stocking programs.

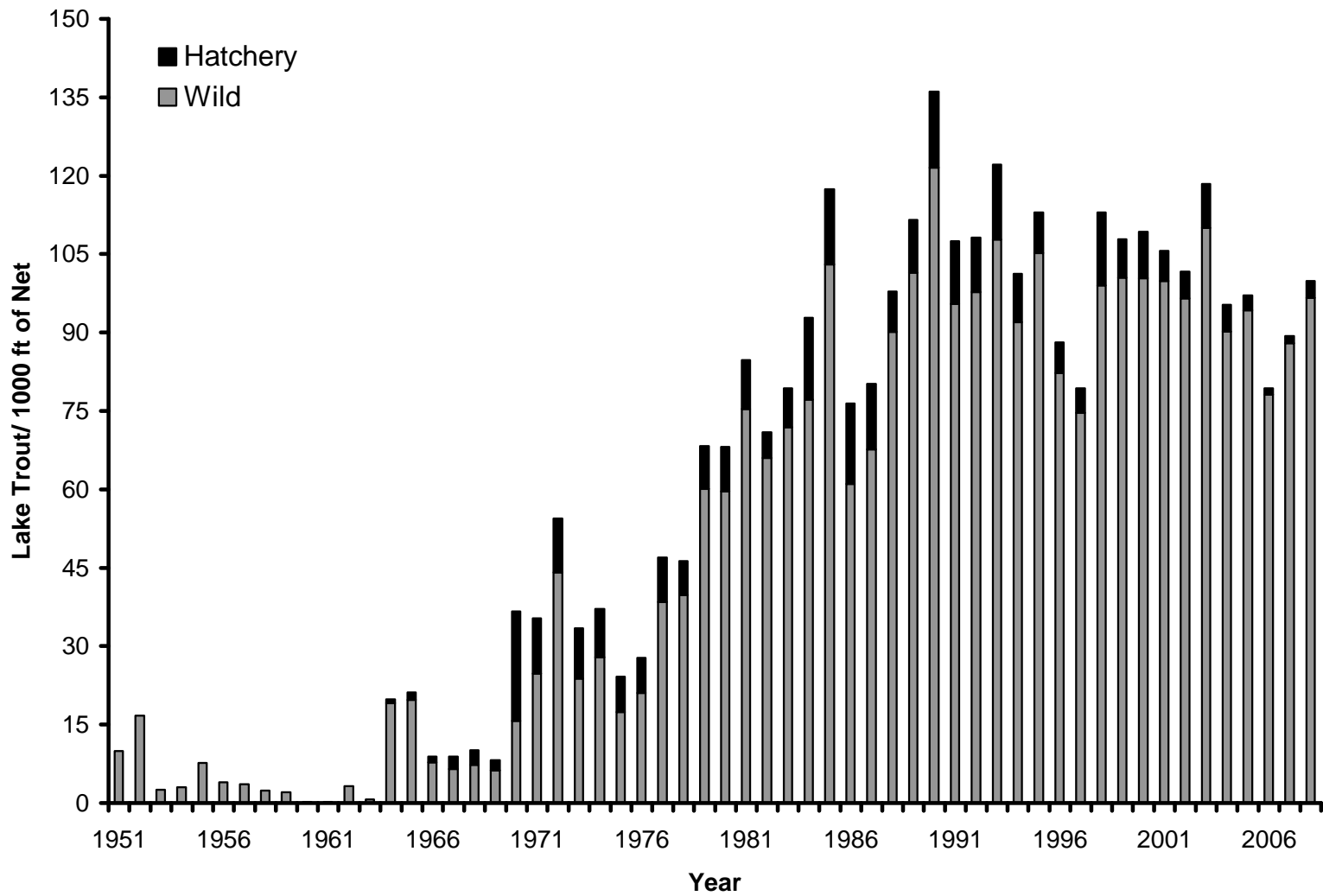


Figure 1. Catch-per-unit-effort of lake trout from spawning assessment at Gull Island Shoal, 1951-2008.

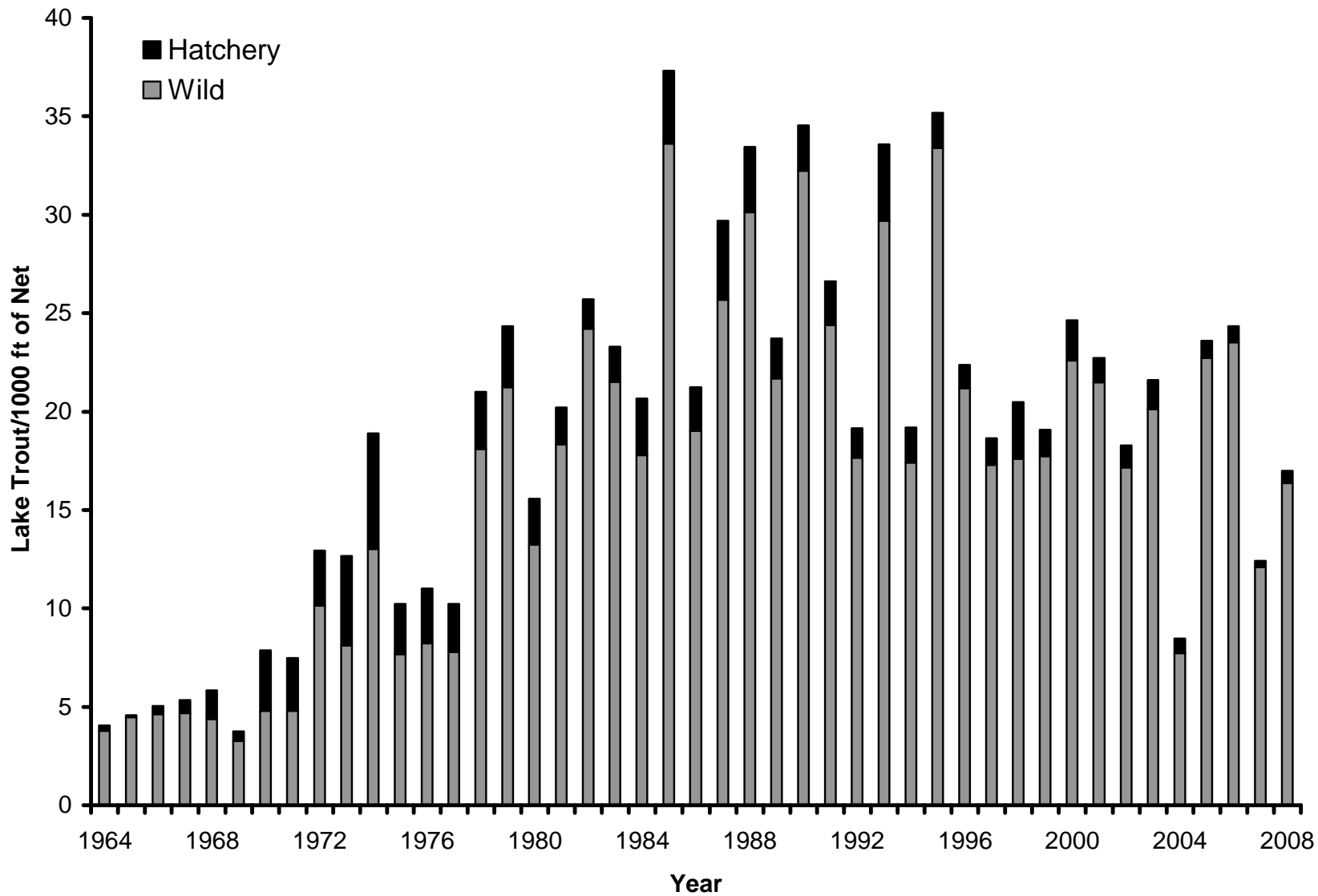


Figure 2. Female lake trout catch-per-unit-effort from spawning assessment at Gull-Michigan Island Complex, 1964-2008.

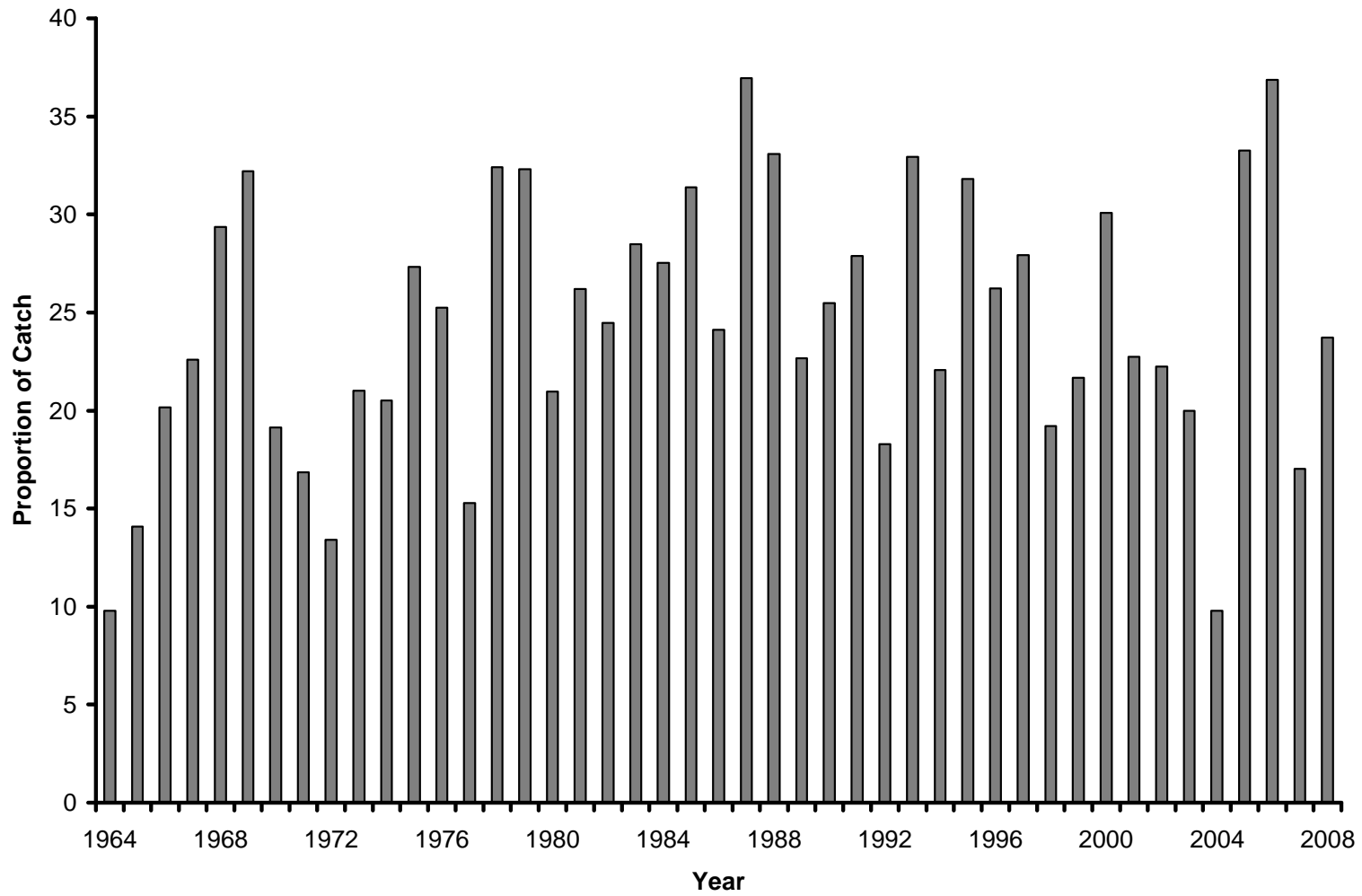


Figure 3. Mean proportion of female lake trout in the catch from the Gull-Michigan Island Complex during the spawning assessment, 1964-2008.

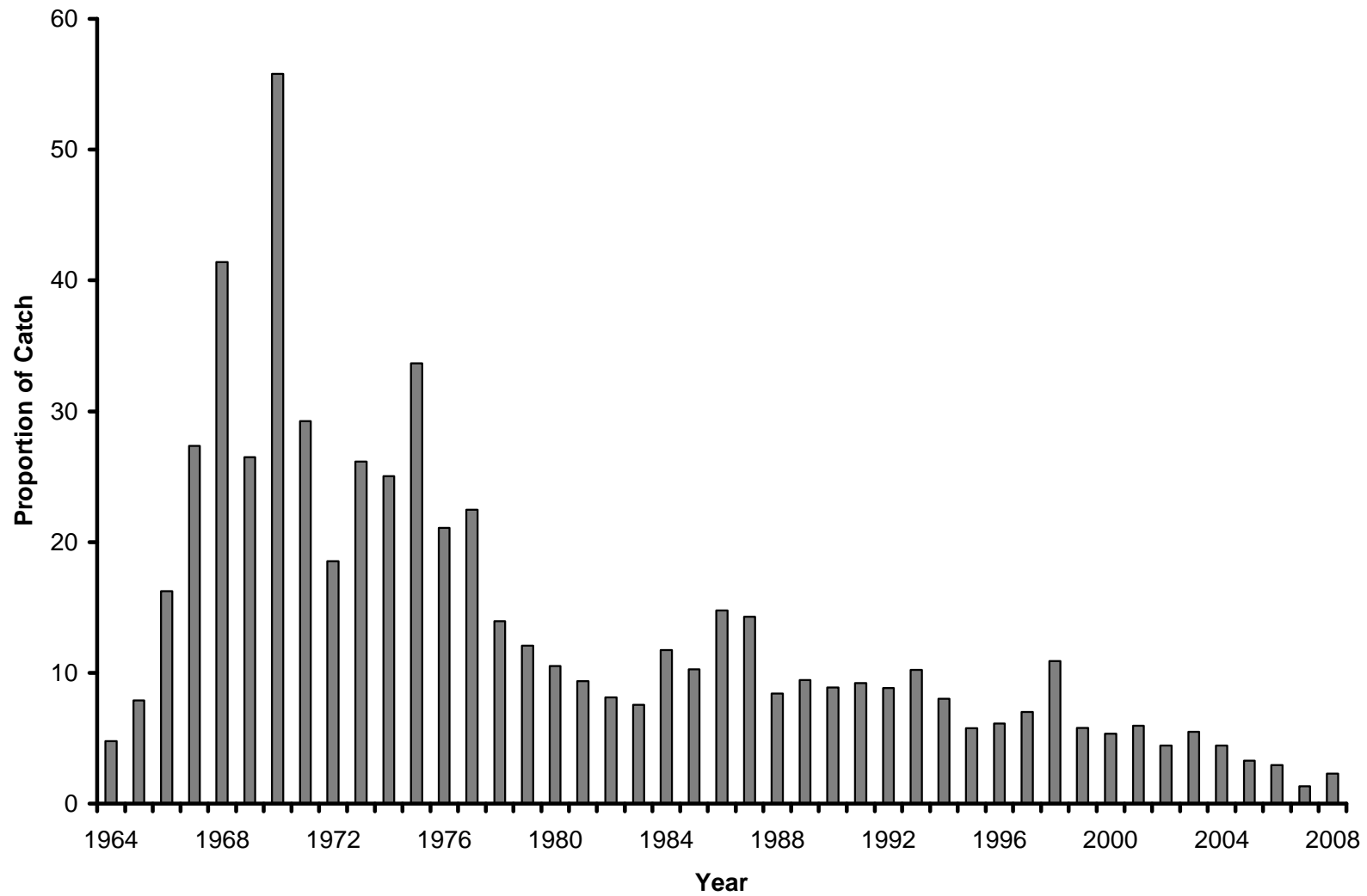


Figure 4. Mean proportion of hatchery lake trout in the catch from Gull-Michigan Island Complex during the spawning assessment, 1964-2008.

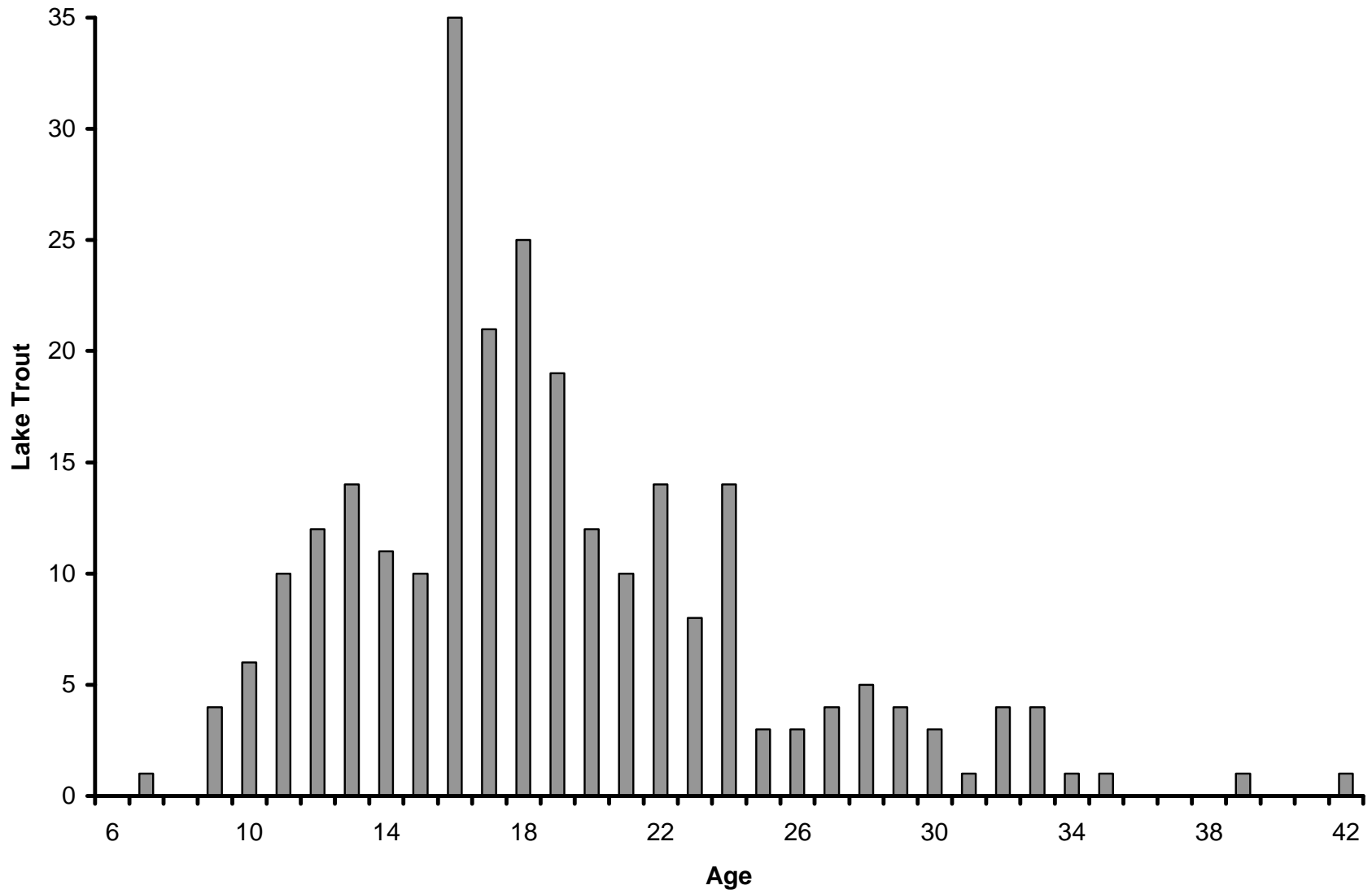


Figure 5. Age distribution of lake trout sampled during spawning assessment at Gull Island Shoal, 2006 through 2008.



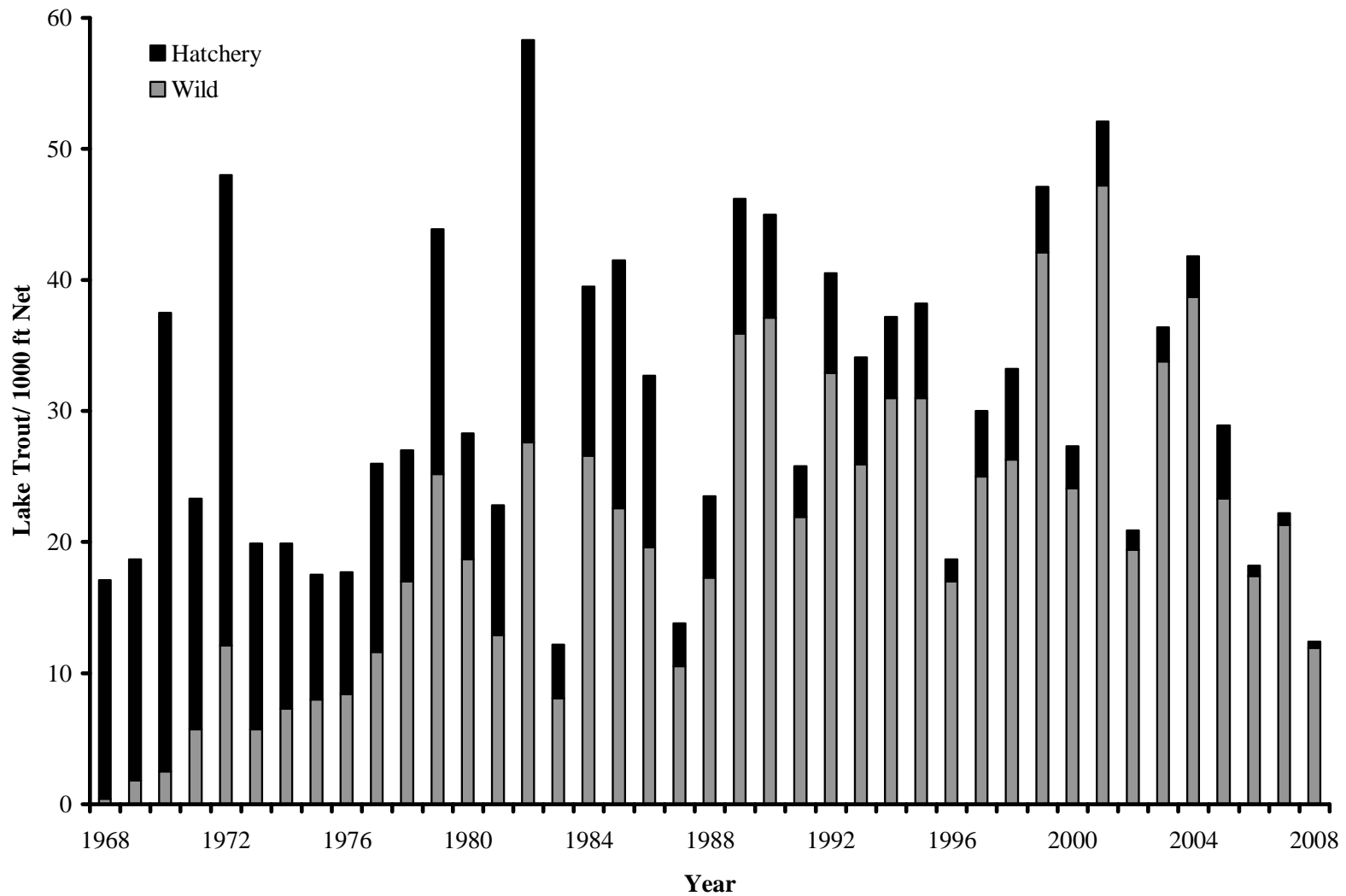


Figure 6. Catch-per-unit-effort of lake trout from spawning assessment at Sand Cut Reef, 1968-2008.

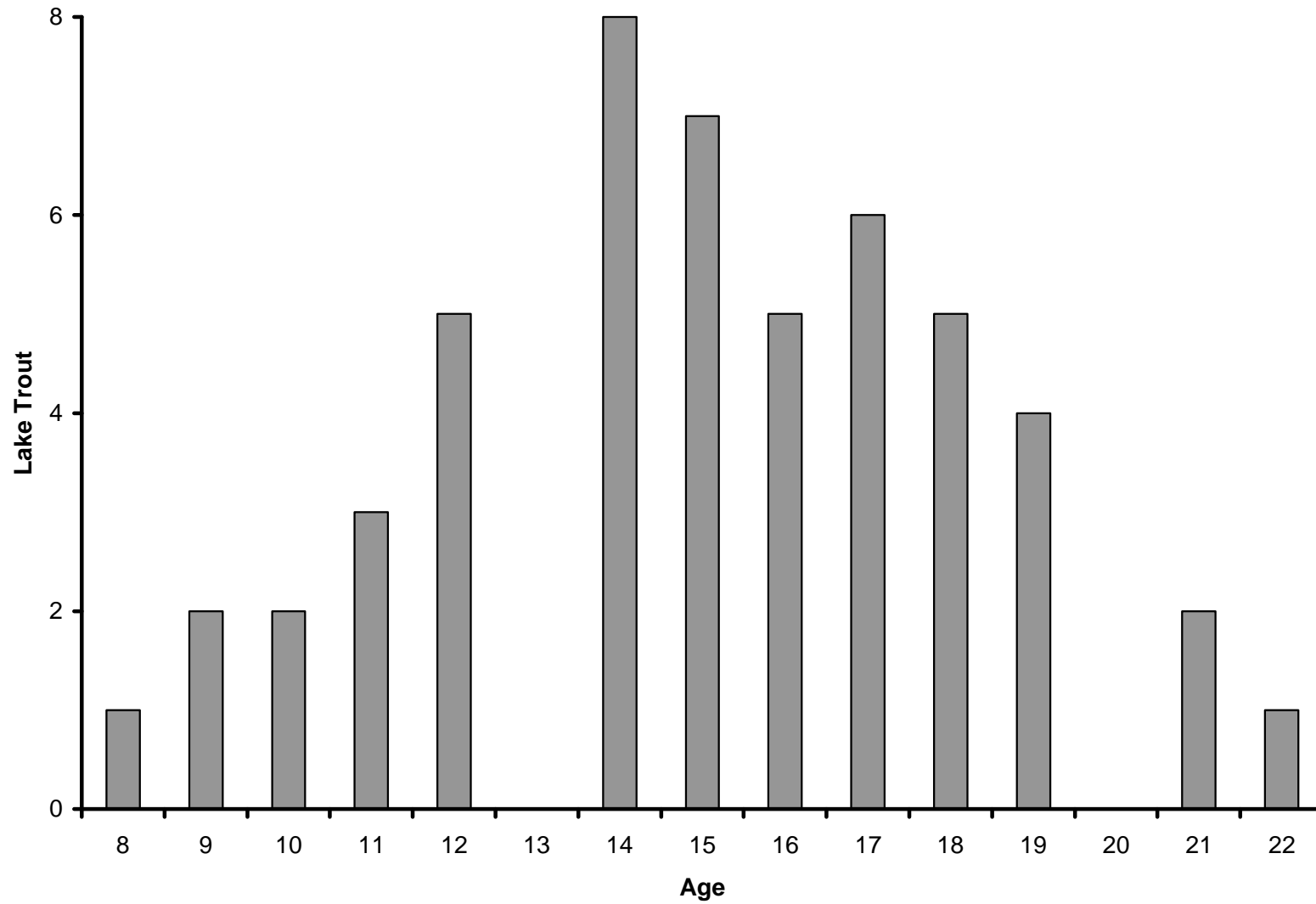


Figure 7. Age distribution of lake trout sampled during spawning assessment at Cat Island Shoal, 2007 and 2008.

Table 1. Lake trout catch per 1,000 feet of net (CPUE) and effort (ft) fished for 5.5-in and 6-in mesh nets on Gull Island and Michigan Island Shoals, 1982-2008.

Year	Gull Island Shoal				Michigan Island Shoal			
	5.5" mesh		6.0" Mesh		5.5" mesh		6.0" Mesh	
	Effort	CPUE	Effort	CPUE	Effort	CPUE	Effort	CPUE
1982	3,000	136.7	5,400	68.9	1,200	143.3	2,400	87.9
1983	5,700	101.4	7,500	62.9	1,500	140.0	2,100	58.1
1984	4,500	125.0	8,100	74.4	2,700	135.5	6,300	75.9
1985	2,400	149.6	3,000	82.0	1,800	253.3	3,600	73.9
1986	4,800	97.7	6,000	73.2	2,400	174.2	3,000	103.0
1987	4,800	95.6	6,000	66.7	2,400	117.1	3,000	68.3
1988	4,800	115.4	6,000	82.5	2,400	137.5	3,000	94.3
1989	4,800	148.5	6,000	80.3	2,400	132.1	3,000	84.7
1990	2,400	173.3	3,000	104.0	2,400	187.5	3,000	105.7
1991	4,800	111.5	6,000	102.0	2,400	103.8	3,000	68.0
1992	4,800	119.8	6,000	96.8	2,400	98.3	3,000	89.3
1993	4,800	153.3	6,000	121.2	2,400	92.1	3,000	74.7
1994	4,800	116.9	6,000	87.0	2,400	95.0	3,000	58.7
1995	3,600	136.7	4,500	92.0	2,400	151.3	3,000	108.3
1996	4,800	101.3	6,000	77.0	1,200	94.2	1,500	73.3
1997	4,800	87.1	6,000	71.7	2,400	55.8	3,000	55.3
1998	4,800	122.7	6,000	99.8	2,400	110.4	3,000	82.0
1999	4,800	111.3	6,000	103.2	2,400	85.8	3,000	72.3
2000	4,800	117.7	6,000	100.8	2,400	76.3	3,000	58.3
2001	4,800	118.1	6,000	93.8	2,400	105.0	3,000	69.3
2002	4,800	113.1	6,000	91.2	2,400	72.9	3,000	60.3
2003	4,800	135.8	6,000	100.0	2,400	112.9	3,000	95.0
2004	4,800	102.1	6,000	98.7	2,400	84.2	3,000	64.0
2005	4,800	102.5	6,000	93.8	2,400	52.9	3,000	39.0
2006	4,800	88.8	6,000	72.7	2,400	56.3	3,000	44.3
2007	4,800	97.5	6,000	81.3	2,400	81.2	3,000	60.0
2008	4,800	118.1	6,000	86.3	2,400	66.2	3,000	50.3

Table 2. Effort (ft) fished, lake trout catch, and lake trout catch per 1,000 feet of net (CPUE) from 5.5-in and 6-in mesh nets on the Gull-Michigan Island Complex, 1982-2008.

Year	Effort (Ft)	21 – 24.9"		25 – 28.9"		29" ≤	
		Catch	CPUE	Catch	CPUE	Catch	CPUE
1982	12,000	63	5.3	721	60.1	380	31.7
1983	18,600	171	9.2	838	45.1	519	27.9
1984	18,000	242	13.4	898	49.9	417	23.2
1985	10,800	191	17.7	862	79.8	286	26.5
1986	16,200	199	12.3	1,035	63.9	308	19.0
1987	16,200	171	10.6	823	50.8	351	21.7
1988	16,200	228	14.1	1,139	70.3	294	18.1
1989	16,200	292	18.0	1,259	77.7	213	13.1
1990	10,800	201	18.6	1,047	96.9	247	22.9
1991	16,200	155	9.6	945	58.3	505	31.2
1992	16,200	206	12.7	948	58.5	506	31.2
1993	16,200	111	6.9	1090	67.3	707	43.6
1994	16,200	73	4.5	946	58.4	464	28.6
1995	13,500	118	8.7	1,034	76.6	441	32.7
1996	13,500	73	5.4	646	47.9	452	33.5
1997	16,200	88	5.4	542	33.4	518	31.9
1998	16,200	104	6.4	786	48.5	808	49.9
1999	16,200	219	13.5	724	44.7	632	39.0
2000	16,200	158	9.8	687	42.4	683	42.2
2001	16,200	182	11.2	790	48.8	619	38.2
2002	16,200	144	8.9	677	41.8	623	38.5
2003	16,200	175	10.8	916	56.5	716	44.2
2004	16,200	102	6.3	736	45.4	575	35.5
2005	16,200	97	6.0	620	38.3	582	35.9
2006	16,200	127	7.8	521	32.2	483	29.8
2007	16,200	150	9.2	770	47.5	411	25.4
2008	16,200	137	8.4	752	46.1	505	31.2

Table 3. Sea lamprey wounds on lake trout captured during spawning assessment, 2008.

Gull Island Shoal Complex							
Length (in)	#	A1	A2	A3	A4	Sum A1-3	Fresh Rate
<17	0					0	-
17-20.9	1	0	0	0	0	0	0.0
21-24.9	137	0	0	0	2	0	0.0
25-28.9	752	4	11	17	85	32	4.3
>28.9	505	12	19	67	383	98	19.4
Total	1395	16	30	84	470	130	

Sand Cut Reef							
Length (in)	#	A1	A2	A3	A4	Sum A1-3	A1-A3 Rate
<17	0					0	-
17-20.9	1	0	0	0	0	0	0.0
21-24.9	28	0	0	0	0	0	0.0
25-28.9	50	0	0	0	4	0	0.0
>28.9	18	1	1	6	13	8	44.4
Total	97	1	1	6	17	8	

Cat Island Shoal							
Length (in)	#	A1	A2	A3	A4	Sum A1-3	A1-A3 Rate
<17	0					0	-
17-20.9	0					0	-
21-24.9	58					0	0.0
25-28.9	212					0	0.0
>28.9	107					0	0.0
Total	377	0	0	0	0	0	

Table 4. Catch per 1,000 feet of net (CPUE; total and for wild fish) and catch statistics of spawning lake trout at Sand Cut Reef, 1968-2008.

Year	Total CPUE	% Female	Wild CPUE	% Wild
1968	17.1	18.3	0.4	2.4
1969	18.7	12.3	1.8	9.6
1970	37.5	17.3	2.5	6.7
1975	17.5	17.6	8.0	45.7
1980	28.3	14.7	18.7	66.0
1981	22.8	22.1	12.9	56.6
1982	58.3	23.7	27.6	47.0
1983	12.2	26.7	8.1	66.7
1984	39.5	23.7	26.6	59.7
1985	41.5	25.9	22.6	54.3
1986	32.7	32.2	19.6	60.0
1987	13.8	46.3	10.5	75.9
1988	23.5	20.8	17.3	73.8
1989	46.2	14.2	35.9	77.8
1990	45.0	23.3	37.1	82.3
1991	25.8	30.8	21.9	85.1
1992	40.5	22.5	32.9	81.3
1993	34.1	16.5	25.9	75.9
1994	37.2	30.3	31.0	83.4
1995	38.2	16.5	31.0	81.2
1996	18.7	18.3	17.0	90.8
1997	30.0	19.7	25.0	83.3
1998	33.2	16.2	26.3	79.2
1999	47.1	15.0	42.1	89.4
2000	27.3	23.0	24.1	88.3
2001	52.1	18.2	47.2	90.6
2002	20.9	25.7	19.4	92.7
2003	36.4	26.4	33.8	92.9
2004	41.8	12.3	38.7	92.6
2005	28.9	31.6	23.3	90.0
2006	18.2	33.1	17.4	95.8
2007	22.2	27.7	21.3	95.9
2008	12.4	27.8	11.9	95.8

Table 5. Effort (ft) fished, catch per 1,000 feet of net (CPUE), and catch composition of lake trout from spawning assessment at Cat Island Shoal, 1968-2008.

Year	Mesh	Effort	Males	Females	Total	CPUE	Collector
1968	4.5-6.0	7,800	154	34	188	24.1	USGS-GLSC-LSBS
1969	4.5-6.0	19,500	174	76	250	12.8	USGS-GLSC-LSBS
1970	4.5-6.0	15,600	192	28	220	14.1	USGS-GLSC-LSBS
1971	4.5-6.0	21,000	201	32	233	11.1	USGS-GLSC-LSBS
1972	4.5-6.0	7,200	96	21	117	16.3	USGS-GLSC-LSBS
2005	4.5-7.0	3,900	194	15	209	53.6	WDNR
2007	4.5-7.0	7,800	307	70	377	48.3	WDNR
2008	4.5-7.0	3,900	126	37	163	41.8	WDNR