Lake Murray
Fisheries Management Plan

Southcentral Region
Oklahoma Department of Wildlife Conservation

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Background

Lake Murray impounds Anadarche Creek, 8 miles south of Ardmore in Carter and Love Counties, Oklahoma (Figure l). Lake Murray covers 5,728 surface acres and was constructed in 1929 by the U.S. Park Service. The lake is managed by the State of Oklahoma and is bordered on all sides by Lake Murray State Park land. The watershed is indicative of the cross timber ecosystem and has one major urban development, the town of Ardmore, which has a population of 24,283 according to the 2010 census. Agricultural operations including hay production and livestock grazing make up a small portion of the watershed. The lake's primary operational purpose is recreation. The normal conservation pool is 746 feet msl.

Habitat

Natural fish habitat consists of rock points and islands, aquatic vegetation, areas of limited standing timber, rock, coarse gravel, and mud or sand flats. Native aquatic vegetation including American pondweed (*Potamogeton nodosus*), coontail (*Ceratophyllum demersum*), niad (*Najas* spp.), bulrush (*Scirpus* spp.), and white water lily (*Nymphaea odorata*), can be found throughout the lake, especially in the uppermost portions. Non-native hydrilla (*Hydrilla verticillata*) has become increasingly dense over the past five years.

Additional habitat includes man-made structures such as natural and artificial brush piles. The ODWC currently maintains 18 marked brush piles to increase angler opportunities. Maps and geo-references for these structures are available on the Fish and Wildlife Digital Atlas (http://fishlab.ou.edu/odwcims/).

Water Quality

Lake Murray is classified as an oligotrophic reservoir with low primary productivity. Water quality data collected through the Oklahoma Water Resources Board (OWRB) as part of their Beneficial Use Monitoring Program (BUMP) classifies Lake Murray as supporting all but the dissolved oxygen criteria outlined for the Fish and Wildlife Propagation (FWP) beneficial uses. The complete BUMP report for Lake Murray can be viewed at http://www.owrb.ok.gov/quality/monitoring/bump.php. A brief overview of several water quality parameters is included below and in Table 1.

Thermal and Chemical Stratification

Lake Murray exhibits strong chemical and thermal stratification during summer months (July – mid-September). Depth and severity of the thermocline varies between years, but typically occurs at a depth of 20 – 30 feet. Dissolved oxygen levels below this depth are generally below 2.5 mg/L. Lake Murray is considered not supporting the FWP beneficial use based on low dissolved oxygen levels recorded during the summer.

Turbidity

Lake Murray has an average turbidity of 6 NTU and an average secchi disk depth of 72 inches. The fish and wildlife beneficial use based on turbidity is supported.

Productivity
A trophic state index (TSI), using Carlson's TSI (chlorophyll-a), was calculated to measure the lake's productivity. The TSI value for Lake Murray is 37, which classifies the lake as oligotrophic.

Conductivity
Specific conductivity ranged from 306 µS/cm to 336.7 µS/cm. These values are similar to other lakes in the region.

Salinity
Salinity values ranged from 0.10 to 0.20 ppt.

pH
The pH values ranged from 7.11 to 8.57, representing a neutral to slightly alkaline system. The fish and wildlife beneficial use based on pH is supported.

Tailrace
Lake Murray does not have a year-round tailrace or an established tailrace fishery. During most of the year there are minimal or zero water releases through the dam. Floodwater releases are intermittent and short lived.

Fishery

The major sportfish in Lake Murray include largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieu*), spotted bass (*M. punctulatus*), white bass (*Morone chrysops*), white crappie (*Pomoxis annularis*), channel catfish (*Ictalurus punctatus*), and walleye (*Sander vitreus*). The primary forage species include threadfin shad (*Dorosoma petenense*), gizzard shad (*D. cepedianum*), and several species of sunfish (*Lepomis* spp.).

Quality fish caught at Lake Murray are eligible for Lake Record status. Information about the ODWC Lake Record program can be found at the ODWC website (www.wildlifedepartment.com). The fish stocking history for Lake Murray is included in Table 2. Special fishing regulations which apply to Lake Murray include:

Largemouth and Smallmouth Bass:	6 combined per day, no minimum size limit.
Spotted Bass:	no creel limit, no minimum size limit.
All Crappie:	37 per day, no minimum size limit.
White Bass:	no creel limit, no minimum size limit.
Walleye	6 combined per day, 14-inch minimum size limit

Channel and/or Blue Catfish:	15 combined per day, only one blue catfish greater than 30-inches per day.
Other Species:	Statewide regulations.

Black Bass

Lake Murray contains three species of black bass (largemouth bass, spotted bass, and smallmouth bass) and is one of the most popular black bass lakes in the region. In 2011, Lake Murray ranked as the #4 bass tournament lake in Oklahoma according to results reported to ODWC (Table 3).

Largemouth Bass

Florida-strain largemouth bass have been stocked consistently throughout the 1990s and 2000s to increase abundance of trophy-sized bass. Lake Murray has produced numerous trophy largemouth bass over the past decade. The current lake record largemouth bass was caught in April 2010 and weighed 12.1 lbs. A bass weighing 13.4 lbs was caught during 1997 and reported through the Angler Recognition Program. While this fish predated the lake record program, it is recognized on the list of Oklahoma's Top-20 largemouth bass.

Catch rates and relative weights for largemouth bass greater than 12 inches have been within the range of acceptable values for a quality fishery over the past decade. Recruitment of young bass is occasionally below acceptable values. This was true during the two most recent surveys conducted in 2008 and 2011. Catch rates and size structure of largemouth bass are included in Table 4 and Figures 2 – 3. Growth rates for largemouth bass are below acceptable levels when compared to other major reservoirs within the region. While growth rates to age-3 appear to meet or exceed that of other bass populations in the region, average growth beyond age-3 appears to slow drastically. This trend is noted in other species in Lake Murray, specifically walleye, and is likely due to the lakes low primary productivity and forage availability for larger predators. However, this growth is an average and not all largemouth bass exhibit this same trend (Figure 4). Individual fish have exhibited fast growth and the number of trophy bass produced at Lake Murray illustrates this fact.

DNA samples collected during 2009 indicated that 7.5% were pure Florida strain, 25% were F_1, 65% were F_x, and 2.5% were native northern strain bass. Historical DNA results are included in Table 5. Largemouth bass from Lake Murray were tested for Largemouth Bass Virus (LMBV) in 2002. These results indicated that approximately 31% of the population carried LMBV at that time. Fish kills resulting from LMBV were never confirmed at Lake Murray.

Spotted Bass

Spotted bass make up a considerable portion of the black bass population at Lake Murray. The lake's clear water and deep rocky bluffs and points are preferred habitat of spotted bass. Spring electrofishing samples conducted during 2011 resulted in an overall catch rate of 11/hr with no fish exceeding 14 inches. Catch rates, size structure, and growth rates of the spotted bass population are listed in Table 6 and Figures 5 – 7.

Smallmouth Bass

Lake Murray's smallmouth bass population is self-sustaining and relatively abundant when compared to other smallmouth bass populations throughout Oklahoma. Smallmouth were first stocked in 1981 and annual stockings continued until 1987. These early stockings are believed to be from mixed broodstock sources and not considered reservoir-strain smallmouth bass. Minor stockings of adult and/or fingerling reservoir-strain smallmouth bass were conducted in 2005 and 2009 as ODWC hatcheries discontinued smallmouth bass production.

Sampling data is limited for smallmouth bass given their preference for deeper, rock and boulder type habitat. These habitats are not effectively sampled by daytime electrofishing. Spring electrofishing samples conducted during 2011 resulted in an overall catch rate of 14.7/hr with 1.3/hr exceeding 14 inches. Catch rates and size structure of the smallmouth bass population are listed in Table 7 and Figures 8- 9. Growth rates of smallmouth bass to age-2 appear to be similar to other smallmouth bass populations in the region. However, growth beyond age-2 cannot be compared due to the small sample size of older individuals during the last age and growth evaluation conducted in 2008. Growth rate data is presented in Figure 10.

White Bass

White Bass are native to the Lake Murray watershed and contribute to the recreational fishery. Abundance estimates for white bass have varied over the past ten years. The population is comprised of primarily 12 – 13 inch white bass although fish exceeding 15 inches are not uncommon. Catch rates and size structure of the Lake Murray white bass fishery are included in Table 8 and Figures 11 – 12.

Channel Catfish

Channel Catfish are omnivorous, feeding on a wide variety of organic matter, dead and alive. Some of the more common foods are fish, mussels, snails, insects and crayfish. Gill net catch rates and size structure for channel catfish have been relatively consistent over the last decade (Table 9; Figures 13 – 14). Relative weights have consistently varied over time. During the most recent sample in 2011, relative weights were below acceptable values for all size groups.

Crappie

Angling for crappie is popular throughout the year around man-made brush piles. Trap netting is the preferred method for sampling crappie in reservoirs. However, the steep slopes on Lake Murray make trap netting ineffective. Gill netting at Lake Murray has resulted in low catch rates for crappie but should not be considered an adequate evaluation of the population. Crappie catch rates are listed in Table 10.

Walleye

Lake Murray is home to the only walleye population in southcentral Oklahoma. The walleye population is self-sustaining and provides a unique fishery to the area. Walleye are a popular sportfish because of the angling challenges they provide as well as their reputation for being an excellent food fish. Gillnet catch rates for walleye greater than 16 inches have historically remained low. Catch rates and size structure for walleye are included in Table 11 and Figures 15 – 16. Night electrofishing for walleye was attempted in March of 2005 with greater success than fall gill netting (Table 12, Figure 17). Night electrofishing will likely need to be evaluated in the future due to the expansion of hydrilla into suitable gillnet sampling areas.

Walleye growth rates appear to slow once fish reach approximately 14 inches (Table 13, Figure 18). This has resulted in the minimum length limit for walleye at Lake Murray to be lowered from the statewide limit of 18 inches to 14 inches. This regulation allows for increased harvest opportunities based on the size structure of the population.

Forage Fish

Shad

Lake Murray contains both gizzard and threadfin shad. Adult gizzard shad are able to reach large sizes and can outgrow gape limits of many predators. Threadfin shad adults are considerably smaller, rarely exceeding 6 inches in length. Threadfin are temperature sensitive and stress at temperatures below 45°F. The winter of 2009/2010 was exceptionally cold and likely resulted in the loss of adult threadfin shad. In an effort to be proactive and ensure sufficient numbers of threadfin shad broodstock, the ODWC stocked approximately 3,100 adult threadfin in 2010. Catch rates for gizzard and threadfin shad are included in Table 15.

Bluegill

Bluegill sunfish are an important forage fish at Lake Murray. Catch rates for bluegill are included in Table 14.

Fish Consumption Advisories

Fish consumption advisories are issued by the Oklahoma Department of Environmental Quality (ODEQ) and can be viewed at www.deq.state.ok.us. At the time of this document, no fish consumption advisories exist for Lake Murray.

Threats to the Fishery

Aquatic Nuisance Species (ANS)

Zebra mussels

Zebra mussels (*Dreissena polymorpha*) were first confirmed in Lake Murray in the spring of 2012. Since that time, zebra mussels have become widespread throughout the lake, attaching themselves to hard structures and vegetation. Nearby Lake Texoma became established with zebra mussels in 2009 and may have been the source of the Lake Murray infestation. Due to the popularity of both Murray and Texoma lakes, numerous vectors exist for the transfer of water and zebra mussel veligers to surrounding reservoirs.

Hydrilla

Hydrilla (*Hydrilla verticillata*) is an invasive and potentially damaging aquatic weed popular in the aquarium trade. It has the ability to form dense mats displacing native species, restricting water flow, and impairing recreational activities. Its many modes of reproduction, including fragmentation, allows for rapid spread and dispersal within and among water bodies. Hydrilla has been observed within Lake Murray since the mid-2000s. For years, the infestation was only

known to exist in the upper portion of the western arm of the lake. Hydrilla expanded dramatically during low lake conditions in 2011 and became established in the upper half of both arms. Expansion continued in 2012 as far south as the spillway area. Large surface mats of hydrilla could be found throughout the lake during the summer of 2012.

Lake Murray Fisheries Management Goal

To provide a diversified, high quality sport fishery commensurate with resource capabilities and public desires.

Objectives and Strategies

Objective 1.0 Maintain the largemouth bass population at the following levels.

A. Length at age – 14 inches at age 3.
B. Maintain Florida bass genetics – FLMB + $F_1 \geq 30\%$.

Strategies

1. Collect age and growth data as needed.
2. Maintain current harvest regulations.
3. Stock certified FLMB according to recommended stocking rates.

Objective 2.0 Evaluate walleye sampling methods.

Strategies

1. Compare the relative efficiency of night electrofishing to fall gillnetting for walleye.

Objective 3.0 Address aquatic nuisance species through monitoring efforts and public outreach.

Strategies

1. Participate in Hydrilla Task Force and provide technical assistance towards applicable plans, monitoring efforts, and public outreach.
2. Conduct at least one media contact per year highlighting ANS issues and measures the public can use to prevent further spread.
3. Provide area managers and/or constituency groups with information that will educate the public regarding aquatic nuisance species.

Objective 4.0 Protect and enhance aquatic habitat to benefit important sportfish and their associated prey species.

Strategies

1. Maintain a minimum of fifteen (15) fishing attractors and visually mark their position with buoys. Brush piles made of natural materials will be refurbished once during the duration of this plan.
2. Provide GPS coordinates of all newly established habitat structures for public viewing on the ODWC website.

Objective 5.0 Conduct public outreach

Strategies

1. Conduct at least one media contact per year highlighting ODWC management efforts on Lake Murray and fishing opportunities available to the public.
2. Provide support to the Lake Records program and area vendors.
3. Collect fish and/or tissue samples as requested to monitor contaminant levels in selected fishes.
4. Educate anglers and tournament directors about proper fish handling and associated fishing mortality.
5. Encourage tournament directors to submit reports for inclusion into the ODWC Bass Tournament database.

Table 1. Physical and chemical characteristics of Lake Murray

Operating Agencies:	State of Oklahoma
Purpose	Recreation
Impoundment Date	1937
Surface Area	5,728 acres
Capacity	153,250 acre-feet
Shoreline	95 miles
Shoreline Development Ratio	14.1
Mean Depth	26.6 ft.
Maximum Depth	94.8 ft.
Secchi Disk	72 in
pH Range	7.11 – 8.57
Conductivity Range	306 – 336.7 μS/cm
Salinity Range	0.10 – 0.20 ppt
Average Turbidity Value	6 NTU
Trophic State Index (chlorophyll a)	37
Trophic Class	Oligotrophic

Table 2. Species, number and size of fish stocked in Lake Murray from 1949 to 2010.

DATE	SPECIES	NUMBER	SIZE
1949	Largemouth bass	3,000	
1949	Channel catfish	4,500	
1949	Redear	10,000	
1949	Bluegill	5,000	
1949	White bass	4,000	
1950	Largemouth bass	43,150	
1950	Channel catfish	1,500	
1950	Redear	12,000	
1950	Crappie	50	
1951	Largemouth bass	8,000	
1953	Largemouth bass	65,000	
1953	Redear	4,000	
1953	Bluegill	10,000	
1955	Striped bass	3,000	
1962	Largemouth bass	20,000	
1962	Channel catfish	4,000	
1963	Largemouth bass	42,000	
1964	Largemouth bass	42,000	Fry
1965	Largemouth bass	31,000	Fry
1968	Largemouth bass	7,000	Fry
1969	Largemouth bass	35,000	Fry
1973	Blue catfish	5,000	
1973	Walleye	513,019	Fry
1974	Walleye	1,109,062	Fry
1974	Largemouth bass	25,000	Fry
1974	Florida LMB	3,000	Fry
1974	Channel catfish	18,816	Fry
1975	Walleye	1,000,000	Fry
1975	Hybrid LMB	15,000	Fry
1975	Largemouth bass	25,000	Fry
1975	Channel catfish	12,500	Fingerlings
1976	Largemouth bass	25,000	Fry
1976	Channel catfish	50,000	Fry
1977	Florida LMB	16,320	Fry
1977	Blue catfish	5,500	Fingerlings
1979	Channel catfish	50,000	Fry
1980	Threadfin shad	10,000	
1980	Florida LMB	57,280	
1981	Threadfin shad	6,300	
1981	Smallmouth bass	103,850	
1981	Channel catfish	143,940	
1982	Smallmouth bass	98,040	
1983	Largemouth bass	4,000	

Table 2. Continued.

DATE	SPECIES	NUMBER	SIZE
1983	Smallmouth bass	65,990	
1983	Channel catfish	76,450	
1984	Threadfin shad	10,000	
1984	Smallmouth bass	38,420	
1984	Channel catfish	54,810	
1985	Smallmouth bass	69,300	
1985	Channel catfish	57,505	
1986	Smallmouth bass	28,400	
1986	Channel catfish	94,212	
1987	Threadfin shad	900	Adults
1987	Smallmouth bass	25,464	Fingerlings
1987	Channel catfish	55,667	Adults
1991	Threadfin shad	5,000	Adults
1991	Channel catfish	117,968	Fingerlings
1994	Channel catfish	27,475	Fingerlings
1996	Certified Florida LMB	30,045	Fingerlings
1999	Certified Florida LMB	114,639	Fingerlings
2000	Certified Florida LMB	117,150	Fingerlings
2000	Channel catfish	58,000	Fingerlings
2001	Certified Florida LMB	114,940	Fingerlings
2004	Certified Florida LMB	115,656	Fingerlings
2005	Smallmouth bass	113	Adults
2006	Certified Florida LMB	114,600	Fingerlings
2008	Certified Florida LMB	90,750	Fingerlings
2008	Channel catfish	6,000	Fingerlings
2009	Smallmouth bass	150	Adults
2009	Smallmouth bass	129	Fingerlings
2009	Smallmouth bass	1,348	Fingerlings
2009	Certified Florida LMB	90,750	Fingerlings
2010	Threadfin shad	3,105	Adults

Table 3. Lake Murray Tournament Results. Ranked according to quality fishing indicators. Lake Murray ranking listed in parentheses.

Year	Number of Reports	Total Number Of Anglers	Number of Bass Caught	Number of Bass Weighed In per 8-Hour Day		Bass/ Tourn	Bass Weighed In/Angler	Percent Successful Anglers		Average Weight per Bass (lbs.)		Number of Bass Weighing In Over 5 lbs.	Angler-Hours per Bass Weighing In Over 5 lbs.	Number of Bass Weighing In Over 8 lbs.	Big Bass	Avg. 1st Place Weight (lbs.)		Overall Rank
1994	12	388	698	2.1	(# 3)	58.2	1.8	81	(# 1)	1.3	(# 20)	0.4	(# 15)	0.17	9.1	10.1	(# 13)	10
1995	35	1838	1490	1.4	(# 8)	42.6	0.81	47	(#)	1.7	(#)	0.8	(# 9)	0.1	9.2	9.3	(# 19)	20
1996	38	2198	1861	1.7	(# 5)	48.9	0.85	55	(# 13)	1.93	(# 19)	1.0	(# 13)	0.08	8.0	10.2	(# 14)	12
1997	41	2146	1427	1.0	(# 13)	34.8	0.7	52	(# 19)	1.7	(# 24)	0.8	(# 20)	0.15	9.3	8.9	(# 16)	22
1998	52	2416	1571	1.1	(# 15)	30.2	0.65	57	(# 14)	1.69	(# 18)	0.52	(# 13)	0.1	10.0	7.4	(# 15)	21
1999	54	2215	1571	1.3	(# 8)	29	0.7	63	(# 12)	1.74	(# 18)	0.7	(# 12)	0.13	8.8	8.7	(# 15)	18
2000	15	773	997	1.4	(# 11)	66.5	1.3	81	(# 4)	1.45	(# 20)	0.6	(# 18)	0	7.2	9.9	(# 16)	16
2001	21	856	932	1.09	(# 10)	44.4	1.1	65	(# 6)	1.55	(# 17)	0.6	(# 6)	0.05	8.1	8.36	(# 16)	13
2002	20	763	1168	1.8	(# 2)	58.4	1.5	79	(# 2)	1.25	(# 19)	0.5	(# 11)	0.05	8.2	9.3	(# 10)	8
2003	14	555	811	1.8	(# 4)	57.9	1.5	69	(# 8)	1.3	(# 19)	0	(# 18)	0	5.5	8.2	(# 14)	18
2004	14	880	1471	1.6	(# 2)	105	1.7	82	(# 2)	1.48	(# 18)	0.9	(# 12)	0.07	10.9	10.9	(# 10)	4
2005	18	979	1973	2.0	(# 6)	109.6	2.0	82	(# 1)	1.36	(# 18)	0.4	(# 14)	0.06	9.3	11.7	(# 13)	10
2006	23	1274	1656	1.3	(# 12)	72	1.3	82	(# 3)	1.46	(# 19)	0.3	(# 8)	0	8.9	10.9	(# 13)	14
2007	17	532	1649	3.1	(# 2)	97	3.1	90	(# 1)	1.38	(# 18)	0.7	(# 13)	0.1	11.5	12.1	(# 13)	5
2008	15	1335	742	1.8	(# 5)	89	1.8	87	(# 1)	1.45	(#18)	3.3	(# 15)	0.13	10.8	14.3	(# 10)	8
2009	13	532	1065	-	-	81.9	2.0	88	(# 1)	2.13	(#19)	0.85	(# 14)	0	7.7	11.4	(# 16)	11
2011	9	-	634	1.8	(# 4)	70.4	-	90	(# 1)	1.8	(# 10)	0.67	(# 6)	0.11	-	12.9	(# 8)	4
Avg	**24.2**	**1230**	**1277**	**1.6**	**7**	**65.5**	**1.4**	**74**	**5.6**	**1.57**	**18.4**	**0.76**	**12.8**	**0.08**	**8.9**	**10.3**	**13.6**	**12.6**

Table 4. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of largemouth bass collected by spring electrofishing from Lake Murray. Numbers in parentheses represent acceptable values for a quality fishery. Acceptable W_r values are ≥90.

Total (≥40)			<8 in. (15-45)		8–13 in. (15-30)		≥12 in. (≥15)		≥14 in. (≥10)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r	C/f	W_r
1982	284	20.3	10.9	-			3.9	91	0.8	-
1984	245	25.1	9.7	-			7.2	90	2.4	-
1986	175	58.3	22.3	-			6.4	89	4.0	-
1989	165	55.0	9.3	-			6.9	92	5.0	-
1993	174	58.0	16.3	78			20.4	90	11.0	89
1995	152	101.0	14.7	75			9.8	91	24.7	85
1997	150	75.0	19.0	95			15.0	99	13.5	82
1999	156	104.0	12.0	77	40.7	85	19.8	101	36.7	86
2002	153	76.5	27.5	107	27.5	99	28.8	95	13.0	94
*2005	344	76.4	19.8	91	27.6	89	36.2	96	19.6	88
**2008	155	51.7	10.0	110	19.7	96	47.0	100	17.0	90
***2008	22	14.7	2.7	100	4.0	89	43.5	98	2.7	87
2008	177	39.3	7.6	108	15.6	94	71.2	95	12.2	90
2011	77	25.7	7.0	95	9.0	88	68.4	97	6.3	87

* Denotes changed electrofishing protocol – Minimum of 4.5 hrs of effort required.
** Denotes day electrofishing
*** Denotes night electrofishing

Table 5. Results of largemouth bass DNA analyses from Lake Murray. FLMB = pure strain Florida largemouth bass; F1 = first generation hybrid between FLMB and NLMB; Fx = second or later generation hybrid cross; NLMB = native northern largemouth bass.

Year	FLMB	F_1	FLMB + F_1	F_x	NLMB
1999*	7.5%	7.5%	15%	57.5%	27%
2005*	38%	12%	50%	45%	5%
2009+	7.5%	25%	32.5%	65%	2.5%

* Results derived from gel electrophoresis.
† Results derived from microsatellite DNA analysis.

Table 6. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of spotted bass collected by spring electrofishing from Lake Murray. Numbers in parentheses represent acceptable values for a quality fishery. Acceptable W_r values are $\geq$90.

	Total (≥ 40)		< 8 inches (15-45)		8-13 inches (15-30)		≥ 14 inches (≥ 10)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1982	125	8.9	2.4	-			-	-
1984	30	3.1	1.1	-			-	-
1986	17	5.7	0.7	-			0.3	-
1989	35	11.7	1.7	-			-	-
1993	37	12.3	2.3	87			0.3	86
1995	4	2.7	0.7	-	-	-	-	-
1997	1	0.5	0.5	-	-	-	-	-
1999	2	1.3	0.7	66	0.7	87	-	-
2002	9	4.5	-	-	3.0	91	-	-
*2005	6	1.3	0.2	145	0.4	92	0.2	69
**2008	2	0.7	0.3	200	0.3	84	-	-
***2008	3	2.0	0.0	-	2.0	91	-	-
2008	5	1.1	0.2	200	0.9	89	-	-
2011	33	11.0	1.6	109	5.3	93	-	-

*2005 started a new minimum of 4.5 hours Electrofishing on Lake Murray.
** Denotes day electrofishing
*** Denotes night electrofishing

Table 7. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of smallmouth bass collected by spring electrofishing from Lake Murray. Numbers in parentheses represent acceptable values for a quality fishery. Acceptable W_r values are $\geq$90.

	Total (≥ 40)		< 8 inches (15-45)		8-13 inches (15-30)		≥ 14 inches (≥ 10)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r
1982	6							
1984	6							
1986	-	-	-	-	-	-	-	-
1989	6	2.0						
1993	27	9.0						
1995	-	-	-	-	-	-	-	-
1997	-	-	-	-	-	-	-	-
1999	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-
*2005	5	1.1	0.0	-	0.67	90	0.22	85
**2008	3	1.0	1.0	95	-	-	-	-
***2008	15	10.0	4.7	95	4.7	87	0.7	72
2008	18	4.0	2.2	95	1.6	87	0.2	72
2011	44	14.7	2.3	100	5.3	79	1.3	73

*2005 started a new minimum of 4.5 hours Electrofishing on Lake Murray.
** Denotes day electrofishing
*** Denotes night electrofishing

Table 8. Total number (No.), fish per net night (C/f), and relative weights (Wr) by size groups of white bass collected by gillnetting from Lake Murray.

	Total		< 8 in.		8 – 12 in.		≥ 12 in.	
Year	No.	C/f	C/f	Wr	C/f	Wr	C/f	Wr
1982	59	4.8	0.48	-	2.4	-	1.7	-
1984	121	9.6	1.44	-	2.2	-	4.8	-
1986	86	7.2	0.22	-	1.9	-	4.8	-
1989	87	7.2	1.44	-	2.2	-	2.4	-
1993	152	12.0	7.2	84	2.2	97	2.2	86
1995	254	19.2	4.8	98	9.6	95	2.4	91
1997	119	9.6	2.4	96	2.4	91	2.4	87
1999	178	12.0	1.7	75	4.8	81	7.2	73
2002	205	14.4	4.8	84	6.2	87	3.6	80
2005	254	21.8	1.2	88	7.7	92	13.0	84
2008	239	15.7	0.9	84	4.5	87	10.2	83
*2011	101	7.3	0.72	86	0.65	86	5.9	95

*Gillnets were changed in 2009 to a smaller panel size and overall shorter net.

Table 9. Total number (No.), fish per net night (C/f), and relative weights (Wr) by size groups of channel catfish collected by gillnetting from Lake Murray.

	Total		< 12 in.		≥ 12 in.		≥ 16 in.	
Year	No.	C/f	C/f	Wr	C/f	Wr	C/f	Wr
1982	16	1.2	0.14	-	1.0	-	0.48	-
1984	25	1.9	0.22	-	1.7	-	1.2	-
1986	28	2.2	0.14	-	1.9	-	1.2	-
1989	9	0.7	0.07	87	0.48	-	0.48	-
1993	23	1.7	0.24	75	1.4	82	1.0	83
1995	19	1.4	0.22	95	1.2	93	1.0	98
1997	38	2.6	0.48	87	2.4	89	1.7	94
1999	30	2.2	0.48	72	1.7	83	1.44	84
2002	28	1.9	0.48	82	1.4	91	1.2	91
2005	23	1.9	0.17	95	1.7	90	1.7	90
2008	31	2.0	0.5	80	1.6	84	1.4	85
*2011	22	1.6	0.29	86	1.3	78	0.9	78

*Gillnets were changed in 2009 to a smaller panel size and overall shorter net.

Table 10. Total number (No.), fish per net night (C/f), and relative weights (Wr) by size groups of all crappie collected by gillnetting from Lake Murray. Numbers in parentheses represent acceptable C/f values for a quality fishery.

	Total (≥4.80)		< 8 in. (1.2-7.2)		≥ 8 in. (≥1.9)		≥10 in. (≥0.96)	
Year	No.	C/f	C/f	Wr	C/f	Wr	C/f	Wr
1982	5	0.48	0.14	-	0.22	-	0.14	-
1984	6	0.48	-	-	0.48	-	0.07	-
1986	1	0.07	0.07	-	-	-	-	-
1989	7	0.48	-	-	0.48	-	0.48	-
1993	20	1.44	0.14	94	1.2	85	0.96	85
1995	8	0.72	0.07	94	0.48	92	0.24	93
1997	21	1.44	0.72	92	0.96	90	0.48	83
1999	4	0.24	-	-	0.24	82	0.22	81
2002	7	0.48	0.48	88	0.14	81	0.14	81
2005	3	0.26	0.16	-	0.10	82	0.10	82
2008	4	0.26	0.07	91	0.14	91	0.12	89
*2011	4	0.29	0.00	-	0.29	92	0.29	92

*Gillnets were changed in 2009 to a smaller panel size and overall shorter net.

Table 11. Total number (No.), fish per net night (C/f), and relative weights (Wr) by size groups of walleye collected by gillnetting from Lake Murray.

	Total		< 12 in.		12 – 16 in.		≥ 16 in.	
Year	No.	C/f	C/f	Wr	C/f	Wr	C/f	Wr
1982	3	0.22	0.14	-	-	-	0.07	-
1984	8	0.48	0.48	-	0.14	-	0.07	-
1986	18	1.44	1.20	-	0.14	-	0.07	-
1989	16	1.20	0.72	-	0.14	-	0.24	-
1993	20	1.40	1.20	80	0.48	80	-	-
1995	12	1.00	0.24	99	0.48	82	0.14	86
1999	8	0.72	0.24	70	0.14	95	0.14	76
2002	13	1.00	0.48	85	0.22	75	0.22	75
2005	8	0.72	0.48	93	0.24	80	-	-
2008	56	3.7	2.30	86	0.90	78	0.30	76
*2011	14	1.02	0.07	95	0.87	78	0.07	90

*Gillnets were changed in 2009 to a smaller panel size and overall shorter net.

Table 12. Total number (No.), fish per hour (C/f), and relative weights (Wr) by size groups of walleye collected by night electrofishing from Lake Murray.

	Total		< 12 in.		12 – 16 in.		≥ 16 in.	
Year	No.	C/f	C/f	Wr	C/f	Wr	C/f	Wr
2005	32	23.7	-	-	11.1	-	12.6	-

Table 13. Mean length at age of walleye collected by gillnetting from Lake Murray. Numbers in parentheses represent sample size.

Year	Age 0	Age 1	Age 2	Age 3	Age 4
2008	10.4 (34)	14.0 (12)	16.3 (6)	16.4 (1)	23.7 (1)
2011	8.8 (1)	13.2 (8)	13.8 (3)	19.3 (1)	15.5 (1)

Table 14. Total number (No.), catch rates (C/f), and relative weights (W_r) by size groups of bluegill collected by spring electrofishing and seining from Lake Murray. Numbers in parentheses represent acceptable C/f values for a quality fishery. Acceptable W_r values are $\geq$90.

	Total[1] (≥ 45)		< 3 inches[1] (≥ 10)		3-6 inches[1] (20-100)		≥6 inches[1] (≥ 15)		< 4 inches[2] (1.0)	
Year	No.	C/f	C/f	W_r	C/f	W_r	C/f	W_r	No.	C/f
1982	387	27.6	6.7	-	18.9	-	2.1	-	9	0.45
1984	330	33.8	9.8	-	22.6	-	1.4	-	48	1.18
1986	215	71.7	16.3	-	43.3	-	12.0	-	21	1.08
1989	134	44.7	16.7	-	25.7	-	2.3	-	7	0.34
1993	123	41.0	4.0	-	29.3	69	7.7	92	14	0.77
1995	30	20.0	4.0	-	12.7	57	3.3	76	89	4.87
1997	15	7.5	2.0	-	5.5	95	-	-	14	0.69
1999	41	27.3	8.0	-	12.7	74	6.7	91	-	-
2002	143	71.5	10.5	-	49.0	74	12.0	97	16	0.80
*2005	195	43.3	8.9	-	25.3	79	9.1	90	21	1.03
2008	Did not collect									
2011	Did not collect									

*2005 started a new minimum of 4.5 hours of Electrofishing on Lake Murray.
[1] Spring electrofishing
[2] Seining

Table 15. Total number (No.) and catch rates (C/f) of gizzard shad and threadfin shad collected by gillnetting from Lake Murray.

	Gizzard shad			Threadfin shad	
	Total		< 8 inches	Total	
Year	No.	C/f	C/f	No.	C/f
1982	24	1.7	-	-	-
1984	34	2.4	-	-	-
1986	25	1.9	-	-	-
1989	27	1.9	1.7	-	-
1993	33	2.4	0.14	20	1.44
1995	54	4.1	0.72	28	2.16
1997	57	4.1	0.07	15	1.20
1999	43	3.1	0.22	15	1.20
2002	35	2.4	-	13	0.96
2005	21	1.7	0.24	33	2.88
2008	31	2.0	0.07	173	12.2
*2011	20	1.4	1.4	-	-

*Gillnets were changed in 2009 to a smaller panel size and overall shorter net.

Lake Murray Habitat Map

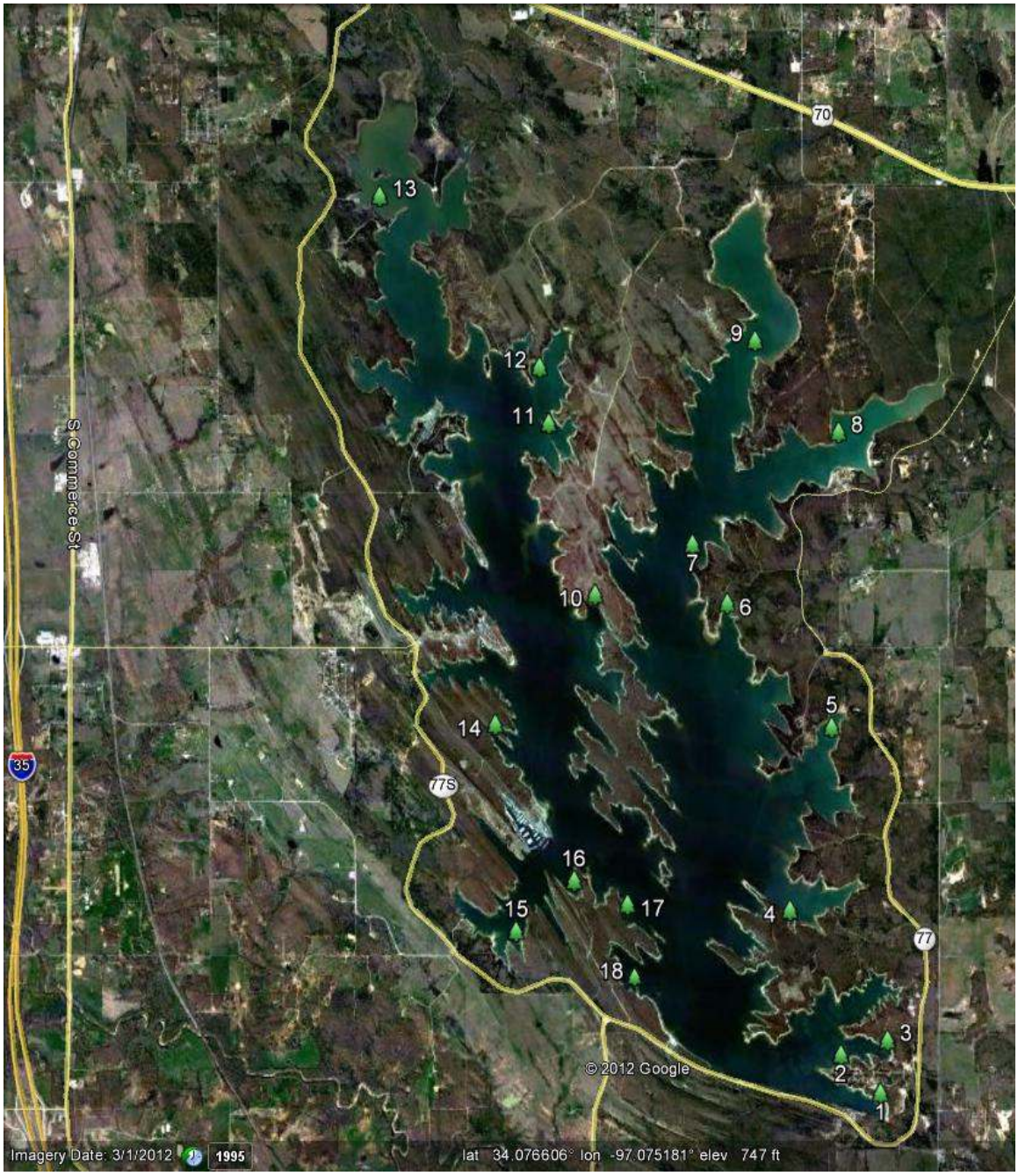

Figure 1. Map of Lake Murray fishing attractor locations and surrounding vicinity.

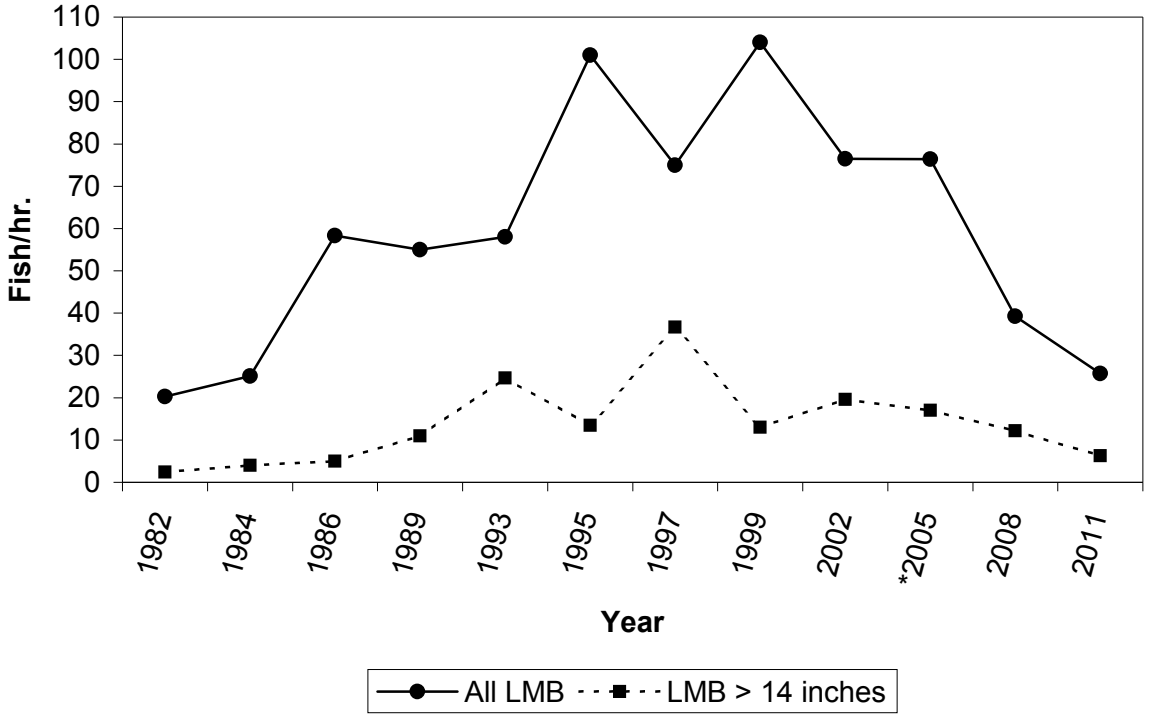

Figure 2. Total catch rates of largemouth bass and catch rates of largemouth bass > 14 inches collected by spring electrofishing at Lake Murray.

* Denotes changed electrofishing protocol – Minimum of 4.5 hrs of effort required.

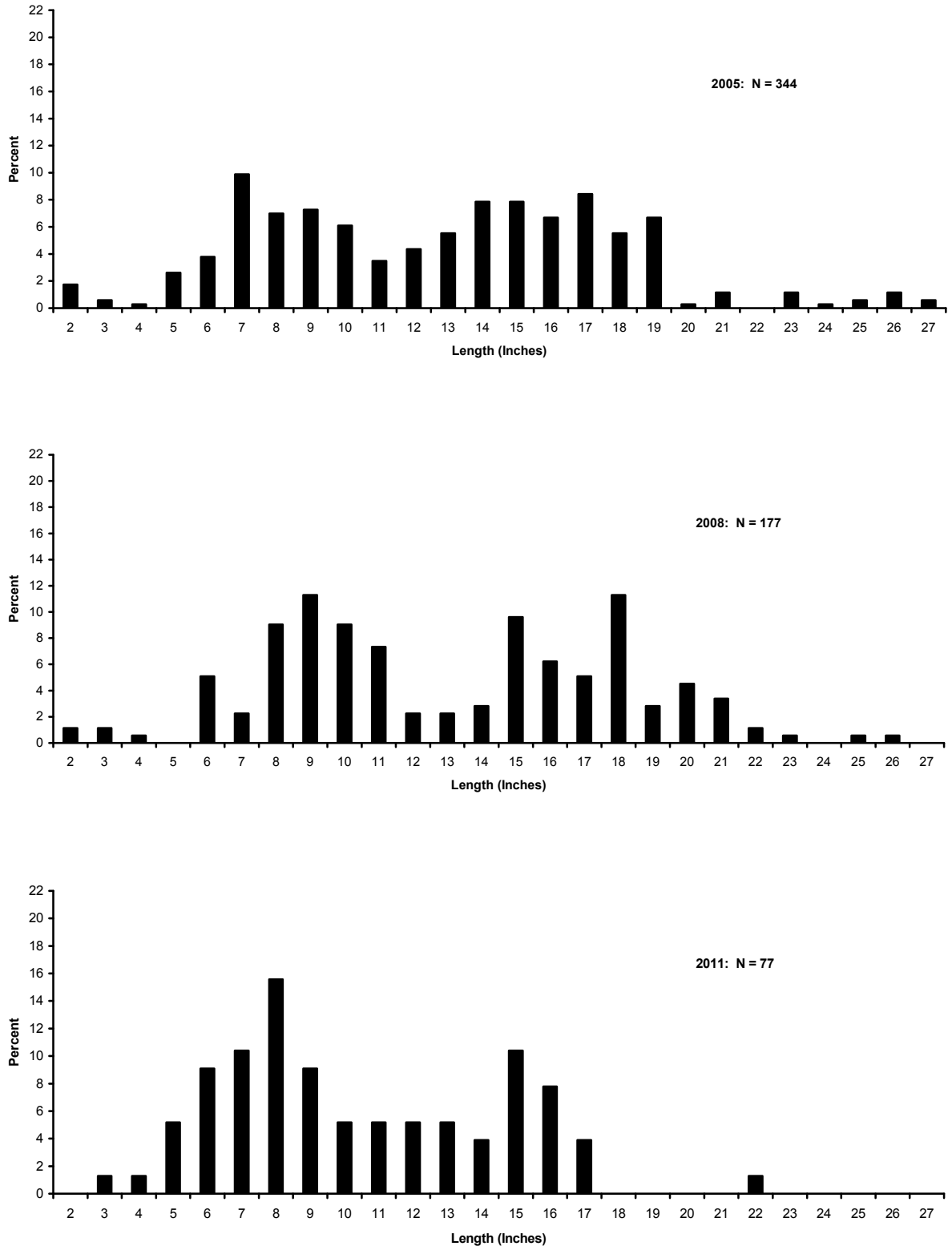

Figure 3. 2005, 2008, and 2011 length frequency distribution for largemouth bass collected by spring electrofishing at Lake Murray.

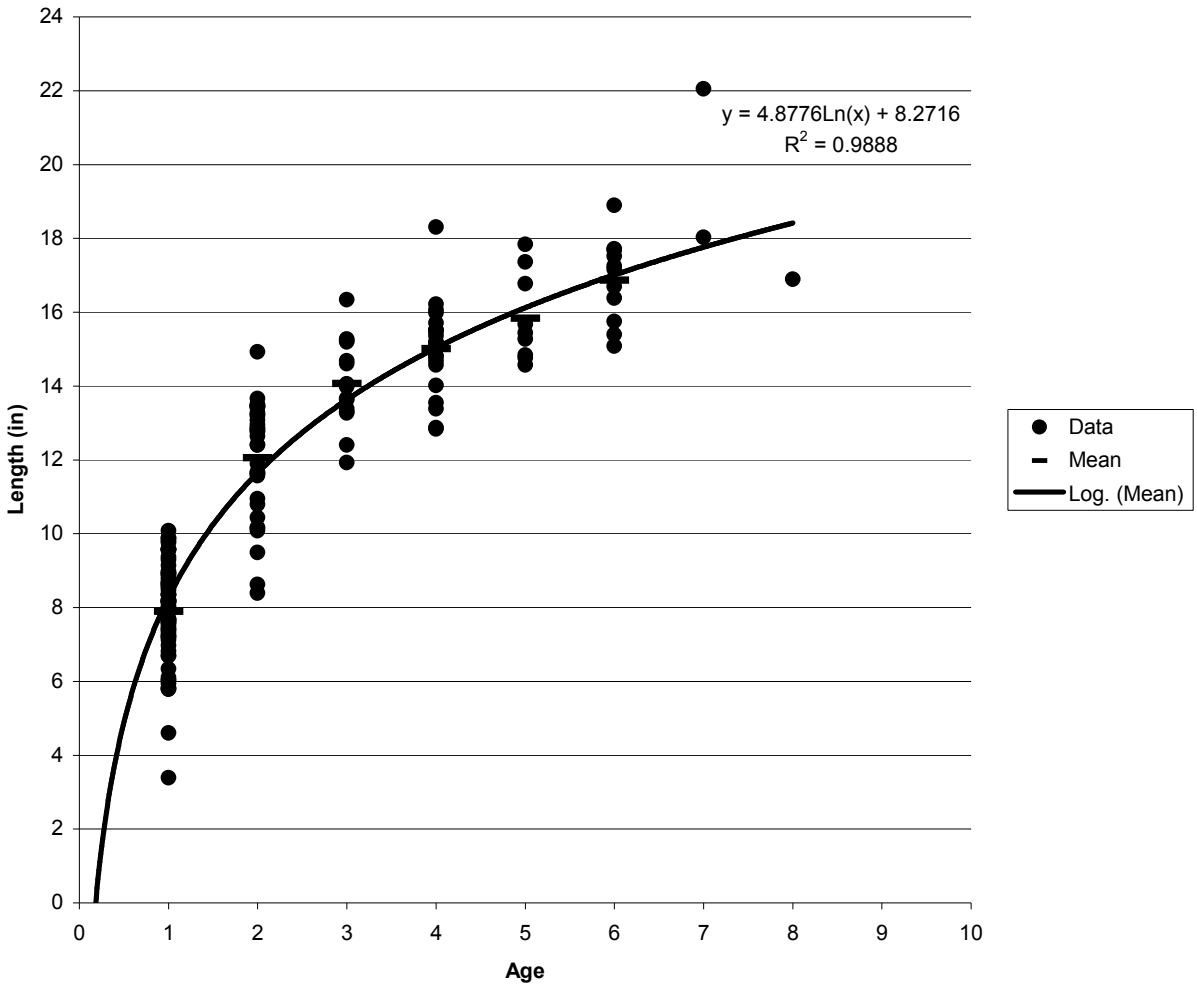

Figure 4. 2008 Length at age data for largemouth bass collected from Lake Murray by spring electrofishing. N = 160

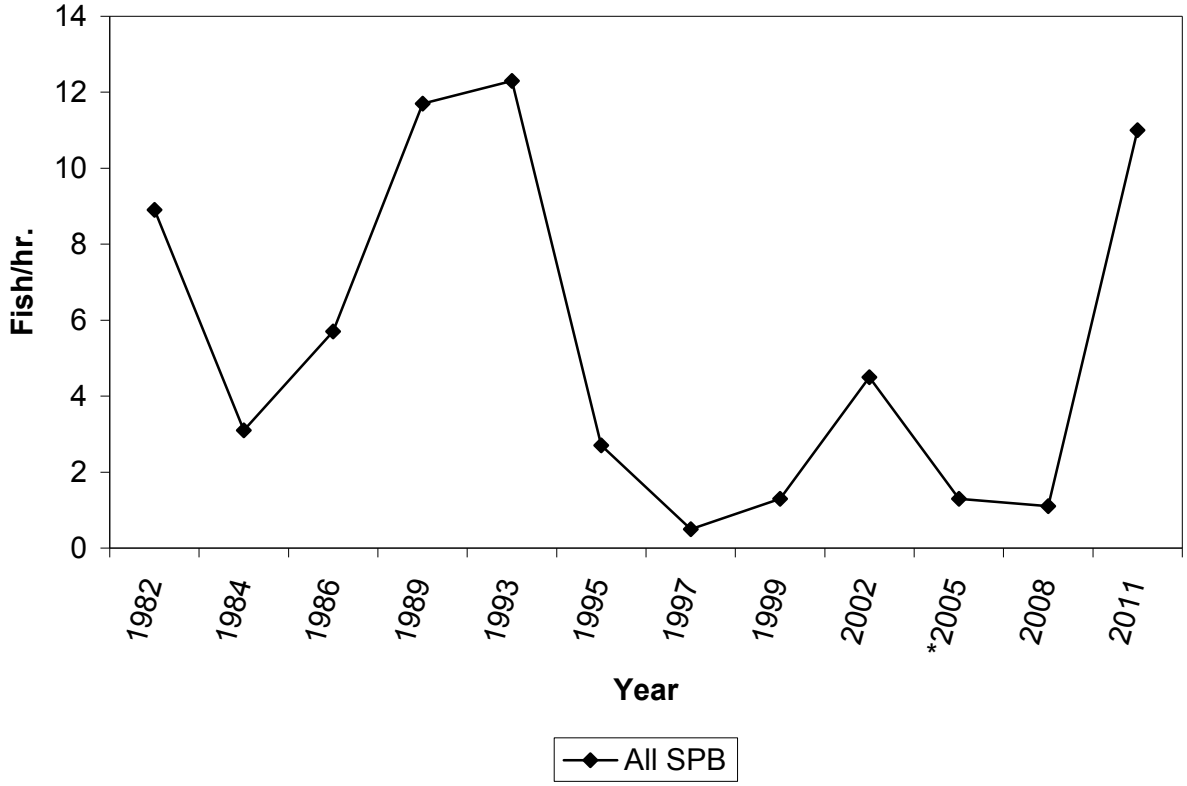

Figure 5. Total catch rates of spotted bass collected by spring electrofishing at Lake Murray.

* Denotes changed electrofishing protocol – Minimum of 4.5 hrs of effort required.

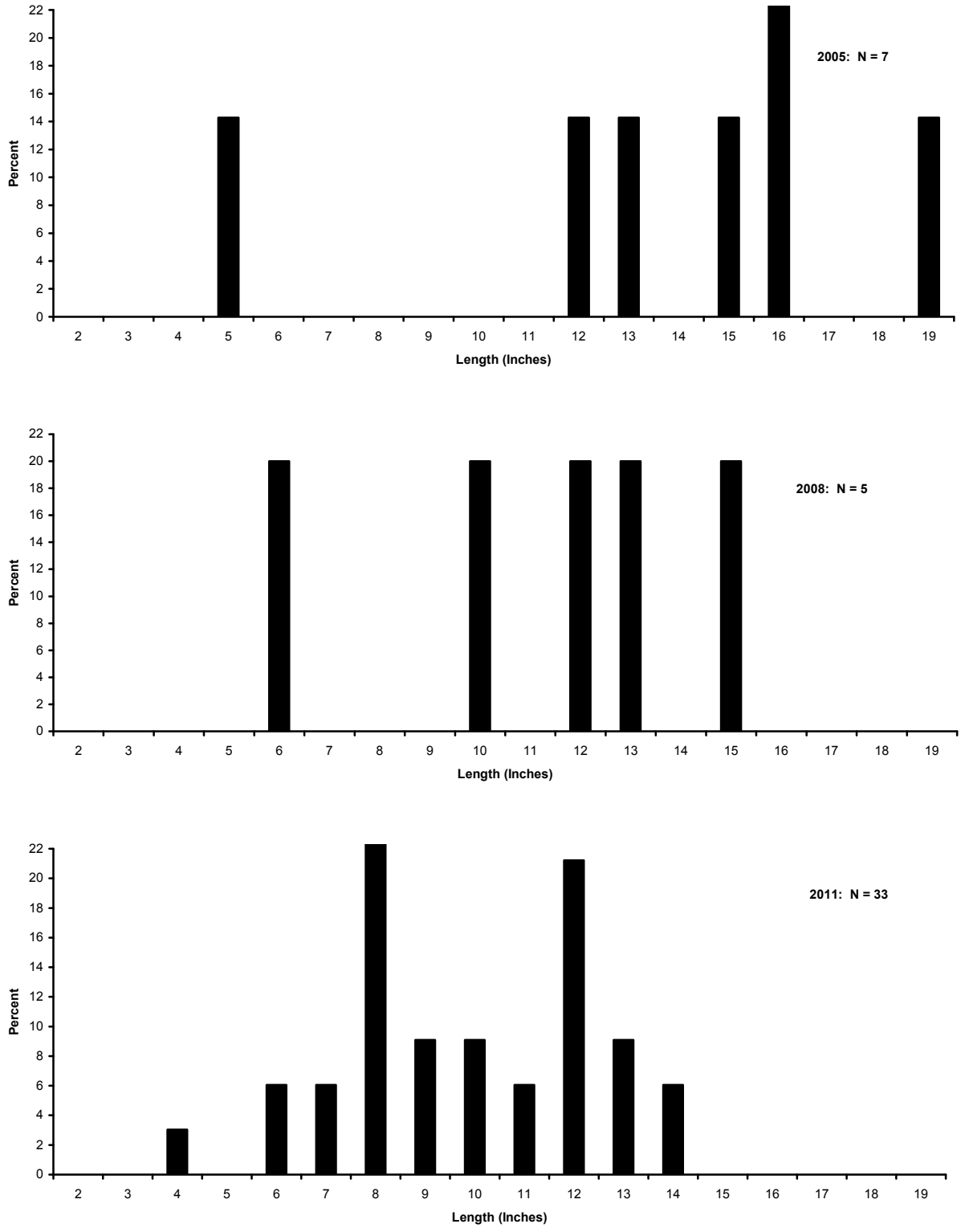

Figure 6. 2005, 2008, and 2011 length frequency distribution for spotted bass collected by spring electrofishing at Lake Murray.

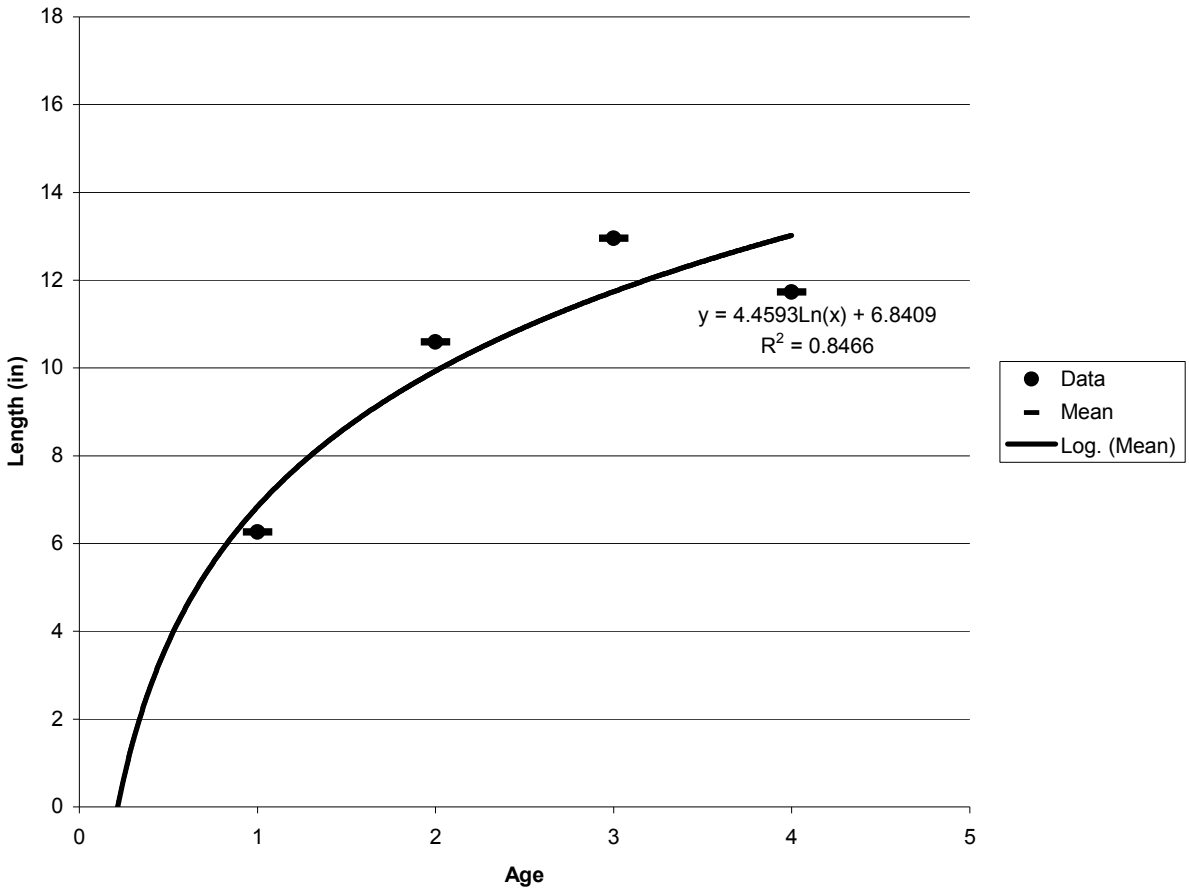

Figure 7. 2008 Length at age data for spotted bass collected from Lake Murray by spring electrofishing. N = 4

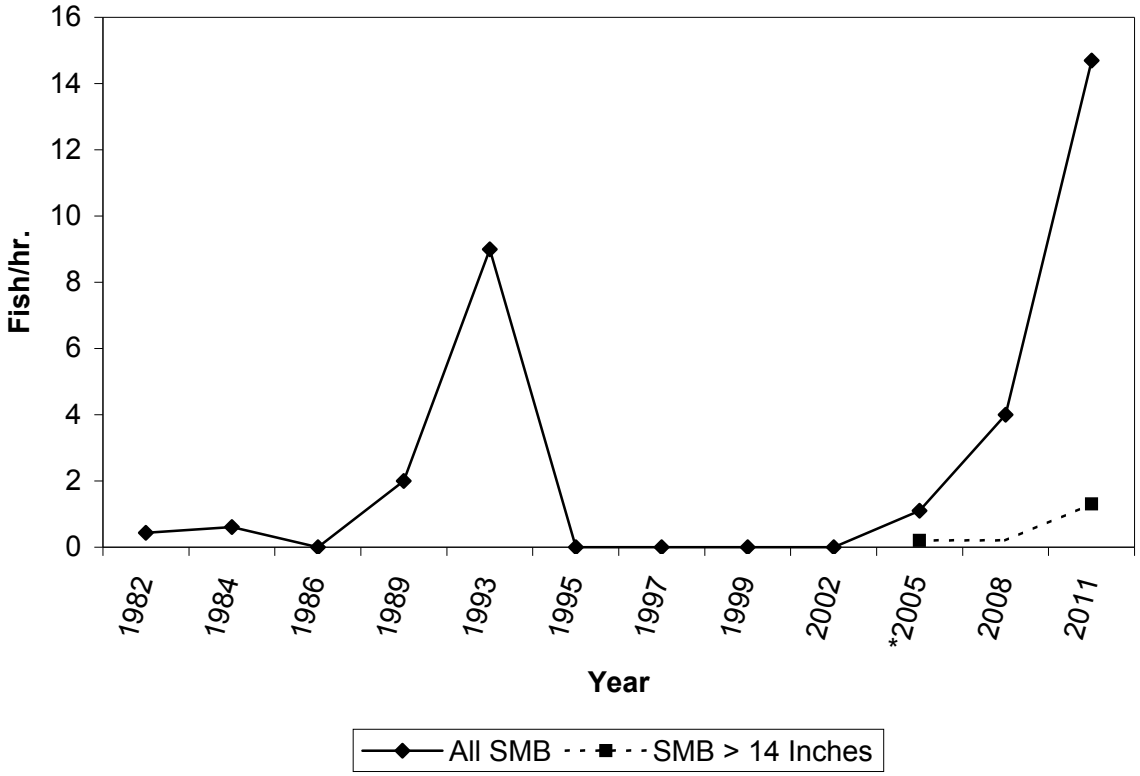

Figure 8. Total catch rates of smallmouth bass collected by spring electrofishing at Lake Murray.

* Denotes changed electrofishing protocol – Minimum of 4.5 hrs of effort required.

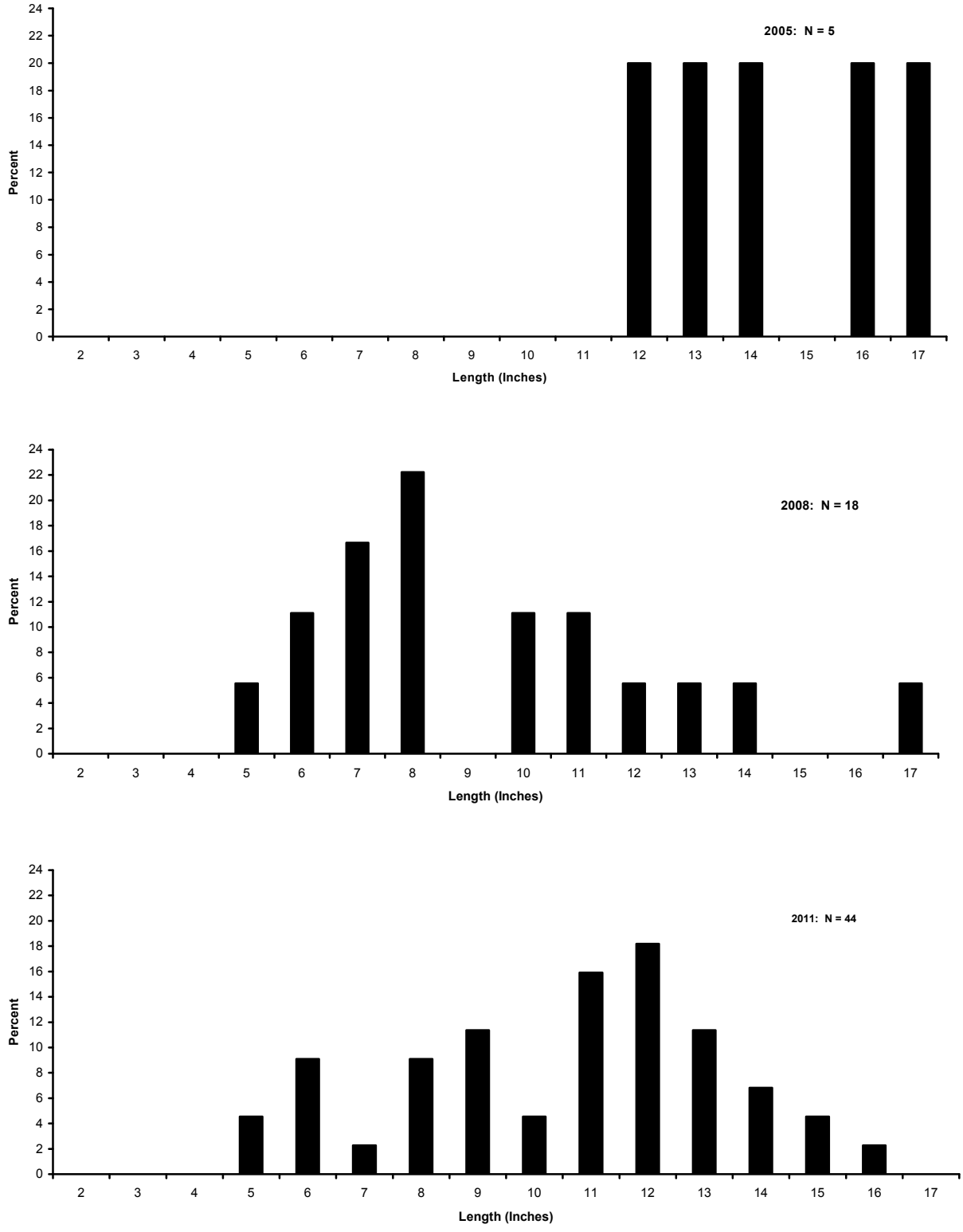

Figure 9. 2005, 2008 and 2011 length frequency distribution for smallmouth bass collected by spring electrofishing at Lake Murray.

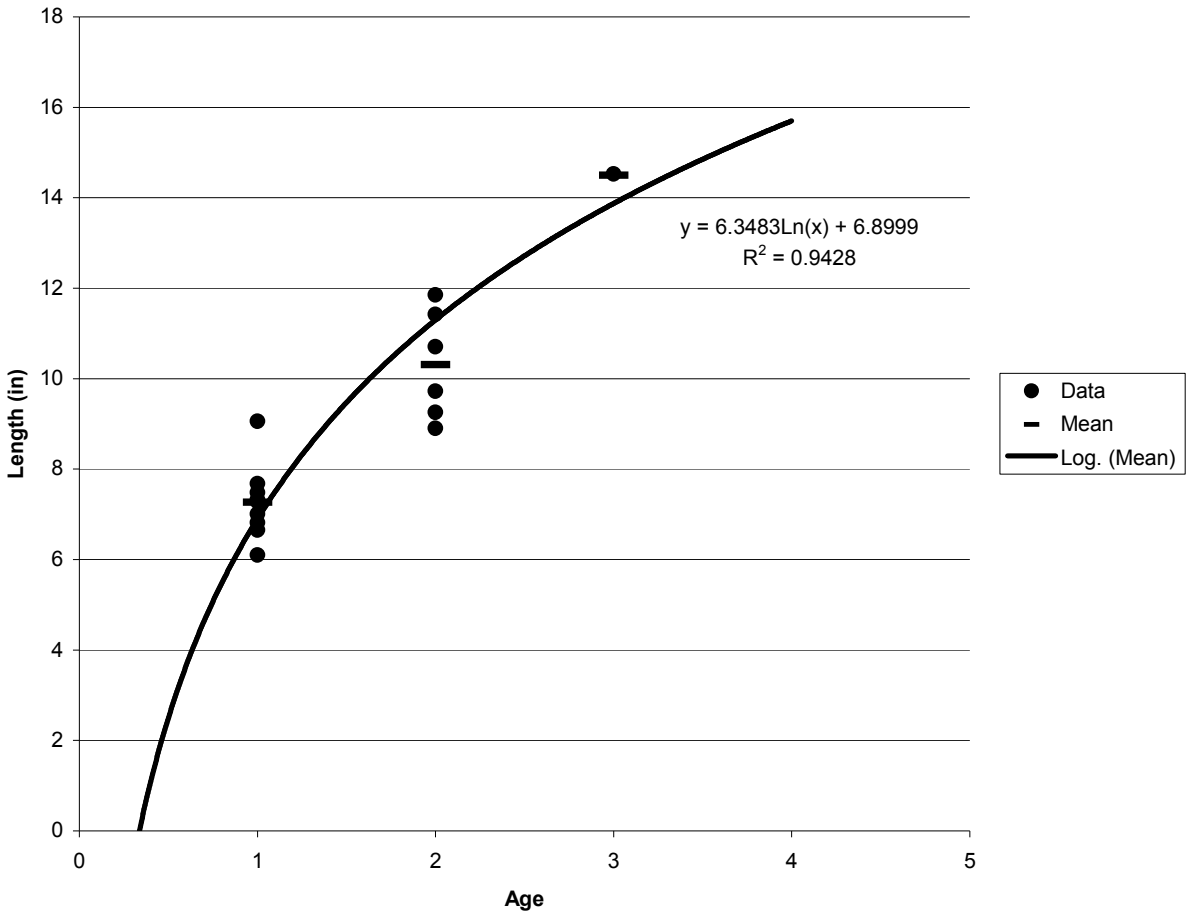

Figure 10. 2008 Length at age data for smallmouth bass collected from Lake Murray by spring electrofishing. N = 16

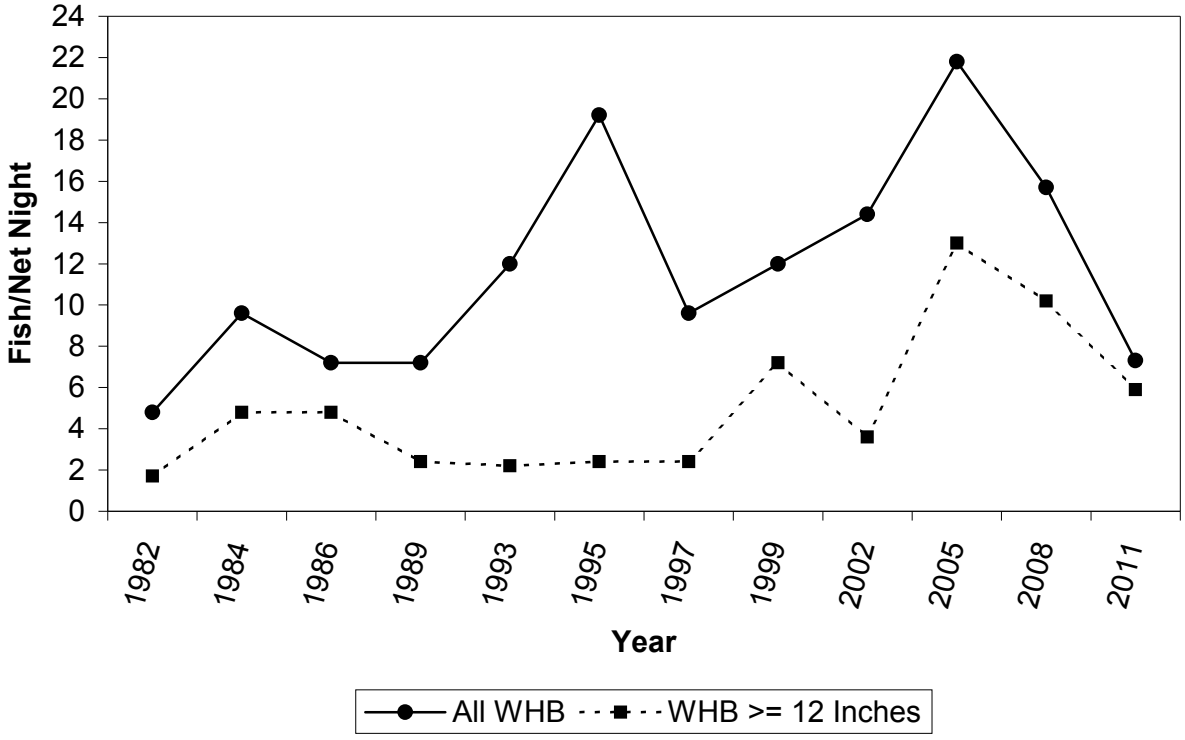

Figure 11. 1982 to 2011 catch rates for all white bass and white bass ≥ 12 inches collected by gillnetting at Lake Murray.

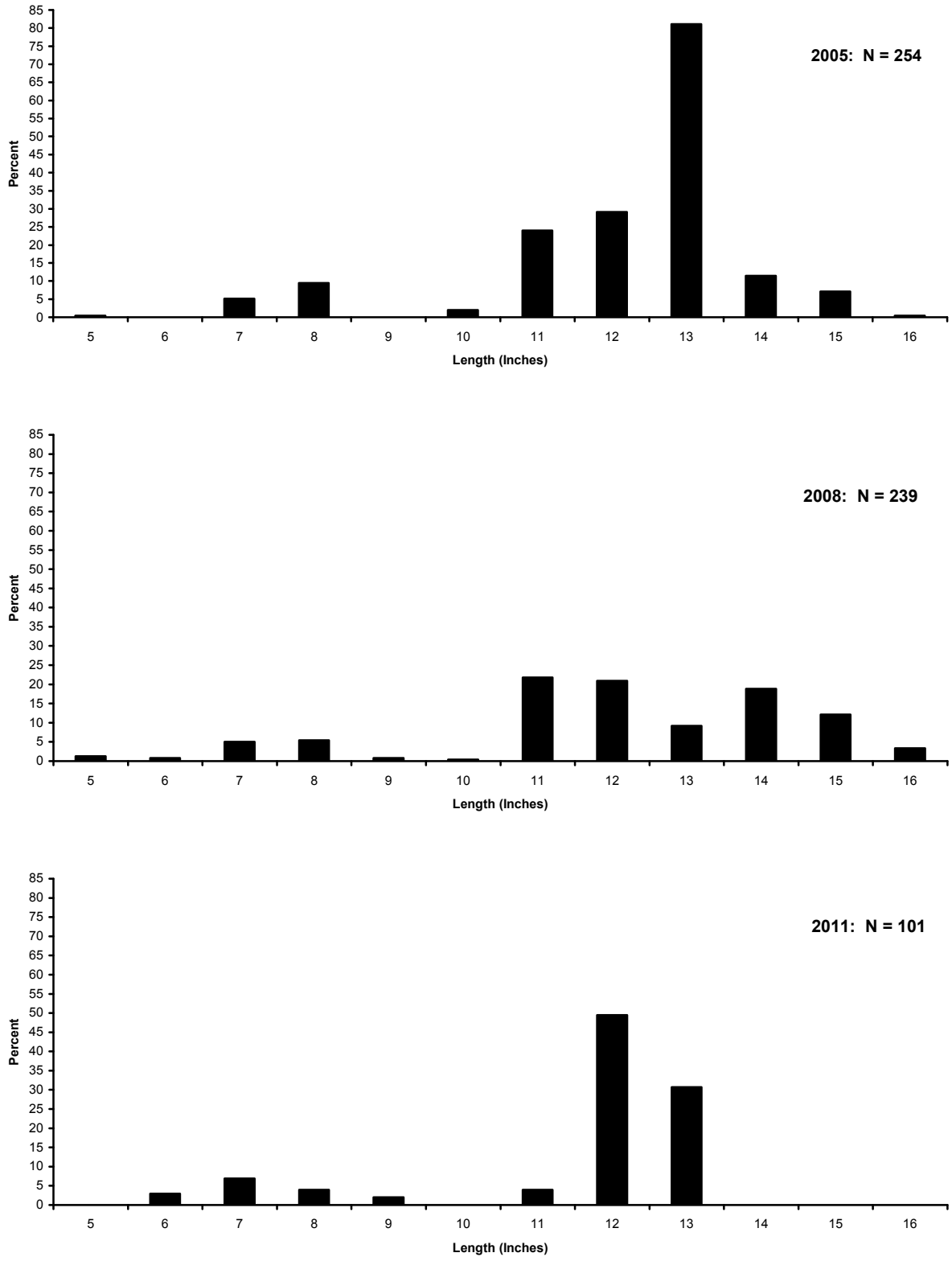

Figure 12. 2005, 2008 and 2011 length frequency distribution for white bass collected by gillnetting at Lake Murray.

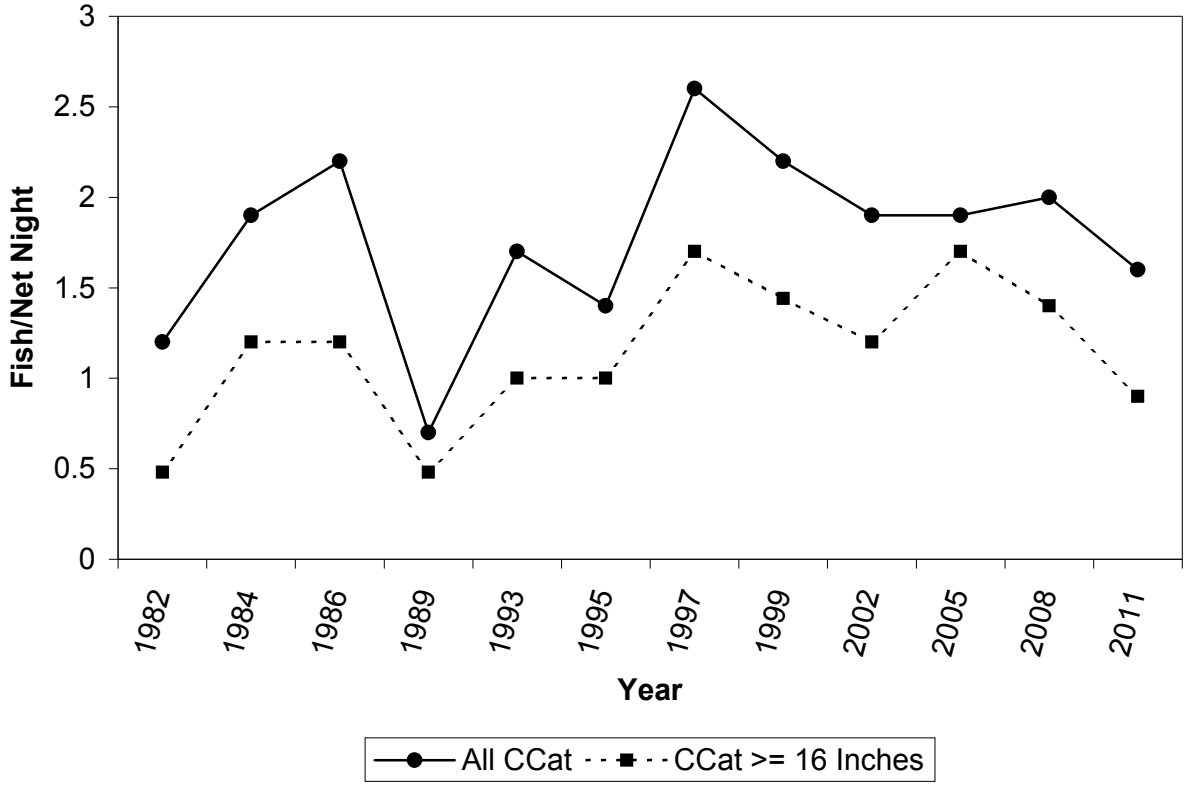

Figure 13. 1982 to 2011 catch rates for all channel catfish and channel catfish ≥ 16 inches collected by gillnetting at Lake Murray.

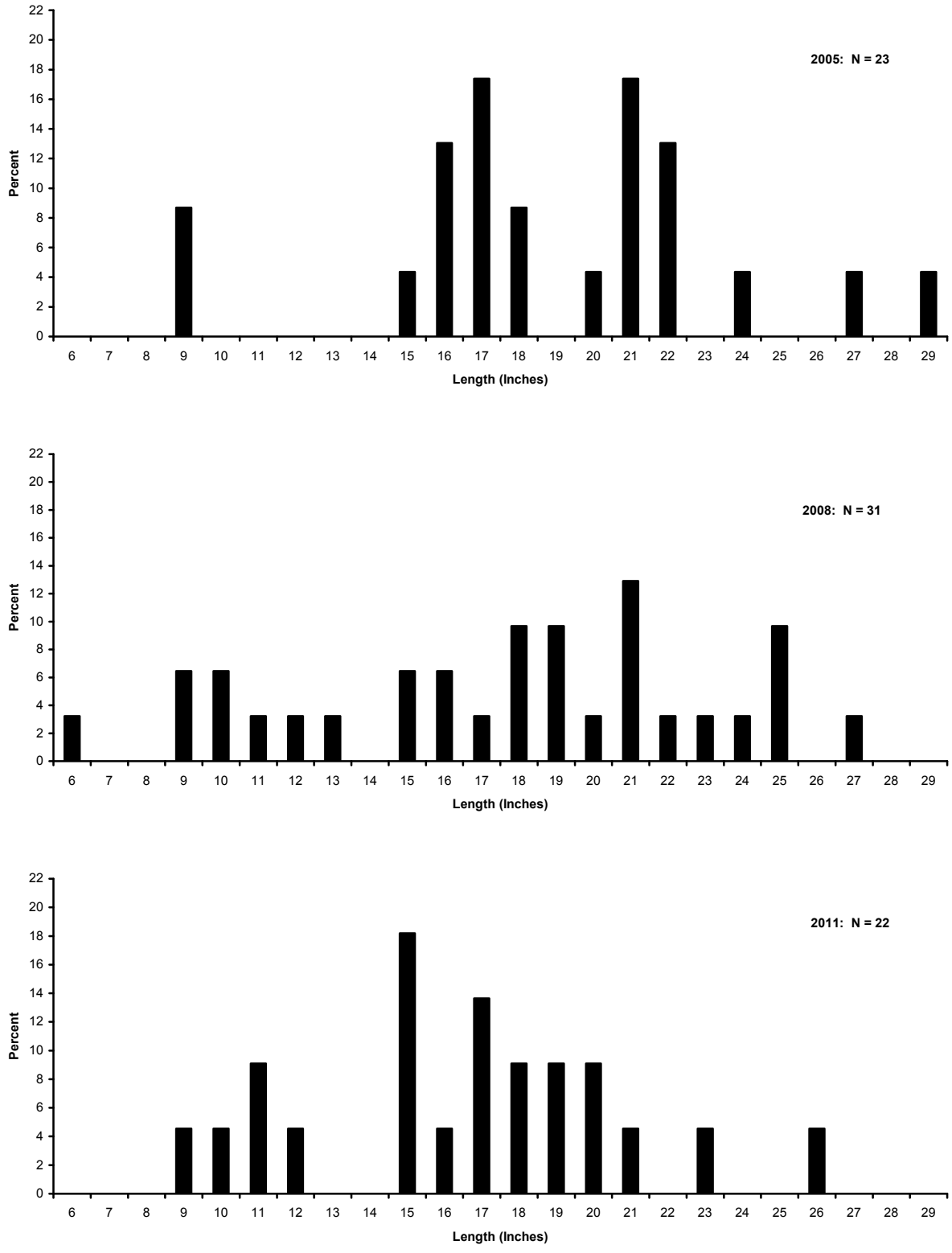

Figure 14. 2005, 2008 and 2011 length frequency distribution for channel catfish collected by gillnetting at Lake Murray.

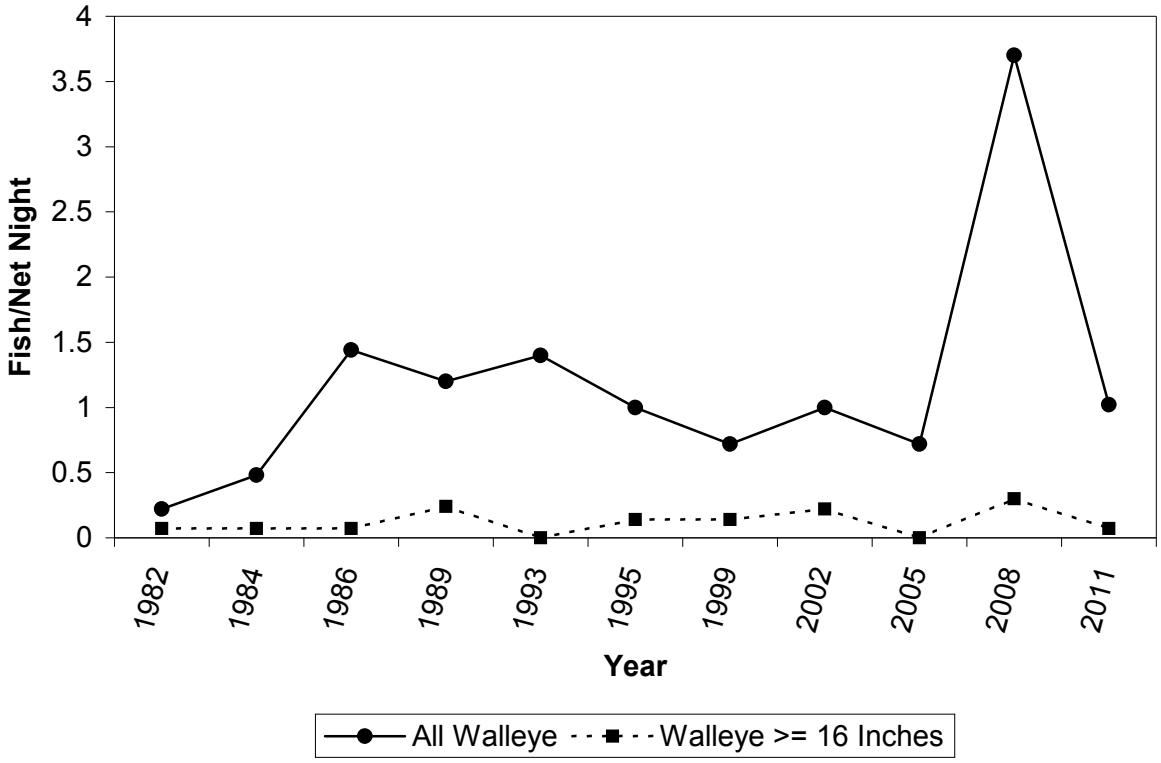

Figure 15. 1982 to 2011 catch rates for all walleye and walleye ≥ 16 inches collected by gillnetting at Lake Murray.

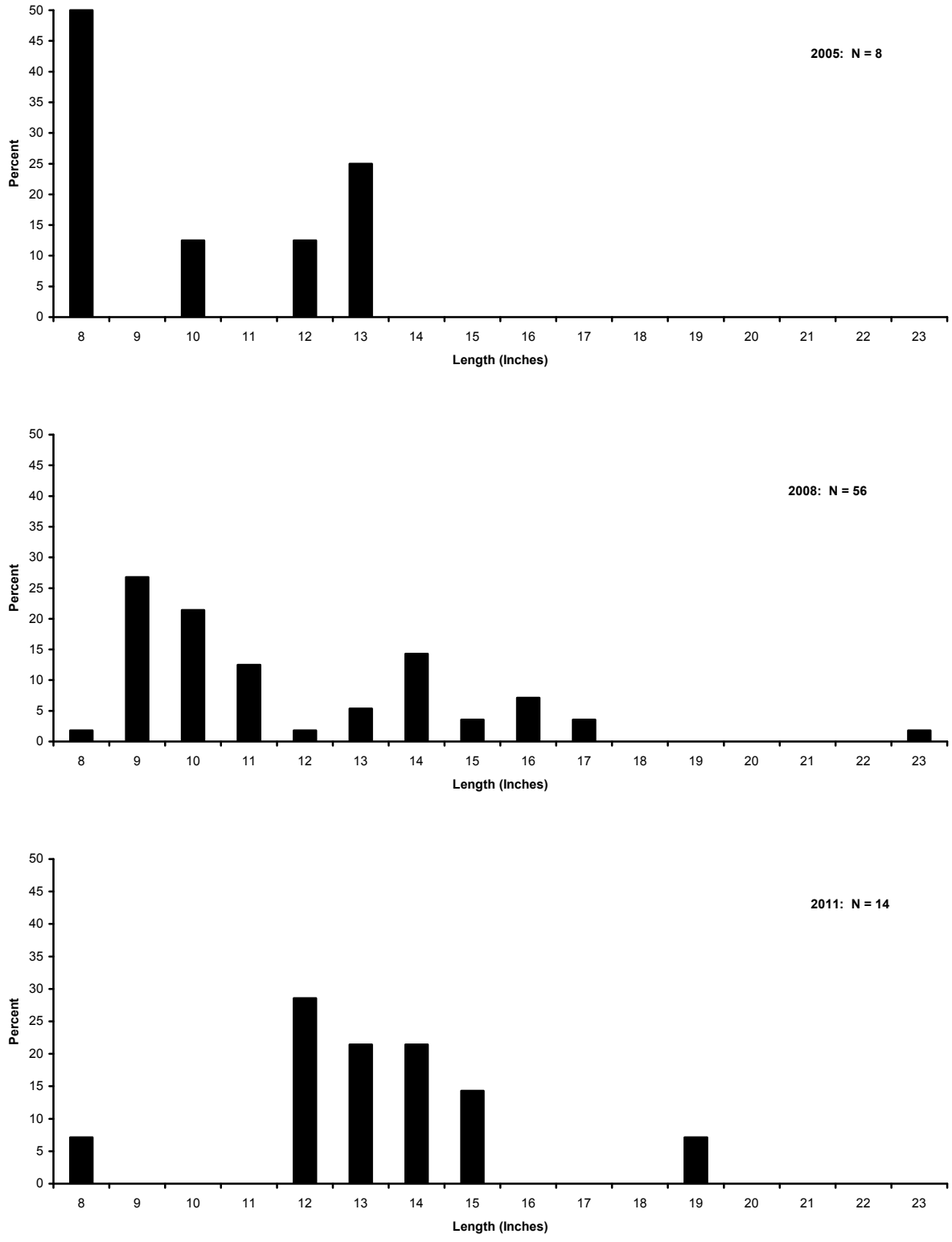

Figure 16. 2005, 2008 and 2011 length frequency distribution for walleye collected by gillnetting at Lake Murray.

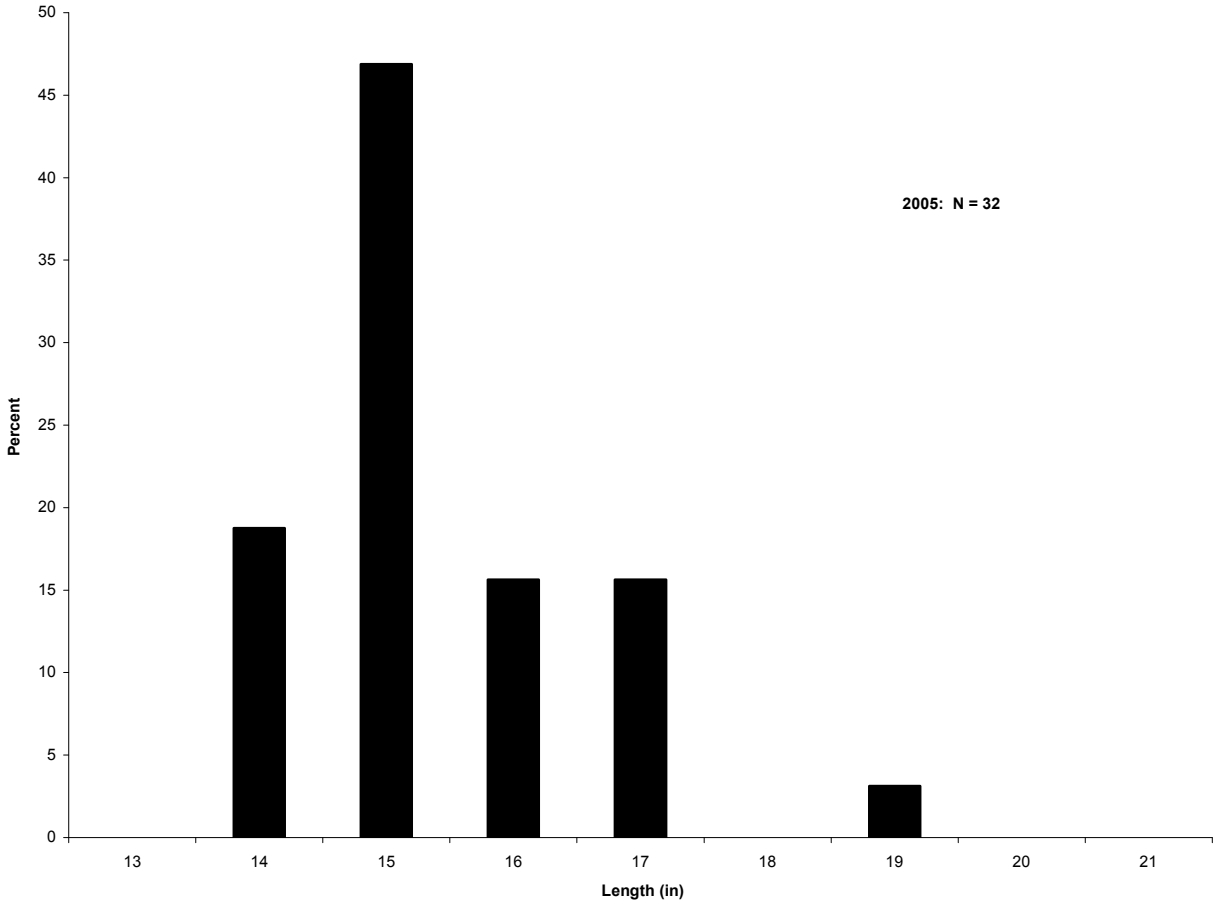

Figure 17. 2005 length frequency distribution for walleye collected by night electrofishing at Lake Murray.

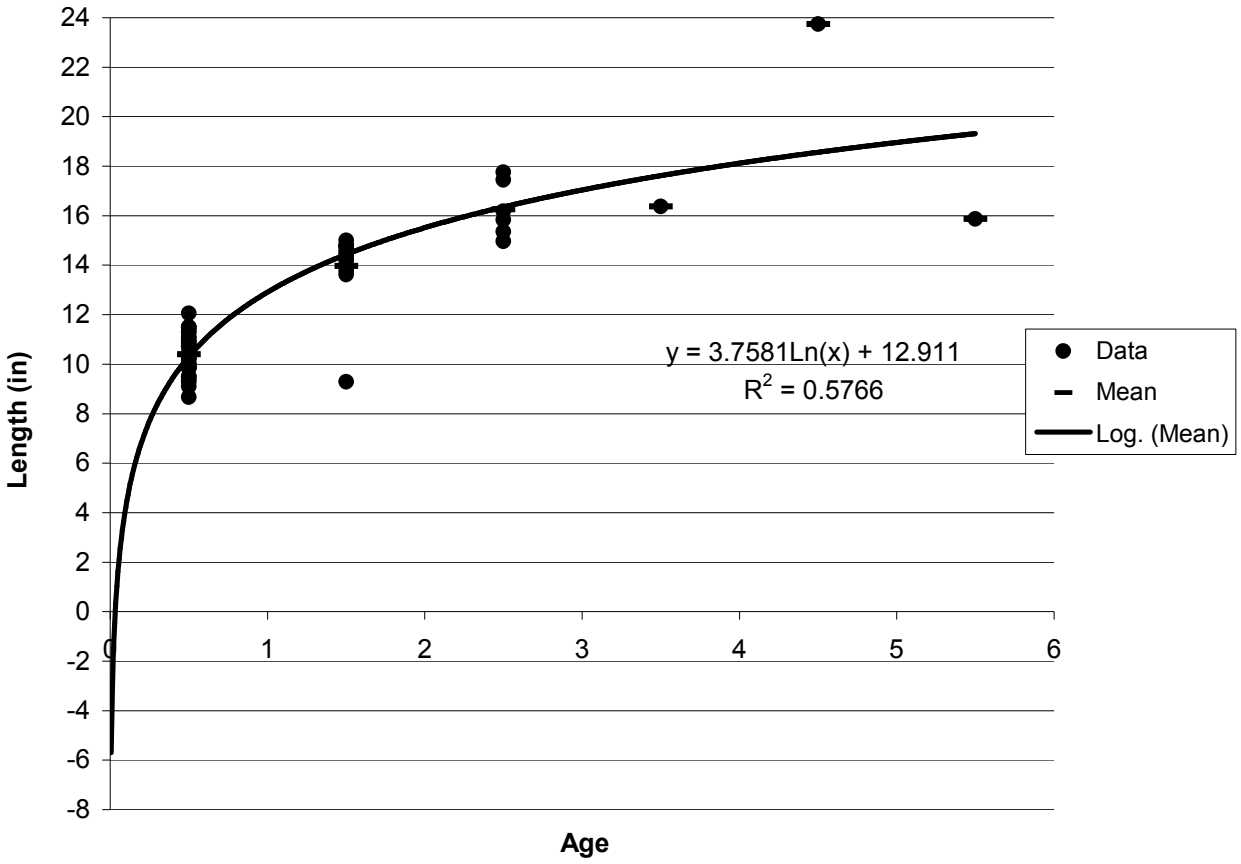

Figure 18. 2008 Length at age data for walleye collected from Lake Murray by fall gillnetting. N = 55