State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor
Matthew Frank, Secretary
John Gozdzialski, Regional Director

Wisconsin DNR
141 S. 3rd Street
P.O. Box 589
Bayfield, Wisconsin 54814
Telephone 715-779-4035
FAX 715-779-4025

2009 Spring Lake Trout Assessment Report

Compiled by

Michael Seider
Lake Superior Fisheries Biologist

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INTRODUCTION

Lake trout were nearly extirpated in Lake Superior during the 1950s due to over-fishing and sea lamprey predation. Sea lamprey control, reduction of commercial fishing and establishment of refuges have contributed to the increase of lake trout abundance in Wisconsin waters. However, lake trout population characteristics are still important to determine the progress of rehabilitation. Biological data collected are required for critical management decisions such as setting the lake trout quota and recreational fishing regulations. The objective of the spring lake trout assessment is to monitor lake trout population dynamics such as abundance, diet, and sea lamprey wounding rates.

METHODS

Thirty-one stations were sampled in the Apostle Islands (WI-2) (Figure 1) with the R/V *Hack Noyes*. Each site was sampled with 2,700 ft of multifilament nylon gill net with 4.5-in stretch mesh. Nets were set for one night (24 hr) at each station.

Sixteen stations were sampled in western Wisconsin waters (WI-1) (Figure 1) with the R/V *Hack Noyes*. Each site was sampled with 900 ft of multifilament nylon gill net with 4.5-in stretch mesh. Nets were set for one night (24 hr) at each station.

All live fish were measured to the nearest 0.1 in (total length), tagged (lake trout and lake whitefish), checked for sea lamprey marks and fin-clips, and then released. Dead fish were processed in the same manner except not tagged, stomach contents were collected and frozen, individual weights were taken when lake conditions permitted, scale samples were taken, and otoliths removed from lake trout. Other species captured were processed similarly to lake trout.

Fish ages were estimated using scales and otoliths.

RESULTS/DISCUSSION

SEA LAMPREY WOUNDING

Sea lamprey wounding data were collected to monitor the effectiveness of control programs and follow trends. Sea lamprey wounding has been consistently lower in WI-2 than in WI-1 (Table 1 and 2). In both management units, wounding rates decreased for all length categories from 2008 to 2009 (Table 2).

LAKE TROUT - CATCH STATISTICS

In 2009, 405 lake trout were captured within WI-2. Wild fish comprised 93% of the lake trout catch. Mean length of wild lake trout was 23.6 in (SD = 3.7) (Table 3, Figure 2). Geometric mean catch-per-unit-effort (CPUE) of wild fish decreased 17% from 2008 to 2009 (Figure 3, Table 3). Mean length of hatchery-reared lake trout was 22.6 in (SD = 4.9) (Figure 2). Geometric mean CPUE of hatchery fish decreased 38% from 2008 to 2009 (Figure 3, Table 3).

In 2009, 216 lake trout were sampled within WI-1. Wild lake trout abundance has been gradually increasing and wild fish accounted for 51% of the catch (Table 4). Mean length of wild fish was 23.8 in (SD = 4.0) (Table 4, Figure 4). Geometric mean CPUE of wild fish increased 42% from 2008 to 2009 (Figure 5, Table 4). Mean length of hatchery-reared lake trout was 25.3 in (SD = 4.9) (Figure 4). Geometric mean CPUE of hatchery fish decreased 9% from 2008 to 2009 (Figure 5, Table 4).

LAKE TROUT - MEAN LENGTH AT AGE 7

Mean length of age 7 lake trout was calculated to examine potential trends in growth. Mean length was calculated for age 7 lake trout because this age has been determined to be the most fully vulnerable to the single mesh gill net used during spring assessment (Hansen et al. 1996). Mean length of age 7 lake trout has ranged from 19.8 in 2009 to 24.1 in 1981 and has generally decreased from 1981 to 2009 (Figure 6). Declining mean length at age 7 may be due to reduced forage levels (e.g. sporadic cisco year classes, reduced smelt abundance) and increased lean and siscowet lake trout abundance since the 1980s.

REHABILITATION PROGRESS

Wild lake trout abundance continues to increase within WI-2 and WI-1. Lake trout stocking is no longer necessary in WI-2 and the 1994 year class was the last to be stocked. This is a sign of continued progress in lake trout rehabilitation. Maintenance of the refuges in combination with sport and commercial regulations, and sea lamprey control, are needed for rehabilitation to continue. Lake trout will continue to be stocked in WI-1 until the stocking protocol established by the Lake Superior Technical Committee indicates otherwise.

SISCOWETS

Few siscowet (fat) lake trout were caught during the spring lean lake trout assessment (Table 5 and 6). Abundance has increased over the years, but sampling does not occur in siscowet habitat, consequently trends may only be marginal indicators of abundance.

LAKE WHITEFISH CATCH STATISTICS

In 2009, 271 lake whitefish were captured in WI-2 (mean length = 19.2 in, SD = 1.5)(Figure 7). Geometric mean CPUE of lake whitefish decreased 80% from 2008 to 2009 (Figure 8). Lake

whitefish catches were highly variable between some years because the majority of fish are caught in a small number of stations.

In 2009, 34 lake whitefish were captured in WI-1 (mean length = 18.8 in, SD = 1.2) (Figure 7). Geometric mean CPUE of lake whitefish decreased 32% from 2008 to 2009 (Figure 8). Lake whitefish abundance in WI-1 has increased slowly since1987 but has been much lower than in WI-2. The majority of lake whitefish captured in WI-1 are at sites in the eastern end of the management area.

LITERATURE CITED

Hansen, M. J. 1996. A lake trout restoration plan for Lake Superior. Great Lakes Fishery Commission Special Publication.

Table 1. Sea lamprey wounds per 100 lake trout (sample size) from spring assessment in WI-1, 1987-2009.

Year	< 17"	17-20.9"	21-24.9"	25-28.9"	28.9"<	Total
1987	0.0 (6)	8.7 (208)	18.8 (335)	31.4 (105)	66.7 (9)	18.1 (663)
1988	0.0 (5)	7.5 (40)	11.6 (241)	22.2 (117)	0.0 (10)	13.8 (413)
1989	0.0 (4)	3.2 (62)	12.4 (209)	16.4 (152)	31.6 (19)	13.2 (446)
1990	0.0 (14)	2.8 (144)	16.1 (112)	28.6 (98)	33.3 (15)	14.4 (383)
1991	0.0 (11)	6.7 (102)	15.0 (140)	19.8 (86)	11.1 (9)	13.2 (348)
1992	0.0 (5)	6.3 (64)	17.9 (95)	34.0 (47)	16.7 (12)	17.5 (223)
1993	0.0 (22)	0.0 (98)	14.4 (187)	23.0 (148)	29.2 (41)	14.7 (496)
1994	0.0 (32)	0.0 (59)	13.0 (54)	5.8 (52)	0.0 (16)	4.7 (213)
1995	0.0 (6)	1.0 (101)	6.3 (126)	14.1 (85)	14.8 (27)	7.2 (345)
1996	-	-	-	-	-	-
1997	0.0 (39)	0.0 (71)	7.8 (115)	11.6 (86)	26.7 (30)	7.9 (341)
1998	0.0 (32)	1.4 (69)	2.9 (69)	7.3 (55)	41.2 (17)	5.8 (242)
1999	0.0 (25)	0.0 (116)	1.1 (181)	2.4 (41)	15.8 (19)	1.6 (382)
2000	9.1 (11)	1.5 (65)	5.3 (169)	16.7 (36)	100 (16)	11.1 (297)
2001	-	-	-	-	-	-
2002	0.0 (6)	2.1 (48)	1.3 (159)	19.3 (109)	38.3 (47)	11.4 (369)
2003	0.0 (4)	0.0 (21)	4.5 (66)	4.3 (47)	21.7 (23)	6.2 (161)
2004	0.0 (1)	0.0 (18)	5.6 (72)	6.4 (47)	53.3 (15)	9.8 (153)
2005	0.0 (0)	2.8 (36)	6.9 (101)	26.9 (41)	44.4 (18)	13.8 (196)
2006	0.0 (3)	0.0 (19)	4.9 (41)	4.5 (44)	40.0 (5)	5.4 (112)
2007	0.0 (2)	0.0 (18)	5.9 (34)	21.9 (32)	0.0 (9)	9.5 (95)
2008	0.0 (3)	0.0 (32)	10.5 (57)	17.9 (56)	20.8 (24)	12.2 (172)
2009	0.0 (3)	0.0 (46)	4.2 (71)	8.2 (61)	5.7 (35)	4.6 (216)

Table 2. Sea lamprey wounds per 100 lake trout (sample size) from spring assessment in WI-2, 1985-2009.

Year	< 17"	17-20.9"	21-24.9"	25-28.9"	28.9"<	Total
1985	1.9 (52)	3.2 (318)	6.7 (556)	7.9 (241)	12.5 (32)	6.0 (1,199)
1990	0.0 (35)	1.9 (471)	3.7 (484)	10.6 (339)	8.3 (84)	5.0 (1,413)
1991	1.7 (58)	1.8 (391)	4.5 (584)	6.7 (374)	11.3 (106)	4.7 (1,513)
1992	0.0 (45)	1.6 (316)	9.2 (601)	12.4 (315)	23.0 (74)	8.6 (1,351)
1993	0.0 (59)	1.0 (302)	5.6 (393)	6.0 (318)	10.5 (105)	4.7 (1,177)
1994	0.0 (58)	0.9 (230)	1.2 (485)	3.0 (370)	8.2 (98)	2.2 (1,241)
1995	0.0 (30)	0.7 (426)	1.9 (643)	7.2 (375)	8.7 (127)	3.3 (1,601)
1996	-	-	-	-	-	-
1997	0.0 (90)	0.3 (356)	2.1 (533)	4.9 (347)	5.1 (158)	2.5 (1,484)
1998	0.0 (46)	0.6 (357)	0.9 (462)	4.8 (147)	8.6 (93)	1.9 (1,105)
1999	0.0 (37)	0.8 (479)	1.0 (707)	2.9 (138)	10.1 (99)	1.7 (1460)
2000	0.0 (33)	0.9 (437)	4.3 (1036)	15.4 (247)	31.8 (107)	6.5 (1860)
2001	-	-	-	-	-	-
2002	0.0 (17)	0.0 (166)	3.3 (398)	7.4 (203)	23.4 (64)	5.1 (848)
2003	0.0 (8)	0.0 (62)	2.5 (244)	5.1 (98)	12.5 (40)	3.5 (452)
2004	0.0 (6)	0.8 (131)	2.8 (179)	5.4 (112)	9.4 (32)	3.3 (460)
2005	0.0 (15)	3.4 (147)	2.9 (279)	6.9 (117)	23.7 (55)	5.5 (613)
2006	0.0 (7)	0.8 (118)	3.7 (273)	5.2 (96)	8.7 (46)	3.7 (540)
2007	0.0 (2)	0.0 (92)	5.8 (191)	7.0 (129)	25.9 (27)	6.1 (441)
2008	0.0 (12)	1.0 (97)	7.5 (199)	9.4 (234)	25.0 (56)	8.7 (598)
2009	0.0 (11)	1.1 (92)	4.4 (160)	8.0 (112)	20.0 (30)	5.7 (405)

Table 3. Catch data for spring sampled lake trout from WI-2, 1981-2009. Nets were set for three nights from 1981-2000 and for one night since 2002.

Year	Effort (Feet)	Sample	Wild Fish	% Wild	Wild Mean Length (in)	Wild GMCPUE	Hatchery GMCPUE
1981	63,300	763	227	29.9	23.9	5.1	11.1
1982	90,000	814	250	30.7	23.5	2.6	5.6
1983	17,400	139	43	30.9	24.1	2.5	5.5
1984	18,000	208	62	29.8	23.7	2.9	9.0
1985	78,300	1,303	459	35.2	23.2	3.5	6.9
1986	88,200	2,093	1,039	49.7	22.7	8.1	8.9
1987	83,700	1,730	1,047	60.5	22.2	7.0	6.9
1988	83,700	1,166	628	53.9	23.1	6.2	5.4
1989	83,700	1,728	954	55.2	23.6	8.9	6.6
1990	83,700	1,395	883	63.3	23.6	7.4	4.5
1991	83,700	1,487	1,031	69.3	23.5	8.5	4.9
1992	83,700	1,351	967	71.6	23.6	8.5	3.7
1993	83,700	1,176	893	75.9	24.0	9.5	3.4
1994	83,700	1,241	967	77.9	24.0	10.2	3.3
1995	83,700	1,601	1,132	70.7	23.8	12.1	3.4
1996	-	-	-	-	-	-	-
1997	83,700	1,484	1,032	69.5	24.4	11.2	4.0
1998	83,700	1,105	775	70.1	23.2	8.0	3.0
1999	83,700	1460	926	63.4	22.9	11.2	4.8
2000	83,700	1860	1233	66.3	23.3	14.9	5.7
2001	-	-	-	-	-	-	-
2002	83,700	848	719	84.8	23.7	21.5	3.4
2003	81,000	452	414	91.6	24.0	12.4	0.9
2004	83,700	460	428	93.0	23.4	12.6	0.8
2005	83,700	613	556	90.7	23.4	16.7	1.1
2006	83,700	548	528	96.2	23.5	16.5	0.4
2007	83,700	441	420	95.2	23.9	13.1	0.5
2008	83,700	598	554	92.6	24.6	14.5	1.3
2009	83,700	405	376	92.8	23.6	12.1	0.8

Table 4. Catch data for spring sampled lake trout from WI-1, 1987-2009. Nets were set for three nights from 1987-2000 and for one night since 2002.

Year	Effort (Feet)	Sample	Wild Fish	% Wild	Wild Mean Length (in)	Wild GMCPUE	Hatchery GMCPUE
1987	17,100	665	85	12.8	20.7	3.1	22.9
1988	17,100	415	35	8.4	23.0	1.5	13.0
1989	17,100	449	29	6.5	21.7	0.9	11.1
1990	17,100	384	52	13.5	20.5	2.1	10.6
1991	17,100	348	68	19.5	22.0	2.7	11.9
1992	17,100	223	68	30.5	21.3	2.5	7.7
1993	17,100	496	103	20.8	21.6	4.3	19.8
1994	17,100	213	62	29.1	21.6	2.8	7.6
1995	17,100	345	146	43.2	22.3	6.5	11.7
1996	-	-	-	-	-		
1997	17,100	341	137	40.2	23.2	6.8	12.0
1998	17,100	242	90	37.2	23.1	4.1	7.7
1999	17,100	382	101	26.4	22.7	4.5	17.3
2000	17,100	297	109	36.7	22.3	7.2	15.4
2001	-	-	-	-	-		
2002	14,400	369	125	33.9	23.9	17.9	35.1
2003	14,400	161	48	29.8	22.9	5.4	13.7
2004	14,400	153	80	52.3	23.6	12.4	13.2
2005	14,400	196	121	61.7	23.3	17.4	10.3
2006	14,400	112	72	64.0	24.1	11.4	4.9
2007	14,400	86	53	61.6	24.4	7.5	4.2
2008	14,400	172	87	50.6	24.1	11.9	10.3
2009	14,400	216	111	51.4	23.8	17.0	9.4

Table 5. Catch data of siscowet lake trout from WI-2, 1981-2009. Nets were set for three nights from 1981-2000 and for one night since 2002.

Year	Effort (ft)	Sample Size	Fish/ 1000 ft	CPUE > 25”	Mean Length (in)
1981	63,300	1	0.16	0.16	25.2
1982	90,000	0	0.00	0.00	--
1983	17,400	7	0.4	0.00	20.3
1984	18,000	20	1.1	0.14	20.5
1985	78,300	0	0.00	0.00	--
1986	88,200	1	0.01	0.00	22.4
1987	83,700	9	0.11	0.00	21.5
1988	83,700	7	0.08	0.00	20.5
1989	83,700	17	0.20	0.00	21.5
1990	83,700	9	0.11	0.04	24.2
1991	83,700	29	0.50	0.04	21.9
1992	83,700	22	0.26	0.02	22.1
1993	83,700	40	0.48	0.04	21.7
1994	83,700	42	0.50	0.01	21.1
1995	83,700	30	0.36	0.06	22.3
1996	-	-	-	-	-
1997	83,700	30	0.36	0.13	22.5
1998	83,700	45	0.18	0.18	23.4
1999	83,700	41	0.50	0.07	21.4
2000	83,700	70	0.84	0.18	22.5
2001	-	-	-	-	-
2002	83,700	21	0.30	--	22.7
2003	81,000	24	0.30	0.05	22.7
2004	83,700	9	0.11	0.04	23.0
2005	83,700	20	0.24	0.08	24.1
2006	83,700	20	0.24	0.03	22.4
2007	83,700	15	0.18	0.02	22.4
2008	83,700	20	0.24	0.04	22.7
2009	83,700	24	0.29	0.03	23.1

Table 6. Catch data of siscowet lake trout from WI-1, 1987-2009. Nets were set for three nights from 1987-2000 and for one night since 2002.

Year	Effort (feet)	Sample Size	Fish/ 1000 ft	CPUE > 25”	Mean Length (in)
1987	17,100	1	0.06	0.00	17.6
1988	17,100	1	0.06	0.00	20
1989	17,100	0	0.00	0.00	--
1990	17,100	2	0.12	0.06	22.9
1991	17,100	6	0.35	0.06	20.6
1992	17,100	1	0.06	0.06	27.8
1993	17,100	16	0.94	0.00	--
1994	17,100	1	0.06	0.00	--
1995	17,100	1	0.06	0.00	20.7
1996	-	-	-	-	-
1997	17,100	8	0.47	0.23	25.5
1998	17,100	31	1.80	0.82	22.8
1999	17,100	14	0.82	0.11	20.8
2000	17,100	6	0.35	0.12	23.2
2001	-	-	-	-	-
2002	14,400	1	0.10	0.00	17.5
2003	14,400	8	0.55	0.35	26.2
2004	14,400	2	0.14	0.00	21.9
2005	14,400	3	0.21	0.00	18.3
2006	14,400	2	0.14	0.07	23.5
2007	14,400	0	0.00	0.00	--
2008	14,400	4	0.28	0.14	24.4
2009	14,400	1	0.07	0.00	13.8

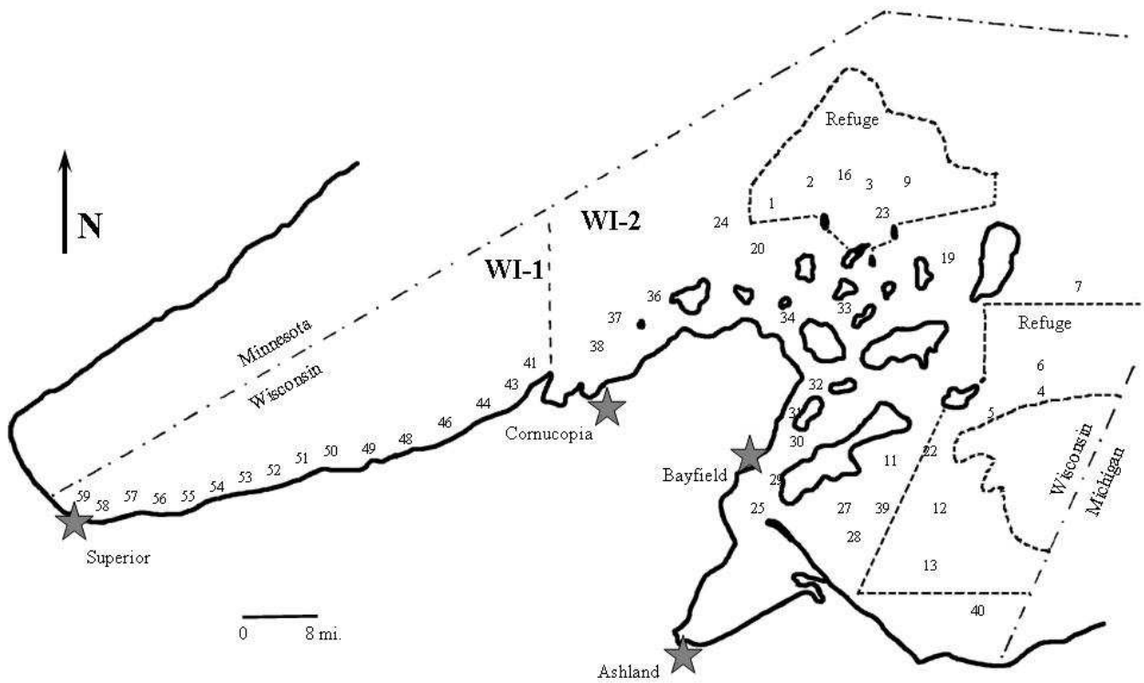

Figure 1. Gill net sites for spring lake trout assessment in the Wisconsin waters of Lake Superior, 2009. Wisconsin waters are divided into two management regions, WI-1 and WI-2.

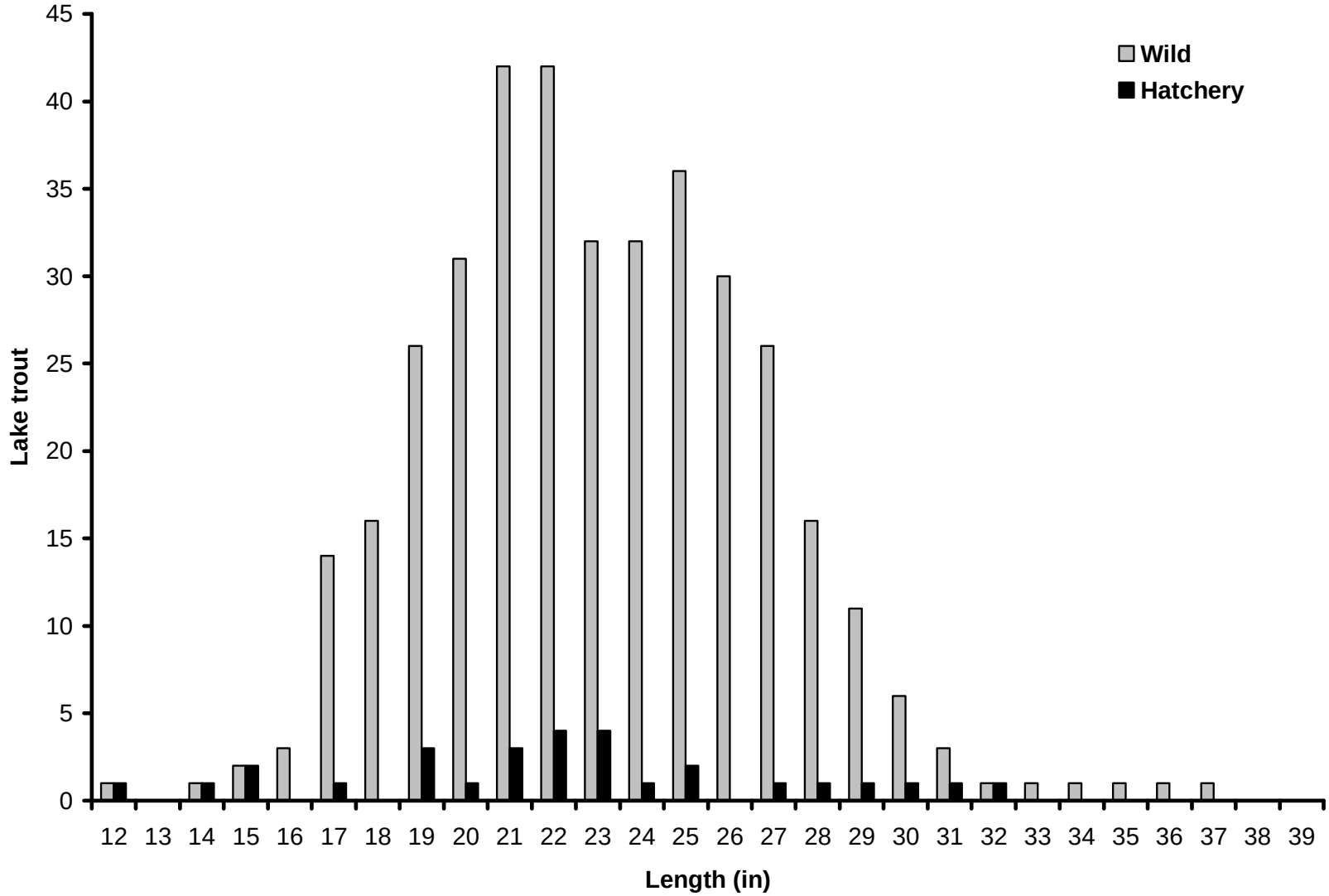

Figure 2. Length distribution of wild and hatchery lake trout caught in WI-2, 2009.

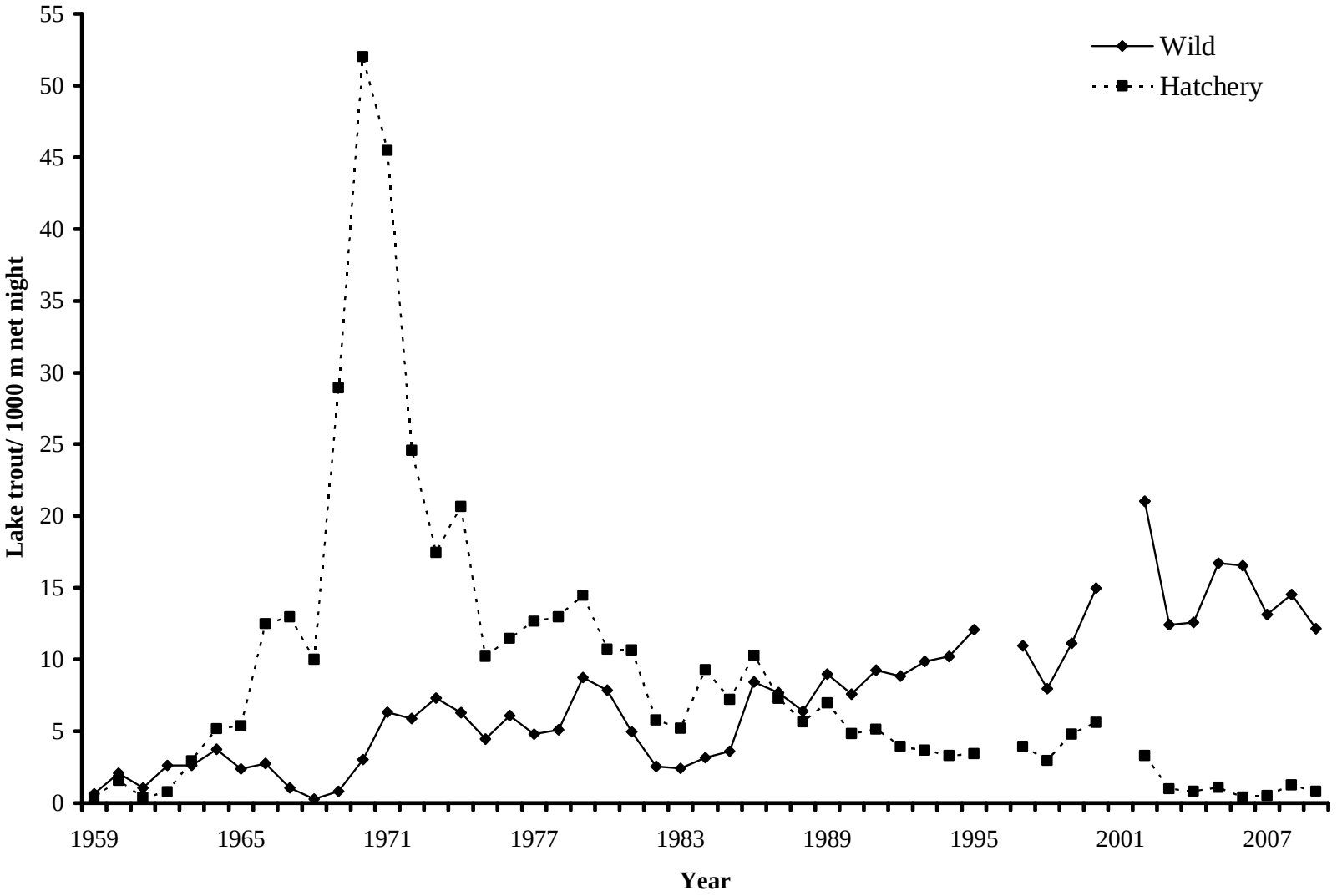

Figure 3. Geometric mean catch-per-unit-effort of wild and hatchery lake trout in WI-2, 1959-2009. Lake trout were not sampled in 1996 and 2001.

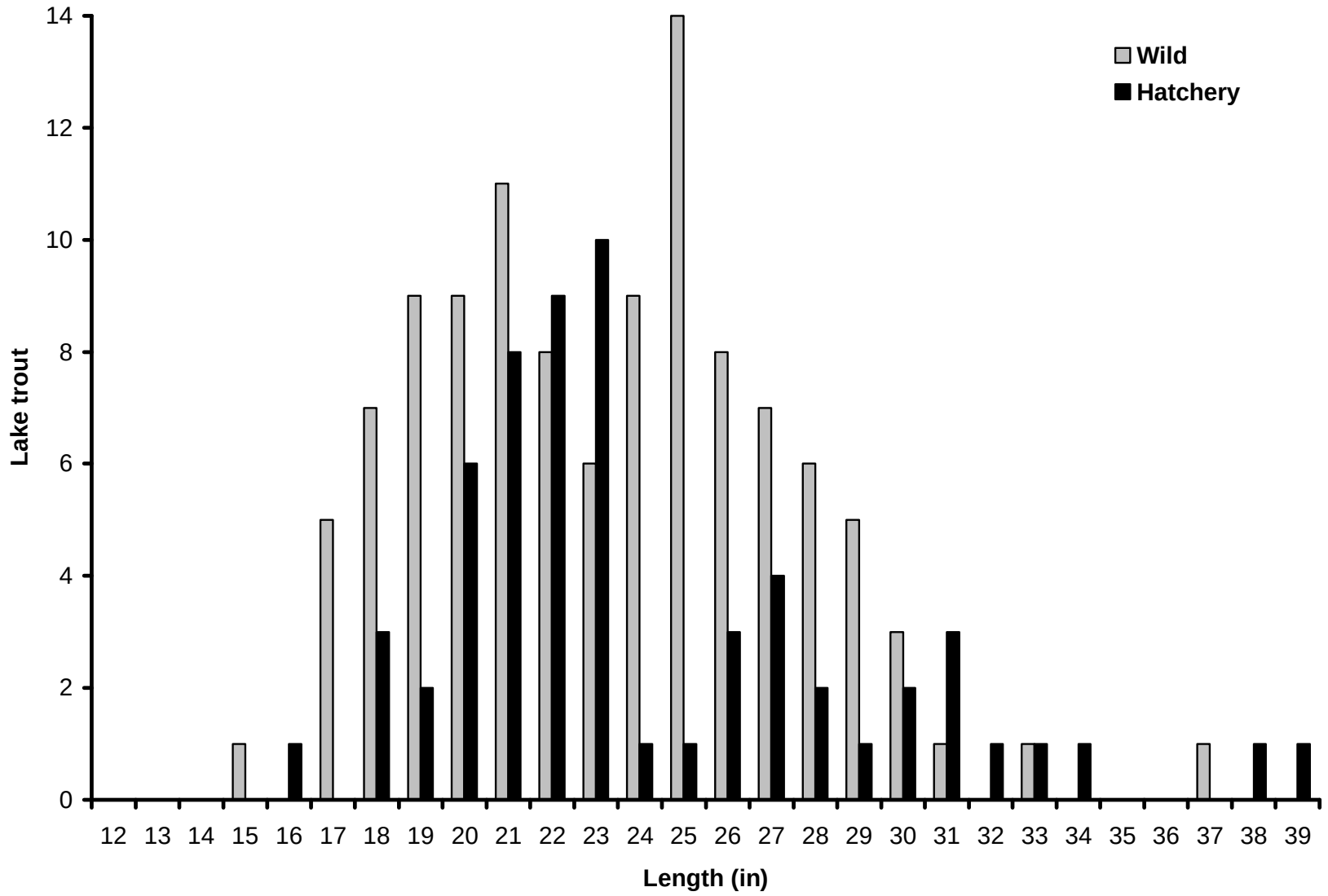

Figure 4. Length distribution of wild and hatchery lake trout caught in WI-1, 2009.

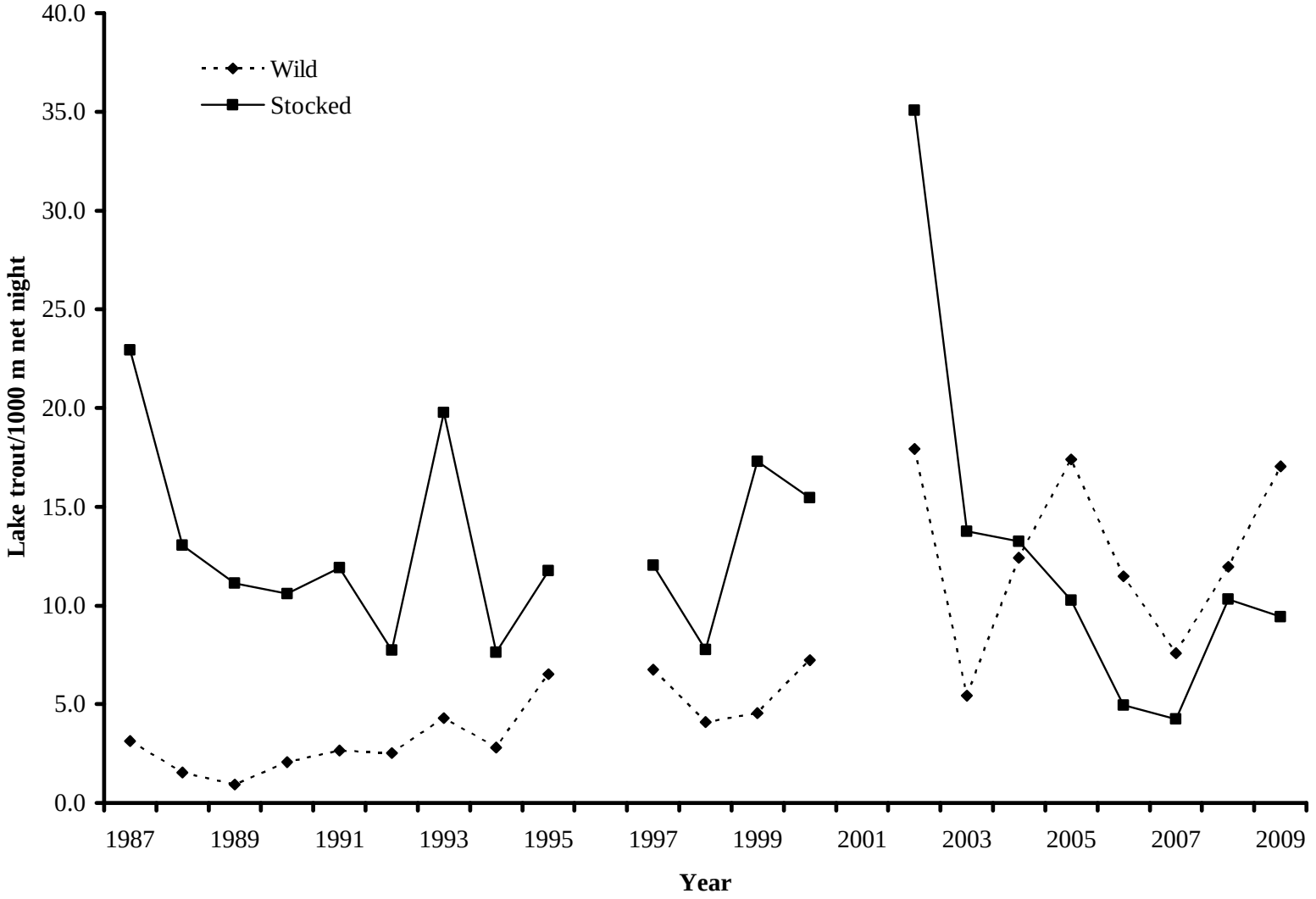

Figure 5. Geometric mean catch-per-unit-effort of wild and hatchery lake trout in WI-1, 1987-2009. Lake trout were not sampled in 1996 and 2001.

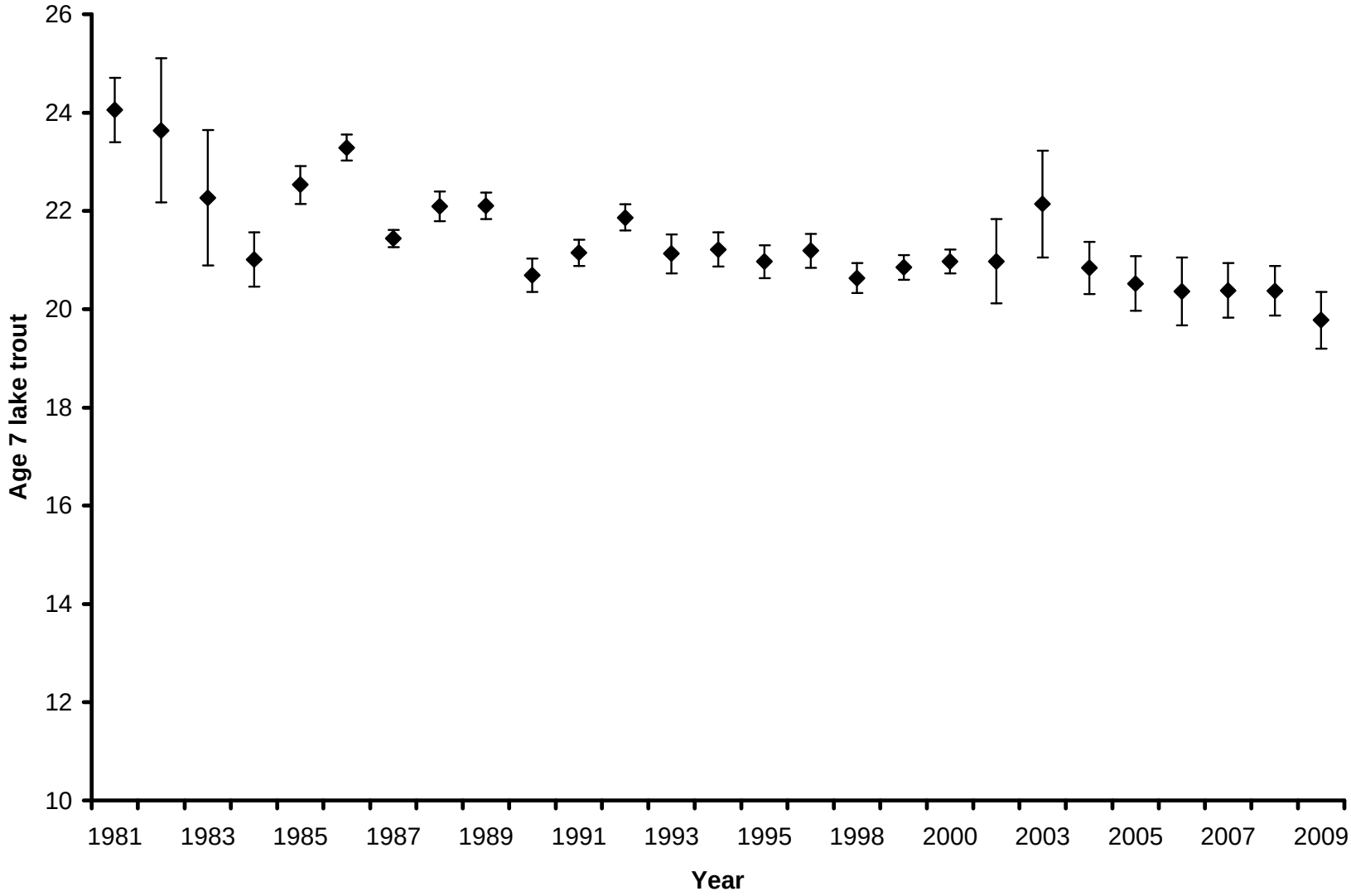

Figure 6. Mean length of age 7 wild lake trout with 95% confidence intervals from WI-2, 1981-2009.

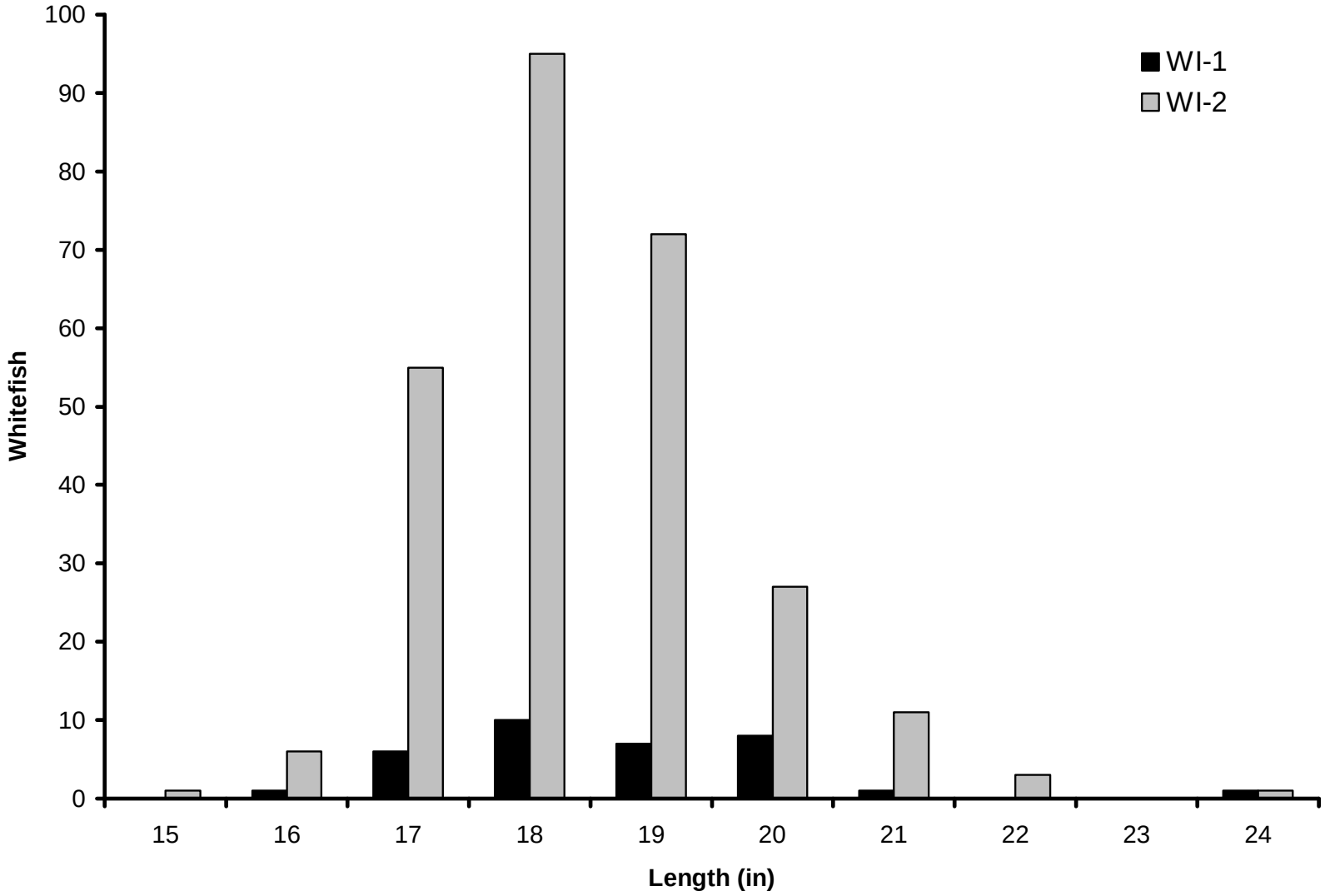

Figure 7. Length distribution of lake whitefish captured in Wisconsin waters of Lake Superior, 2009.

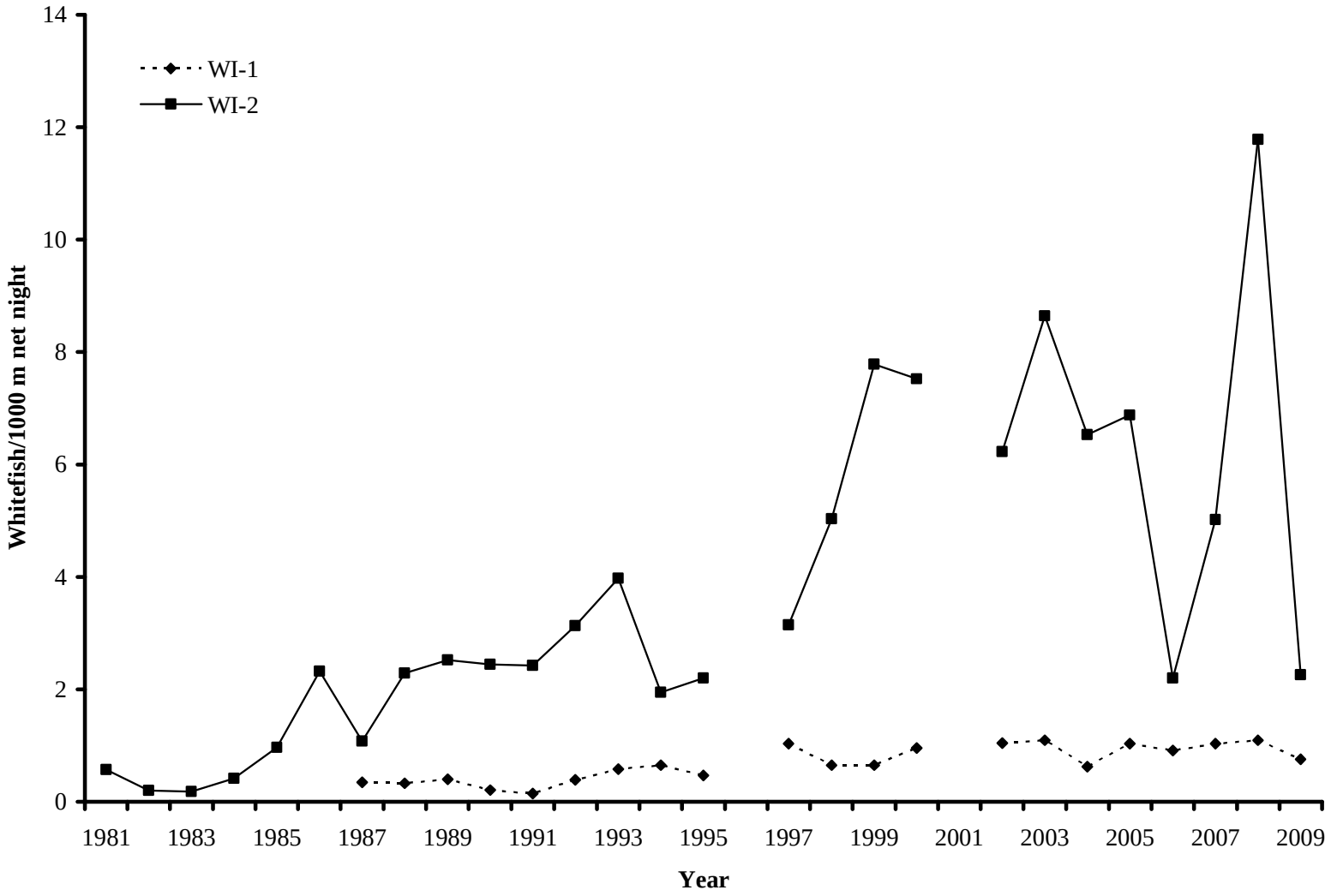

Figure 8. Geometric catch-per-unit-effort of lake whitefish in Wisconsin waters of Lake Superior, 1981-2009. Lake trout were not sampled in 1996 and 2001.