CHEQUAMEGON BAY ASSESSMENTS, 2006

INTRODUCTION

The various fisheries of Chequamegon Bay are an important component of the sport fishery in Lake Superior. The "Bay" receives substantial fishing pressure during the open water and ice fishing seasons. Chequamegon Bay has a unique assemblage of fishes, which provides abundant fishing opportunities but also complicates management strategies. Monitoring the diverse fisheries of the "Bay" must be accomplished through a variety of assessments. The objective of this report is to briefly present data from the various assessments that are conducted within Chequamegon Bay.

METHODS

1) Spawning walleyes along the Ashland shoreline (west of the Ore Dock) were sampled daily with fyke nets from April 15-28. Netting locations were chosen based on previous sampling done in 1994 (Figure 1). Stations 3-8 were fished at various times in 2006, stations 1-6 were fished in 1994. Length, sex, and maturity were recorded for each walleye. Scales and dorsal spines were collected from a length-based subsample of walleyes. Walleyes were marked with individually numbered t-bar tags and fin clips to calculate a Schnabel mark-recapture population estimate (Kohler and Hubert 1999).

2) From May 25th to June 21th, 400 ft and 800 ft graded mesh monofilament gill net gangs (100 ft or 200 ft panels of 8,10,12, and 14 in meshes) were set along the Ashland shoreline near the breakwall (Figure 2). Lake sturgeon were measured (total length), implanted with passive integrated transponder (PIT) tags, marked with external t-bar tags, and weighed when conditions permitted.

3) Smallmouth bass were sampled by hook-and-line on June 9th, in the Kakagon and Sand Cut Sloughs (Figure 2). Wisconsin Department of Natural Resources (WDNR) personnel sampled areas with high concentrations of smallmouth bass preparing to spawn. Hook-and-line methods varied annually but included live bait (sucker minnows, leeches) and artificial baits (soft plastic, spinnerbaits). Smallmouth bass were measured (total length) and scales and dorsal spines were collected for age estimation. During several past surveys smallmouth bass also were marked with individually numbered t-bar tags.

4) On August 23rd and 26th, 17 index stations from Sand Cut Slough to Boyd Creek were seined to capture forage species and young-of-the-year smallmouth bass (Figure 2). Stations were sampled with a 50 ft bag seine (3/16 in mesh, 4 ft by 4ft bag) dragged along a standard distance of shoreline. Species counts were done and a subsample of each species was measured (total length).

RESULTS/DISCUSSION

1) During sampling 1,626 walleye were tagged, of which 872 (53%) were male. From 1994 to 2006, the male to female ratio shifted from 2.3 to 0.75. The spawning population estimate decreased from 7,196 (CI = 6,608-7,898) to 4,715 (CI = 4,272-5,261). The length distribution shifted to the right due to fewer small fish as compared to 1994 (Figure 3). In addition, age distribution was skewed to the right with few younger individuals (Figure 4). Walleye from 16-20 in (age 7-9) were much less abundant than in 1994. Mean length-at-age for younger walleyes increased from 1994 to 2006; however this trend could be an artifact of low sample size (Figure 5 and 6). But given the low abundance of smaller fish in the spawning population, a density dependent increase in growth is plausible.

Given the lack of younger cohorts entering the spawning stock since cessation of stocking in 2000, natural recruitment along Ashland appears to be insignificant. Historically, walleye did not likely spawn along the Ashland shoreline until previously stocked fish began to return in the 1980s. Although walleye continue to spawn along Ashland, an early survival bottleneck appears to be limiting their offspring's contribution to the population. The current walleye regulation has increased the number of walleyes greater than 20 in but the Ashland population would need to be maintained by sporadic stocking in the absence of natural recruitment.

2) In 2006, 134 lake sturgeon were captured, which averaged 45.6 in (Range = 27.9-64.5) (Table 1). Catch-per-unit-effort (CPUE) of lake sturgeon from 8 and 10 in meshes increased from 1988 to 2005 (Figure 7). Sites sampled each year have varied which may influence CPUE trends. Station 7 (little breakwall) has been consistently sampled annually, and its CPUEs have increased annually but were still highly variable (Figure 8). Twelve lake sturgeon captured in 2006 had been tagged previously by WIDNR personnel. In addition, lake sturgeon previously tagged in the Bad River and White River were recaptured in Chequamegon Bay. Although lake sturgeon do not spawn in the "Bay", they inhabit the "Bay" between spawning events.

3) During spring sampling, 76 smallmouth bass were captured in the Sand Cut and Kakagon sloughs. Mean length of smallmouth bass was 17.1 in (SD = 1.9) (Figure 9). Mean length of smallmouth bass has increased steadily since 1991 (Figure 10). Mean length-at-age has not changed noticeably since 1991 (Table 2). The number of older age classes represented in the catch has increased over the past decade (Table 3). The 22 in minimum length limit has increased the number of larger smallmouth bass and allowed more year-classes to contribute to the fishery.

4) Fifteen species were captured during seining in 2006 (Table 4). Smallmouth bass per seine haul was relatively stable but yellow perch per haul has been much more variable since 1996 (Figure 10). Annual changes in vegetation and woody structure in several of the sites in Chequamegon Bay are likely influencing forage catchability, thus influencing catch composition and species abundance.

Since 1993, 2,135 smallmouth bass have been tagged in Chequamegon Bay during various assessments. Through 2006, 190 tagged fish had been recaptured on at least one occasion. Recapture data has revealed a relatively consistent seasonal migration pattern. Spring recaptures indicate that almost all smallmouth bass reproduction occurs in the eastern sloughs. For example, all but two smallmouth bass recaptures during May and June have been in Kakagon and Sand Cut Sloughs. During summer most bass move out of the sloughs into deeper water and in fall many bass congregate off the Ashland shoreline. Furthermore, anglers consistently catch smallmouth bass during winter months near Ashland.

References

Van Den Avyle, M.J. and R.S. Hayward 1999. Dynamics of Exploited Fish Populations. Pages 127-166. *In* C.C. Kohler and W.A. Hubert, editors. Inland Fisheries Management, 2nd edition. American Fisheries Society, Bethesda, Maryland.

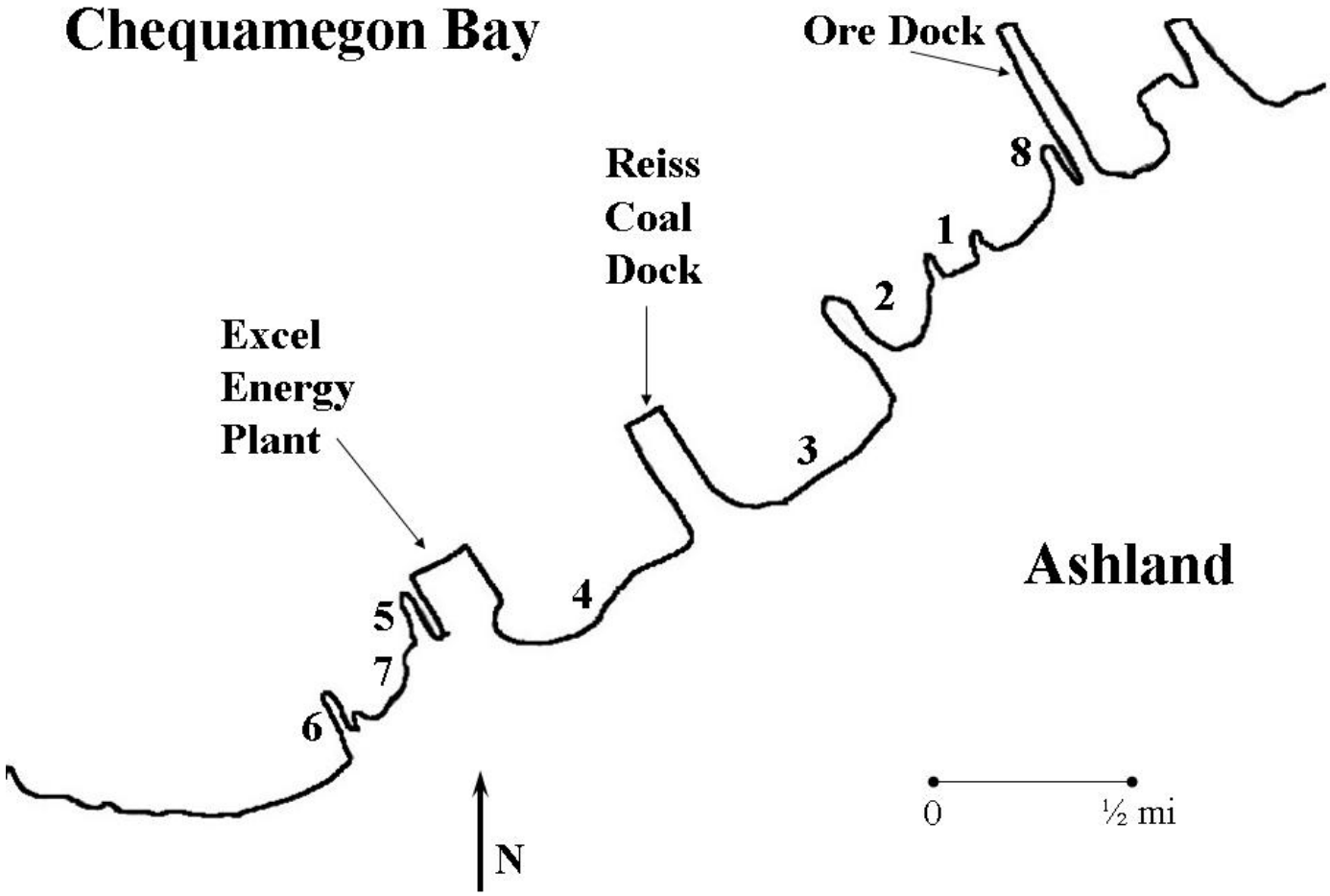

Figure 1. Map of spawning walleye assessment net locations along Ashland Shoreline in 1994 and 2006.

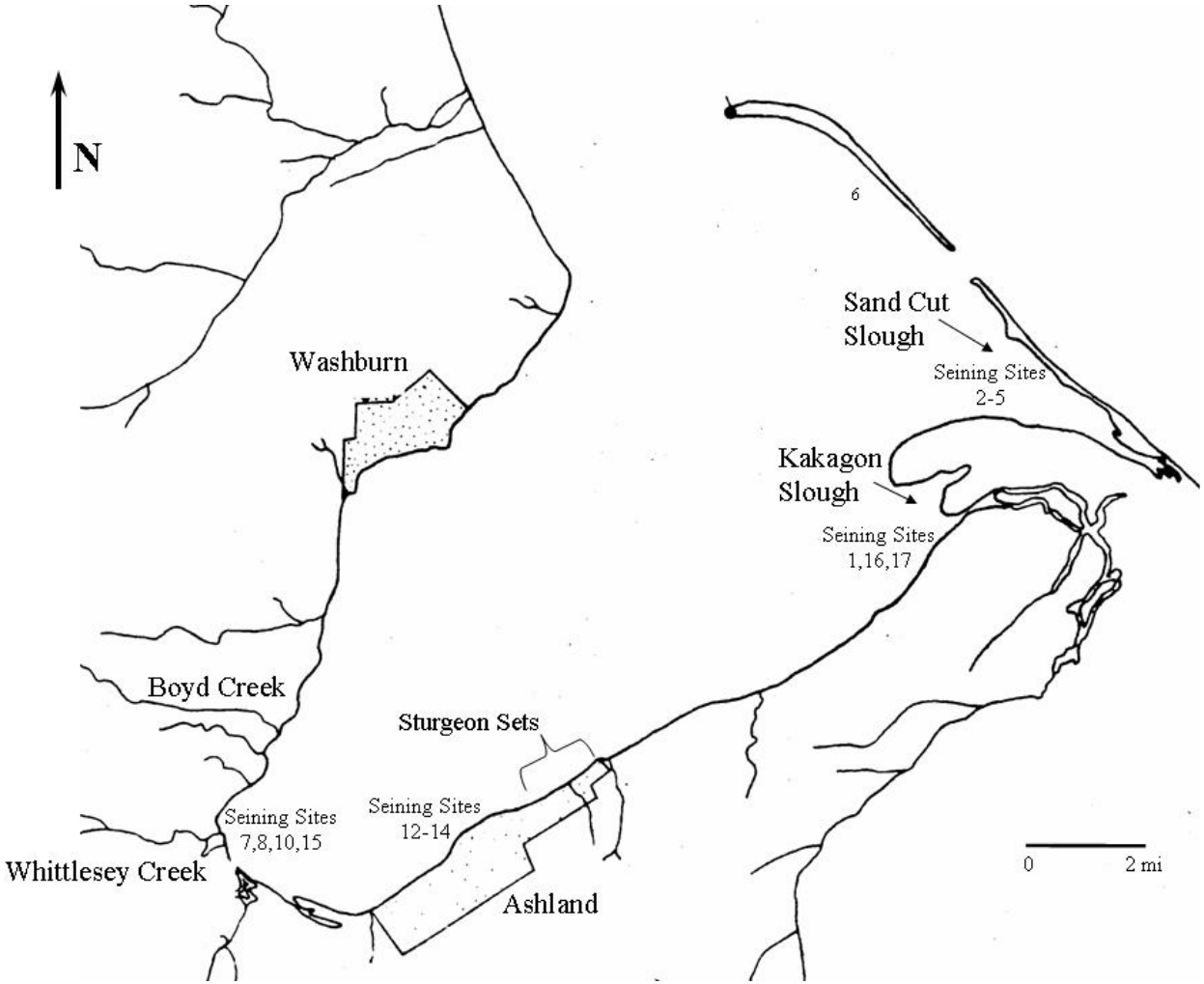

Figure 2. Map of Chequamegon Bay, Lake Superior with seining stations and lake sturgeon gill net sets, 2006.

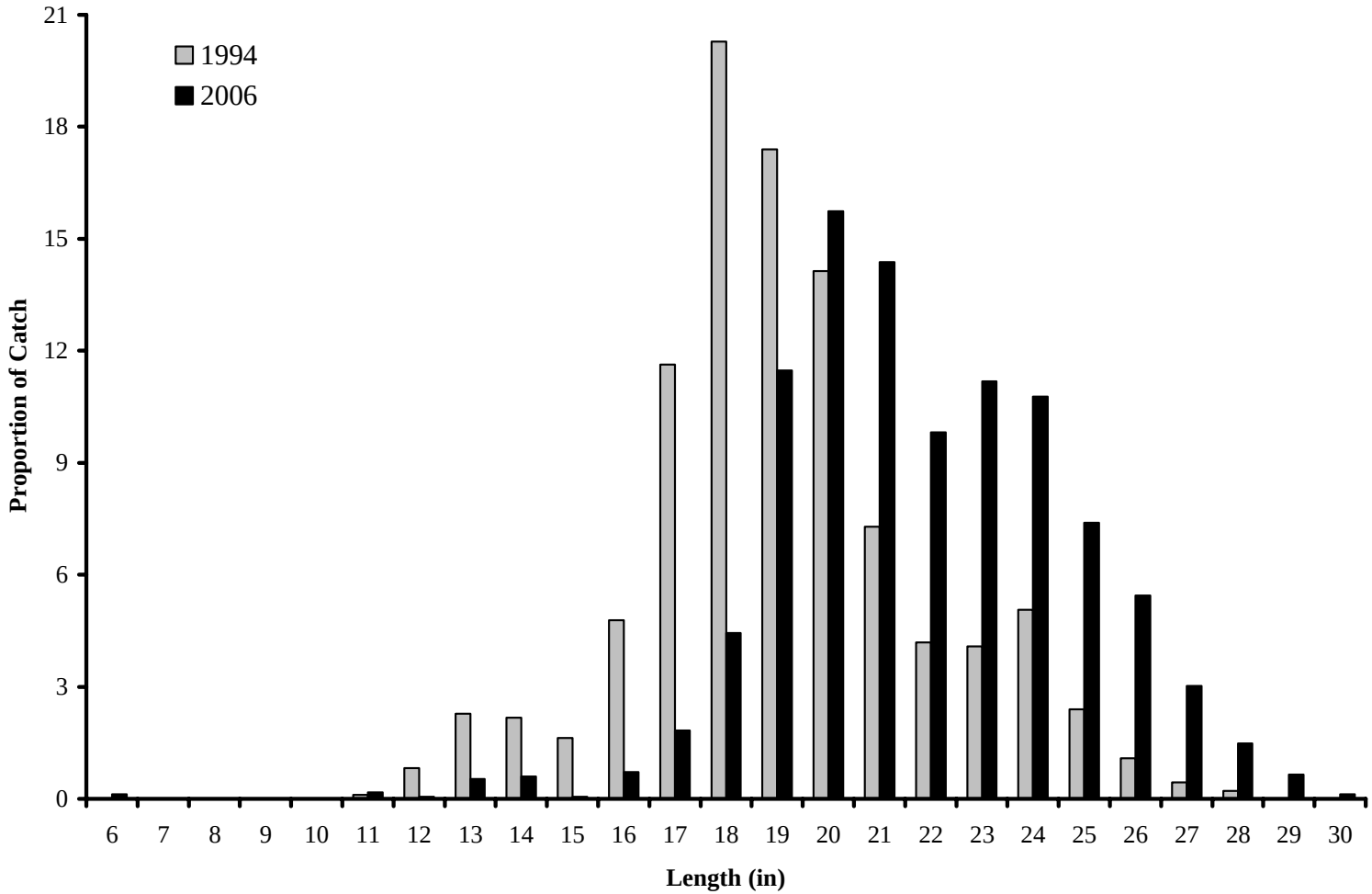

Figure 3. Length distribution of spawning walleyes caught along Ashland shoreline, 1994 and 2006.

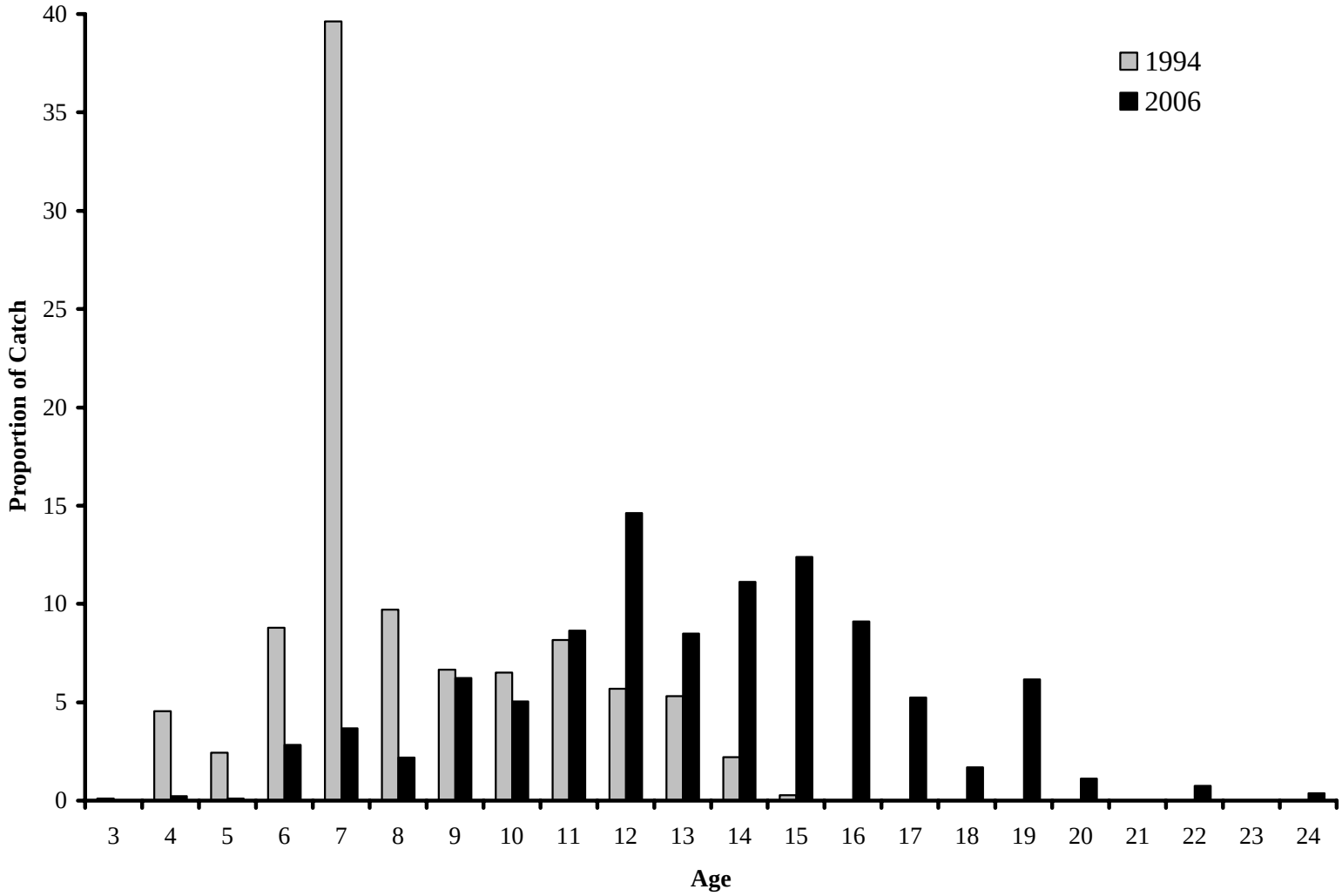

Figure 4. Age distribution of spawning walleyes caught along Ashland shoreline, 1994 and 2006.

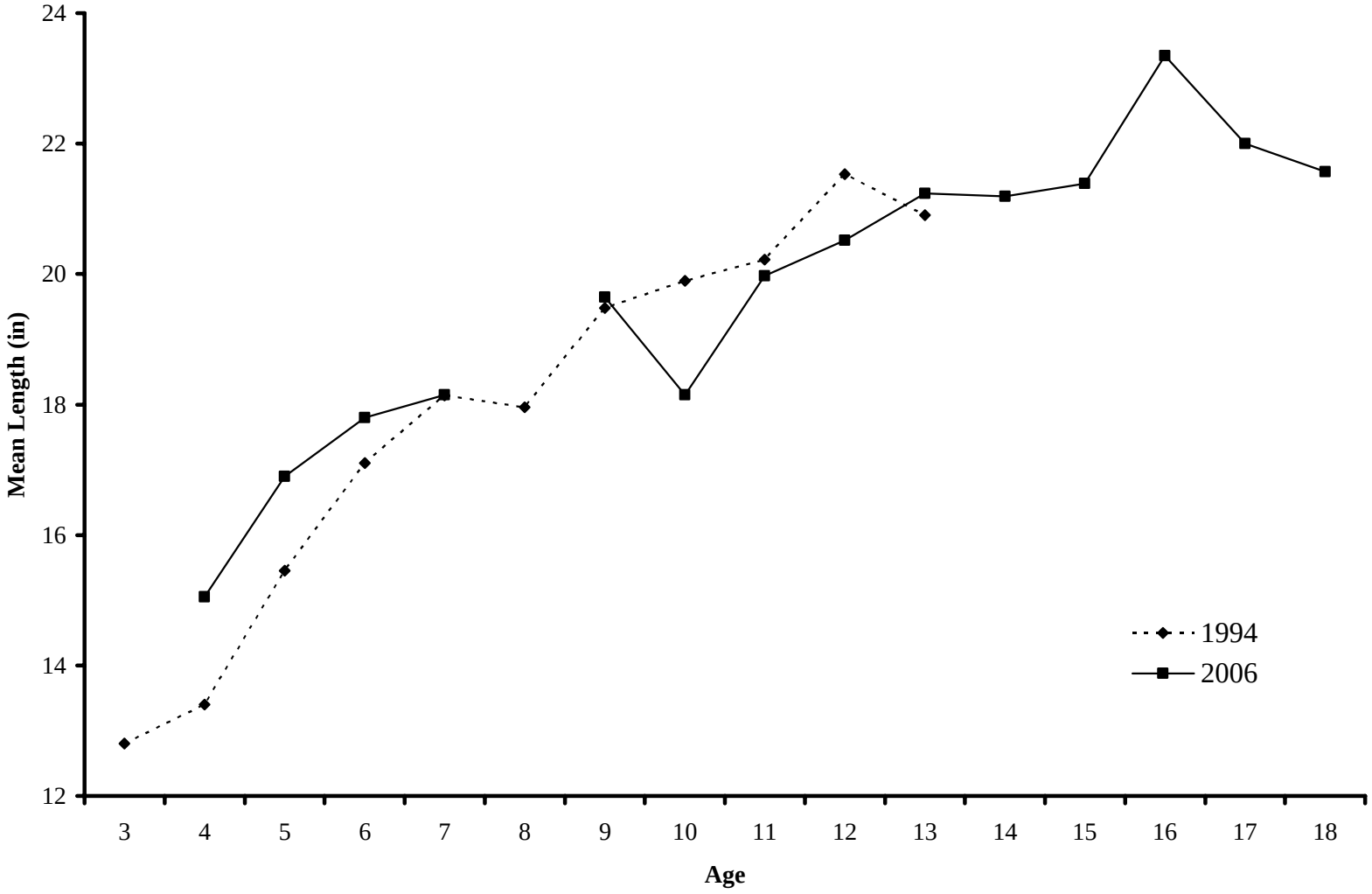

Figure 5. Mean length-at-age of male spawning walleyes caught along Ashland shoreline, 1994 and 2006.

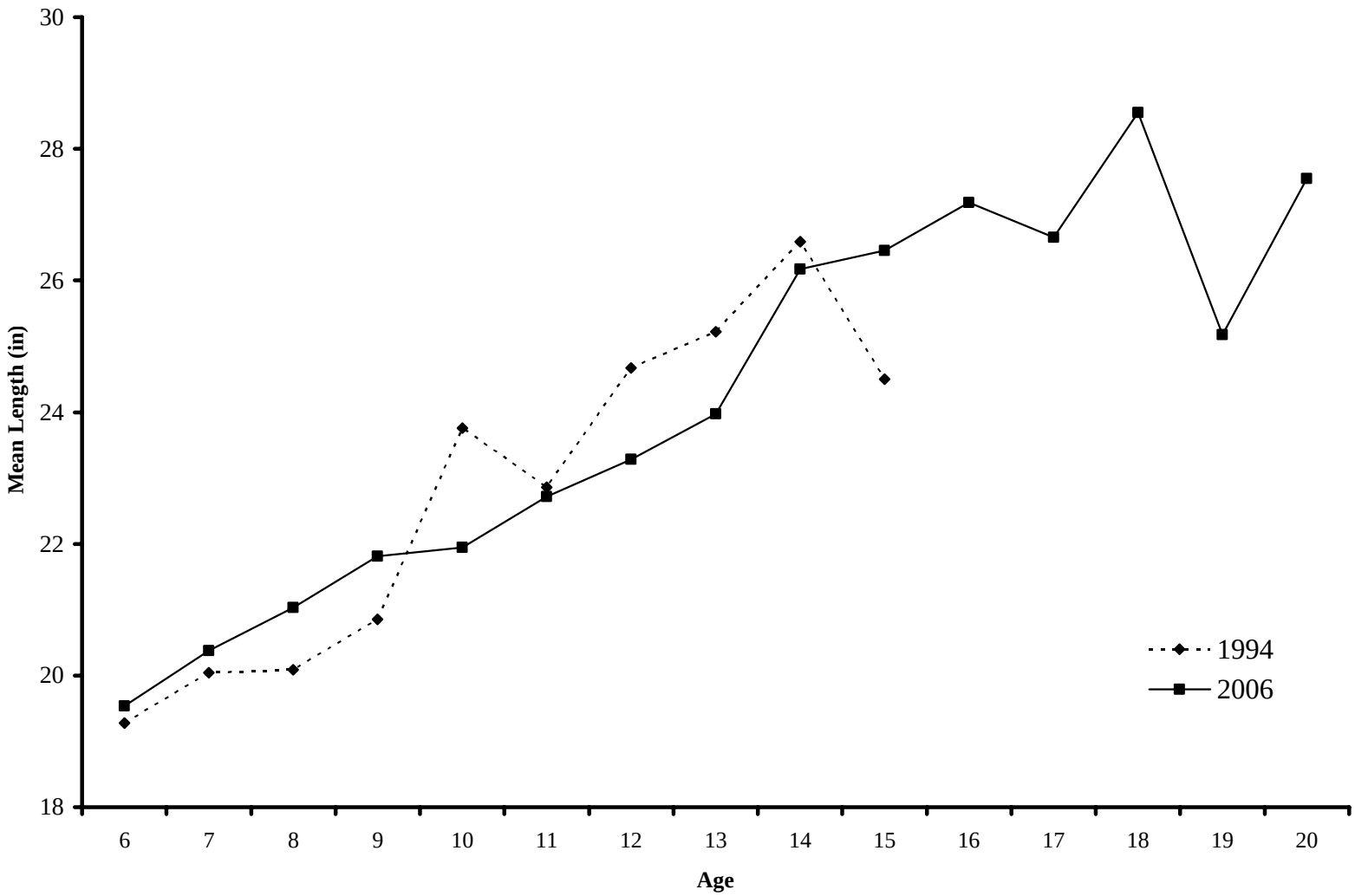

Figure 6. Mean length-at-age of female spawning walleyes caught along Ashland shoreline, 1994 and 2006.

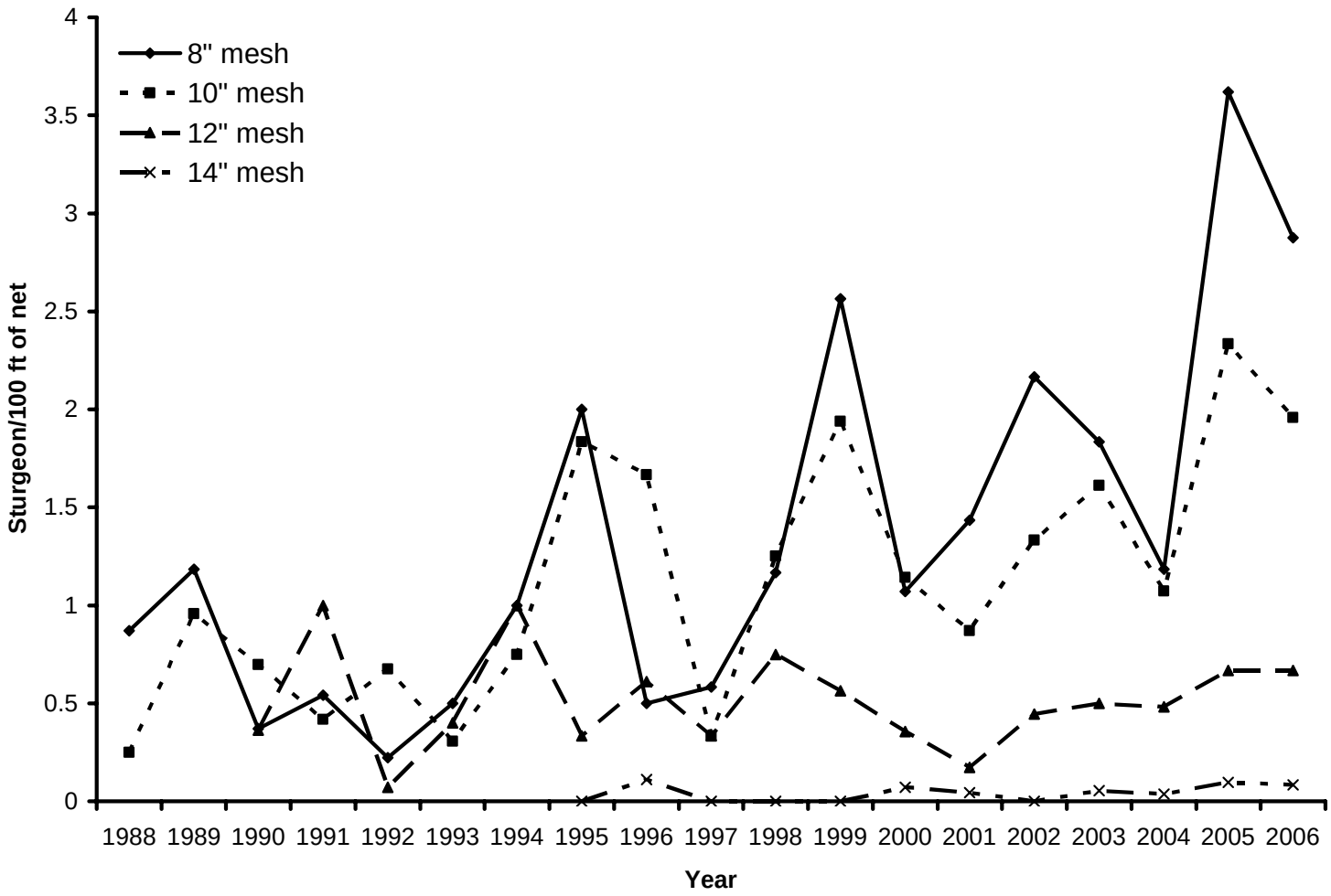

Figure 7. Catch-per-unit-effort of lake sturgeon from spring Chequamegon Bay assessment, 1988-2006. Twelve inch mesh was added to the assessment in 1990 and 14 inch mesh was added in 1995.

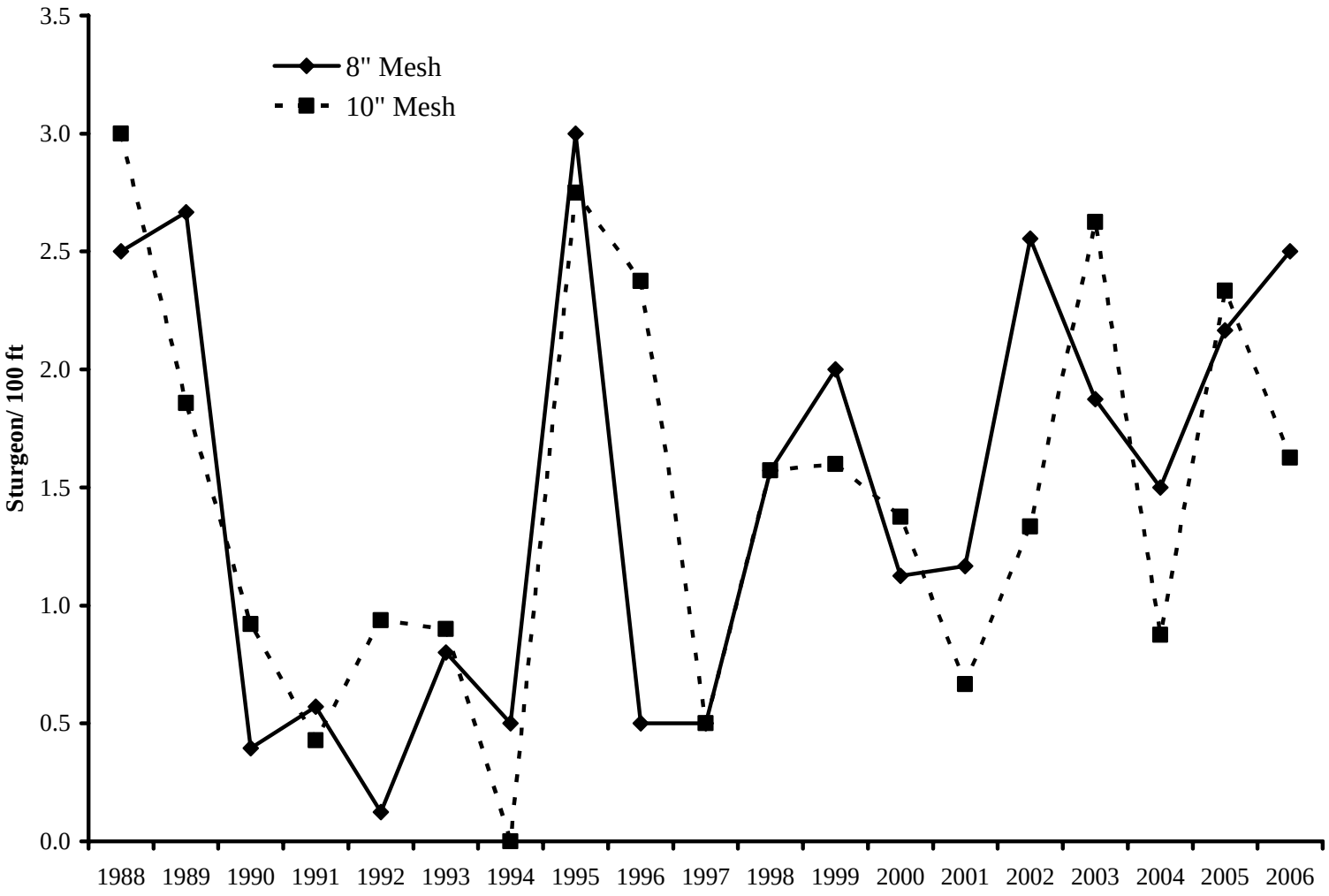

Figure 8. Catch-per-unit-effort of lake sturgeon from little breakwall station during spring Chequamegon Bay assessment, 1988-2006.

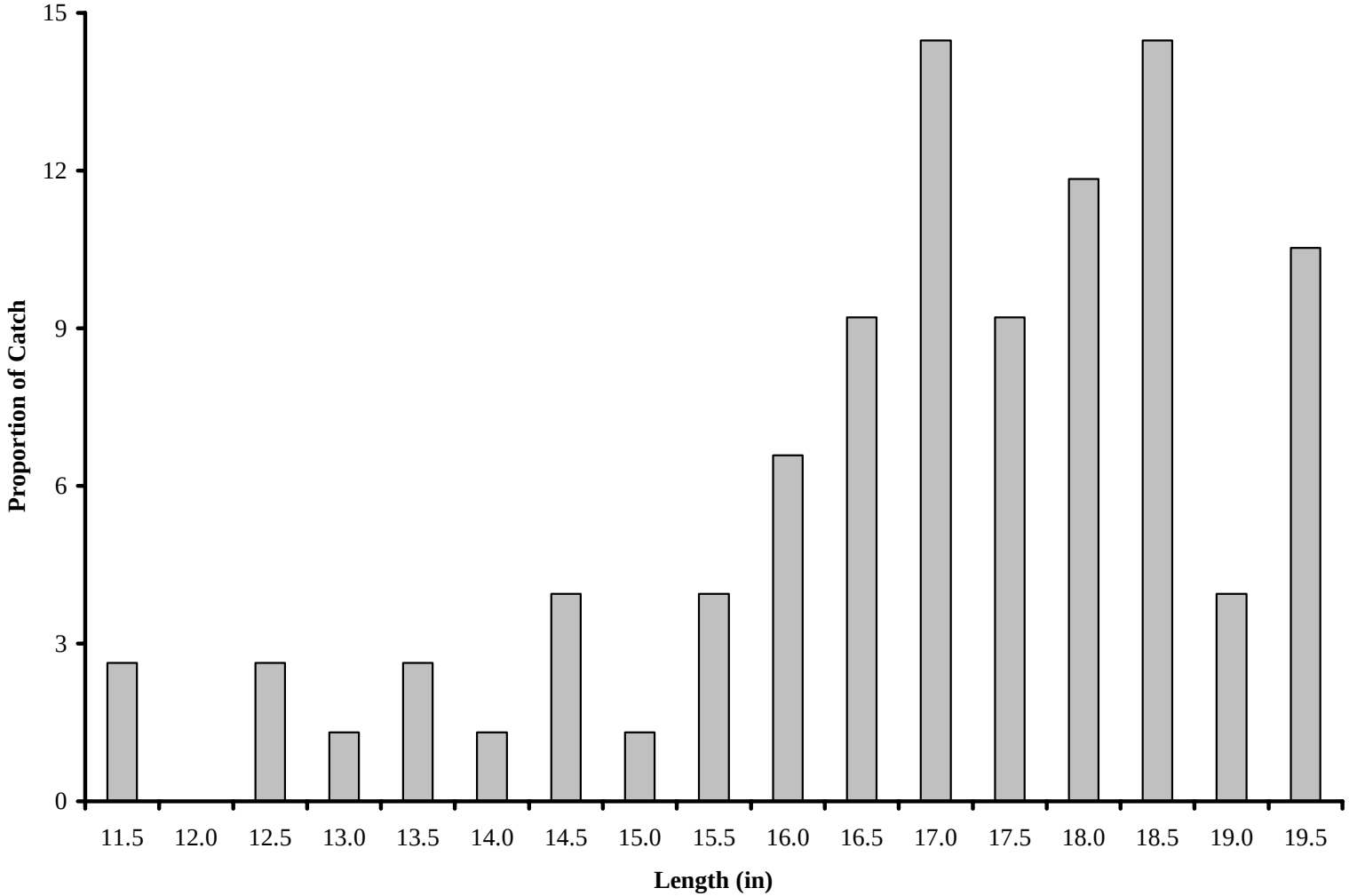

Figure 9. Length distribution of smallmouth bass captured during spring assessment in Chequamegon Bay, 2006.

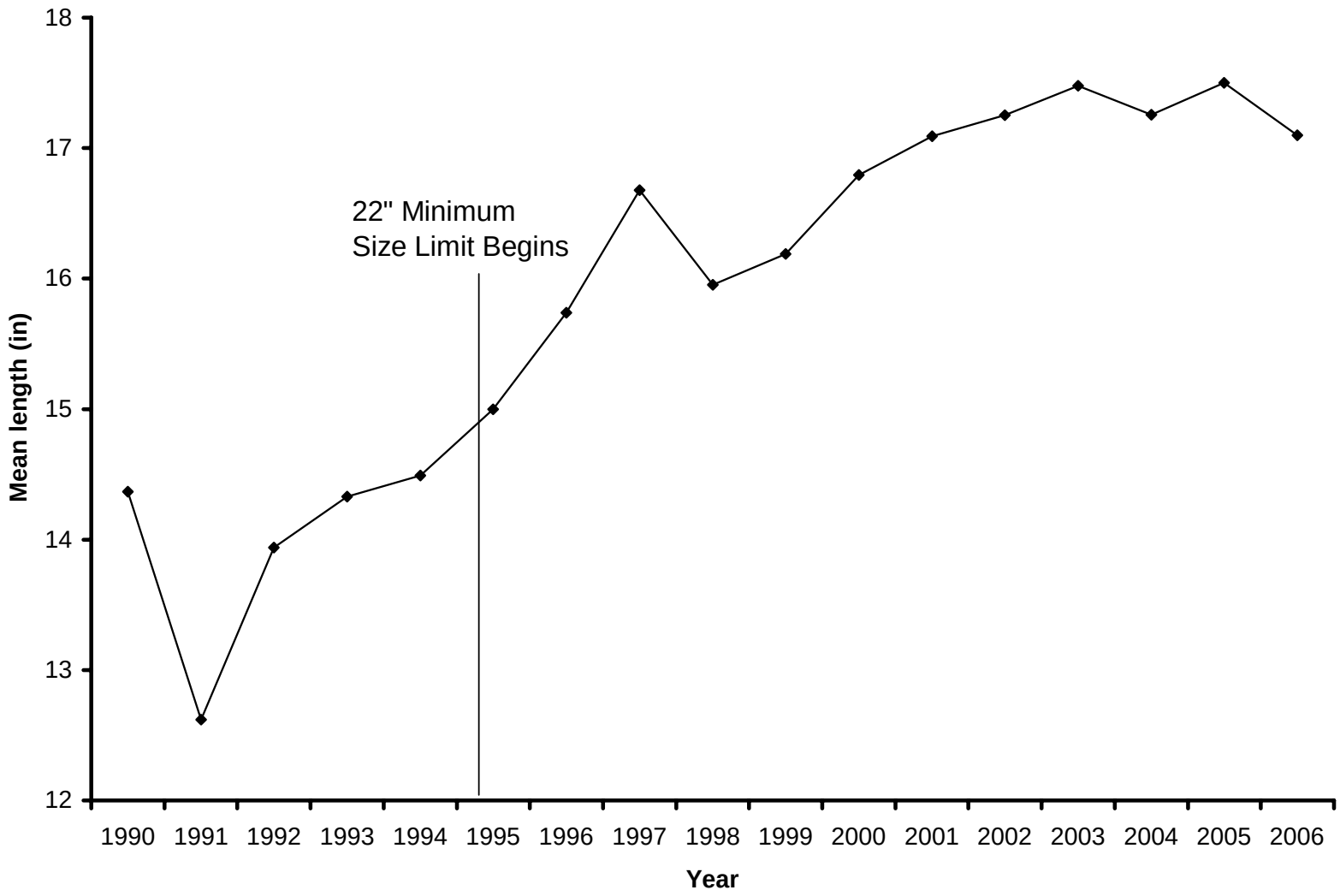

Figure 10. Mean length (in) of smallmouth bass from spring assessment in Chequamegon Bay, 1990-2006.

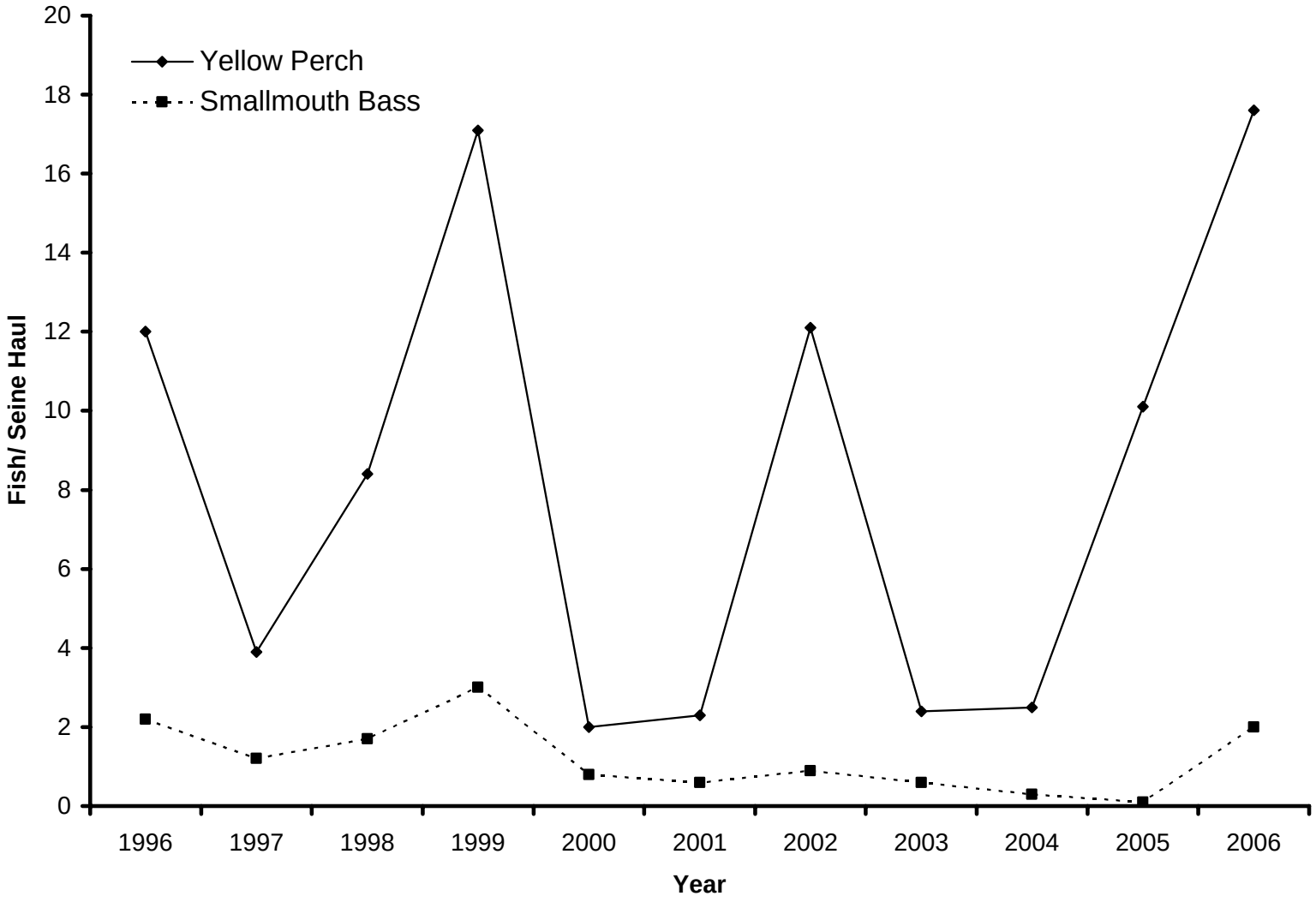

Figure 11. Smallmouth bass and yellow perch per seine haul in Chequamegon Bay, 1996-2006.

Table 1. Lake sturgeon catch and effort data from Chequamegon Bay assessment, 1988-2006.

			NUMBER OF STURGEON						# OF DNR	LENGTH (IN)			WEIGHT (LBS)		
YEAR	EFFORT	DAYS	TOTAL	8"	10"	12"	14"	CPE/100'	RECAPS	MIN.	MAX	AVE	MIN.	MAX	AVE
2006	9600	8	134	69	47	16	2	1.40	12	27.9	64.5	45.6	4	55	24.7
2005	8400	7	141	76	49	14	2	1.68	11	18.6	67.2	44.2	1	82	23.5
2004	10800	9	75	32	29	13	1	0.69	5	23.6	68.8	43.9	2	52	22.4
2003	7200	6	72	33	29	9	1	1.00	3	26.2	67.1	43.7	4.5	71.0	22.9
2002	7200	6	71	39	24	8	0	0.99	7	23.6	67.0	43.2	3.0	100+	22.5
2001	9200	9	58	33	20	4	1	0.63	2	31.0	60.0	45.5	7.0	53.0	25.2
2000	5600	5	37	15	16	5	1	0.66	3	24.0	64.6	45.3	3.5	58.0	23.9
1999	6400	8	81	41	31	9	0	1.27	2	24.0	62.4	42.5	3.0	70.0	20.7
1998	4800	7	38	14	15	9	0	0.79	5	31.5	57.9	45.0	14.0	52.0	26.9
1997	4800	5	15	7	4	4	0	0.31	1	24.8	59.2	47.3	5.0	56.0	27.1
1996	7200	7	52	9	30	11	2	0.72	5	32.2	60.0	47.7	8.0	61.0	27.4
1995	2400	3	25	12	11	2	0	1.04	2	28.8	64.0	41.6	4.5	55.0	18.9
1994	2400	4	21	8	6	8	na	0.87	0	33.2	65.3	48.2	8.5	62.0	31.2
1993	9200	6	37	18	11	8	na	0.40	4	26.7	65.9	47.2	8.0	80.0	29.3
1992	9000	7	36	8	27	1	na	0.40	6	28.0	60.0	45.0	6.0	57.0	23.0
1991	5200	4	27	13	10	4	na	0.52	4	26.2	65.7	43.7	4.5	62.0	23.4
1990	14200	10	74	20	46	8	na	0.52	5	25.2	65.5	48.0	5.5	100+	27.6
1989	4750	3	51	29	22	na	na	1.07	0	27.5	59.0	42.4	6.0	51.0	20.0
1988	5900	6	34	27	7	na	na	0.58	1	34.9	55.9	43.1	na	na	na
TOTAL	124650		945	434	387	117	8		66						

Note: Lake sturgeon were weighed when conditions permitted. Thus the lake sturgeon in length for a particular was not always the largest fish in weight.

Table 2. Mean length-at-age of smallmouth bass from spring assessments in Chequamegon Bay, 1991-2006. No age data were collected in 1993.

	Year														
Age	1991	1992	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
3	10.5						8.0		12.4	11.2		11.1	11.4	10.8	
4	12.2	12.9	11.0	11.6		11.0	11.5	11.8		12.9	12.3	13.5	12.5	13.6	
5	12.9	14.7	11.8	12.6	13.3	12.0	13.6	13.8	13.8	14.4	14.9	14.7	14.4	14.2	13.9
6	15.7	15.6	14.0	14.4	13.9	14.1			16.0	15.0	15.2	15.8	15.8	15.9	14.5
7	16.5	17.1	15.3	15.4	15.2	15.6	15.3	15.5	15.8	16.0	15.3	16.1	16.6	16.2	16.4
8		17.8	15.7	16.2	16.0	16.4	16.3	15.9	17.9	17.2		16.6	16.8	16.7	17.0
9	18.4	17.9	17.5	17.1	16.5	16.8	16.8		17.8	16.3	17.0	16.6	17.3	17.7	17.7
10		18.8	17.7		16.7	17.1	17.0	16.8	17.2	16.5	17.7	18.0	18.6	17.8	17.8
11		20.5			17.5		17.7	17.7	17.6	17.4	17.8	18.5	18.2	18.2	18.0
12								17.7	18.0	17.5	17.9	18.5	18.6	18.7	17.7
13									19.4	18.8	18.8	18.4	18.5	18.5	17.9
14										19.3	18.6	19.2	19.0	19.1	19.2
15		19.8									18.8	19.7	19.0	18.5	18.7
16												19.2	19.6	18.8	18.5
17														19.0	18.6
18														19.4	18.9
19														19.0	
20															19.8
Sample	131	67	109	48	90	31	45	16	26	74	54	73	106	120	59

Table 3. Age distribution (%) of spring catch for smallmouth bass from Chequamegon Bay, 1991-2006. No age data collected in 1993. Highest proportion in bold and border for each year.

	Year														
Age	1991	1992	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
2							4.4								
3	16.0						6.7		7.7	14.9		1.4	1.9	0.8	
4	**74.8**	17.9	4.6	4.2		3.2	11.1	6.3		9.5	11.1	5.5	0.9	2.5	
5	6.9	**49.3**	8.3	4.2	4.4	6.5	6.7	18.8	3.8	8.1	3.7	6.8	7.5	4.2	8.5
6	0.8	6.0	31.2	**33.3**	13.3	3.2			15.4	9.5	7.4	2.7	**19.8**	5.8	10.2
7	0.8	7.5	**49.5**	27.1	15.6	12.9	8.9	6.3	7.7	**20.3**	1.9	15.1	8.5	**15.0**	15.3
8		9.0	1.8	27.1	**34.4**	9.7	8.9	6.3	3.8	5.4		2.7	3.8	9.2	**18.6**
9	0.8	6.0	0.9	4.2	25.6	**54.8**	13.3		11.5	2.7	5.6	2.7	10.4	5.0	6.8
10		1.5	3.7		4.4	9.7	**26.7**	18.8	11.5	2.7	9.3	9.6	3.8	10.8	10.2
11		1.5			2.2		17.8	12.5	**26.9**	5.4	**16.7**	12.3	8.5	5.8	1.7
12								**31.3**	7.7	2.7	14.8	**21.9**	4.7	2.5	1.7
13									3.8	6.8	9.3	6.8	10.4	12.5	1.7
14										12.2	9.3	5.5	6.6	8.3	6.8
15		1.5									11.1	6.8	10.4	5.8	8.5
16												2.7	2.8	8.3	3.4
17														0.8	3.4
18														0.8	1.7
19														1.7	0.0
20															1.7

Table 4. Catch data from summer seining stations in Chequamegon Bay, 2006.

Station	YEP	SMB	John Dart.	Rock Bass	Spot. Shiner	Comm. Shiner	White Sucker	Log-perch	P. Seed	Ruffe	Blue-gill	Brook Stkl.back	Bull Head	Blnt.nse Minn.	Sculpin Spp.
1		1		1					1						
2	6	4							1		1				
3	4	4			1		1	1						4	
4	2	1		1	1			2							
5	2	3													
6															
7		5	3	2	1				5		4	1			7
8	81		2						6						
10	28	3	3	21	2		19		35	14	13		2		
12	5			14	3	2	1	1	9		12				
13	9	7	1	2	1	2			45		9		1		
14	100			11	3				46		15				
15	9		2	2							5				
16	1														
Sum	247	28	11	54	12	4	21	4	148	14	59	1	3	4	7