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# 2009 Spawning Cisco Report

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## INTRODUCTION

Prior to the 1960s, cisco were abundant and an important component of the commercial fisheries in Lake Superior. Although the cause of the decline is uncertain, commercial over harvest was likely a significant factor. Since the early 1980s cisco abundance has increased but appears to be dependent on sporadic recruitment. Cisco are commercially harvested primarily in the fall, during the spawning season. Cisco are valued for their roe; thus the fishery targets unripe females. Long-term effects of commercial harvest on the population are not well understood. The objective of this assessment was to monitor the abundance and age composition of spawning cisco at one long-term index station.

## METHODS

Cisco were sampled on December 1, 2009 during the spawning period at the index station north of the Sand Island lighthouse. Gill nets were set on the bottom for 24-hours. The standard index gang consisted of 1,200 feet of monofilament net. Each net was 300 feet long and arranged in the following sequence:

2-1/2" - 1-1/2" - 2" - 3"

All cisco were measured to the nearest 0.1 inch and sexed. Ages were estimated using scales and otoliths.

## RESULTS AND DISCUSSION

In 2009, 386 cisco were captured with a mean length of 13.1 in (SD=2.2) (Figure 1). Cisco catch-per-unit-effort (CPUE) decreased from 2008 to 2009 (Table 1). Although the annual CPUEs have been highly variable since 1990, spawning cisco abundance has been higher than in the 1970s and early 1980s (Figure 2). Strong year classes in the late 1980s that dominated the spawning population are still present in the spawning population. They have gradually been replaced by the 1998 and 2003 year classes (Table 2).

Mean length-at-age was calculated from 111 cisco (Table 3).

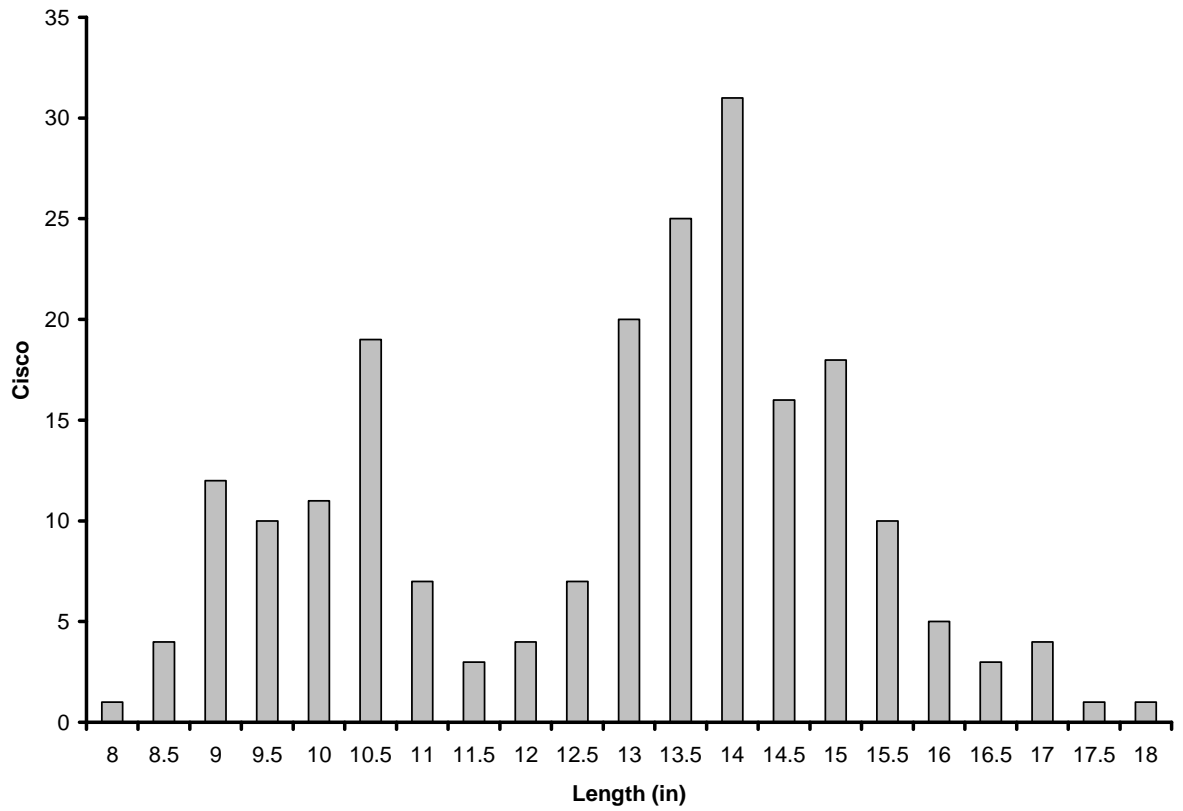


Figure 1. Length distribution of cisco from spawning assessment at Sand Island index station, 2009.

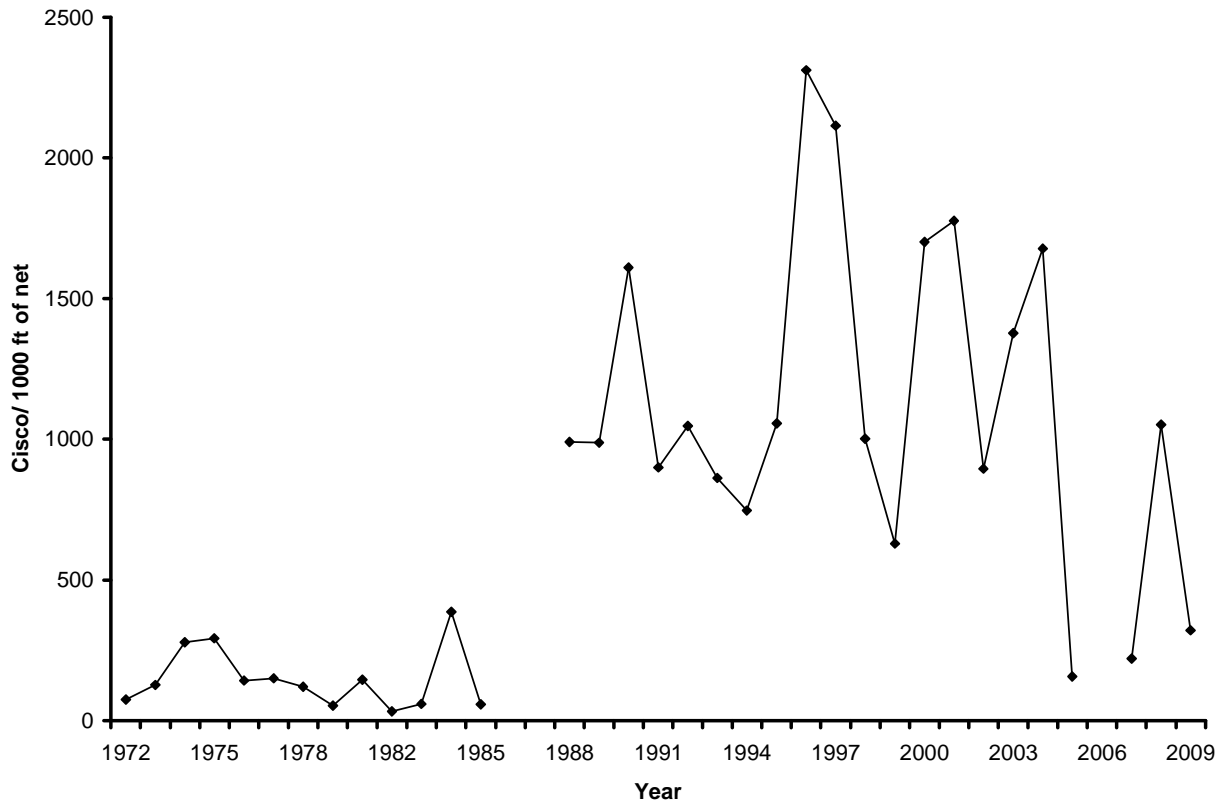


Figure 2. Spawning cisco catch-per-unit-effort from Sand Island Shoal index station, 1972-2009. No data were collected in 1986, 1987 and 2006.

Table 1. Cisco spawning assessment catch data from Sand Island, 1980-2008. No data were collected in 1986, 1987 and 2006.

Year	Effort (Feet)	Cisco	CPUE/1,000'
1980	2,700	142	52.6
1981	2,700	394	145.9
1982	2,700	87	32.2
1983	2,700	162	60.0
1984	2,700	1,042	385.9
1985	2,700	156	57.7
1986	-	-	-
1987	-	-	-
1988	2,700	2,675	990.7
1989	1,500	1,482	988.0
1990	1,500	2,417	1,611.3
1991	1,500	1,350	900.0
1992	485	508	1,047.4
1993	1,500	1,294	862.7
1994	1,500	1,120	746.7
1995	1,500	1,586	1,057.3
1996	1,500	3,468	2,312.0
1997	1,500	3,173	2,115.3
1998	1,200	1,203	1,002.5
1999	1,200	755	629.2
2000	1,200	2,042	1,701.7
2001	1,200	2,133	1,777.5
2002	1,200	1,075	895.8
2003	1,200	1,654	1,378.3
2004	1,200	2,013	1,677.5
2005	1,200	187	155.8
2006	-	-	-
2007	1,200	264	255.0
2008	1,200	1,263	1052.5
2009	1,200	386	321.7

Table 2. Age distribution of spawning cisco at Sand Island, 1989-2009. Percentages in bold indicate dominant year classes.

Year	Age																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
1989	<b>7.1</b>		4.9	21.3	<b>65.3</b>	1.3																	
1990	<b>0.2</b>	<b>10.5</b>	0.8	32.6	17.2	<b>37.4</b>	1.3																
1991	<b>0.5</b>	<b>21.6</b>	<b>18.2</b>			6.6	<b>45.4</b>	7.1				0.3	0.3										
1992		<b>3.0</b>	<b>29.9</b>	<b>9.8</b>	3.0	0.9	4.1	<b>45.0</b>	3.8		0.3			0.3									
1993		2.1	<b>20.5</b>	<b>29.3</b>	<b>5.6</b>	1.9	6.4	1.3	<b>31.5</b>	0.8		0.5											
1994			0.9	<b>19.8</b>	<b>30.6</b>	<b>18.2</b>	8.6	2.2	0.6	<b>15.7</b>	1.2	1.9											
1995				3.4	<b>3.4</b>	<b>23.4</b>	<b>22.8</b>	20.0	13.8	3.4	<b>5.3</b>	3.4	0.9										
1996						<b>9.2</b>	<b>52.7</b>	<b>16.7</b>	6.7		1.7	<b>11.7</b>		1.3									
1997						2.2	<b>24.8</b>	<b>35.6</b>	<b>18.5</b>	1.5	1.5	3.7	<b>12.2</b>										
1998					1.2		1.2	<b>3.6</b>	<b>64.3</b>	<b>15.5</b>	1.2			<b>11.9</b>	1.2								
1999	<b>1.8</b>								<b>14.0</b>	<b>66.7</b>	<b>5.3</b>	5.3		3.5	<b>3.5</b>								
2000		<b>19.4</b>							0.0	<b>8.1</b>	<b>54.8</b>	<b>9.7</b>	1.6			<b>6.5</b>							
2001		4.7	<b>46.5</b>						1.2	4.7	<b>7.0</b>	<b>23.3</b>	<b>7.0</b>		3.5	1.2	<b>1.2</b>						
2002			3.2	<b>54.3</b>	6.4	3.2		1.1	2.1	2.1	6.4	<b>10.6</b>	<b>4.3</b>	<b>6.4</b>									
2003				13.1	<b>63.6</b>	3.0					1.0	4.0	<b>8.1</b>	<b>5.1</b>	<b>2.0</b>								
2004		6.3		2.5	5.1	<b>68.4</b>	1.3					3.8	1.3	<b>11.4</b>									
2005		<b>25.0</b>		1.3	2.5	5.0	<b>31.3</b>	15.0			2.5			3.8	<b>2.5</b>	<b>10.0</b>	<b>1.3</b>						
2006																							
2007		4.4	6.2	<b>16.8</b>	13.3				<b>17.7</b>	26.5	3.5	1.8	0.9			1.8	<b>1.8</b>	<b>0.9</b>	<b>2.7</b>				1.8
2008			1.5	3.9	<b>8.9</b>	8.7	14.0	12.9	3.4	<b>7.6</b>	5.1	25.0	3.7		0.8		0.6	<b>1.4</b>	<b>2.1</b>	<b>0.3</b>			
2009			0.52	6.12	15.6	<b>26.9</b>	2.07	0.84	0	1.28	<b>26</b>	5.07	5.31	0	0	0	0	0	0	<b>5.23</b>	<b>1.92</b>	<b>1.88</b>	1.24

Table 3. Mean length-at-age of cisco from spawning survey at Sand Island, 2009.

Age	Length (in)	St. Dev.
3	9.4	-
4	10.9	1.6
5	10.7	1.4
6	11.9	2.2
7	11.9	2.6
8	11.4	-
9	-	-
10	15.9	0.5
11	14.7	1.3
12	14.8	1.4
13	13.7	1.1
19	14.8	1.6
20	14.3	1.6
21	15.8	1.4
22	15.4	0.7