

**Bitter Lake, South Dakota
Summer and Winter Angler Use and Harvest Surveys
December 2006 – August 2013**

by

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Progress Report

Job Number----- 2109

Date----- March 2014

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Preface

Information in this report was collected between December 2006 and August 2013. Funding for this project was provided by Federal Aid in Sport Fish Restoration, (D-J) Project F-21-R, Job number 2109. Copies of this report and reference to the data can be made with written permission of the author or Director of the Division of Wildlife, South Dakota Department of Game, Fish and Parks, 523 East Capitol, Pierre, South Dakota, 57501.

The authors would like to acknowledge the interns that assisted with the collection and processing of the data.



Executive Summary

- Angling pressure was low to moderate during the summer and winter surveys between December 2006 and March 2011 when catch rates for Walleye and Yellow Perch were low to moderate. Increased catch rates for Walleye and Yellow Perch from May 2011 to August 2013 resulted in substantial increases in angling pressure during summer and winter surveys.
- Nonresident anglers comprised a moderate proportion of total anglers surveyed during both summer and winter. Most summer anglers were fishing from boats and the proportion of winter anglers fishing from shacks was variable.
- Walleye was the most targeted species during the summer. Angler preference for target species during the winter surveys varied with Northern Pike, Walleye and Yellow Perch being frequently targeted.
- The summer angler catch and harvest was dominated by Walleye. Northern Pike and Yellow Perch were periodic components of summer angler catch and harvest. Winter angler catch and harvest was variable. The winter angler catch was comprised of Northern Pike, Walleye and Yellow Perch. However, from 2010-2011 to 2012-2013 a substantial increase in catch and harvest of Northern Pike, Walleye and Yellow Perch occurred.
- Summer angler satisfaction corresponded to catch and harvest rates of Walleye. Winter angler satisfaction is most likely tied to catch and harvest rates for Walleye and Yellow Perch, although the winter of 2011-2012 may be an exception. During the winter of 2011-2012, high catch and harvest rates and good winter access resulted in high angling pressure while angler satisfaction was lower than other winters surveyed.
- During the summer of 2012 most anglers indicated they were satisfied with the size, number and species of fish caught.
- Anglers indicated a diversity of factors that are important to consider a fishing trip successful. Both summer and winter anglers cited 'catching fish' most frequently. 'Harvesting fish', 'participating' and 'relaxation' were also frequently cited by summer and winter anglers. 'Being with friends' and 'other' were infrequently cited by anglers.
- Both summer and winter anglers indicated strong support for the special panfish regulation in place in northeast South Dakota. Few anglers were opposed to the regulation.
- During the summer of 2012 anglers indicated strong support for expanding Northern Pike spearing through the ice statewide.

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**Bitter Lake, South Dakota
Angler Use and Harvest Survey
December 2006 – August 2013**

Bitter Lake has become one of the most important sport fisheries in northeast South Dakota despite being a relatively new fishery. Increased precipitation since the mid-1990's has increased the overall size and depth of Bitter Lake enabling it to maintain a sport fishery. South Dakota Game, Fish and Parks began stocking fish in 1997 and most recently Walleye have been stocked when deemed necessary. Walleye, Yellow Perch and Northern Pike are the primary species sought by anglers.

Currently, a 381-mm (15-inch) minimum length regulation for Walleye is enforced on Bitter Lake. The panfish daily limit was changed from 10 to the statewide limit of 15 in 2011. A fish consumption advisory exists for Walleye of all sizes and Northern Pike over 762-mm (30-inches) due to elevated levels of mercury.

Bitter Lake was last surveyed for angler use and harvest information during the summers of 2005 and 2006 and winters of 2004-2005 and 2005-2006. Information concerning angler use and harvest is important in the ongoing fisheries management of Bitter Lake. This report summarizes summer and winter angler use and harvest surveys that were completed from December 2006 through August 2013.

Study Site

Bitter Lake is a large meandered lake (approximately 6,075 hectares; 15,000 acres) located in Day County on the south edge of the town of Waubay. The maximum depth of the lake basin is 9.8 meters (32 feet). Large tracts of public land are present at Bitter Lake though most is difficult to access or is completely submerged due to the elevated water level. Public access is available at two state boat ramps (one each on the west and east shore), a private boat ramp and access area on the northeast shoreline, and several public roads running into or along the lake shore.

Methods

A roving angler use and harvest survey with two-stage stratification was completed during the summers (May – August) of 2007, 2008, 2009, 2010, 2011 and 2013, and the winters (December – March) of 2006-2007, 2007-2008, 2008-2009, 2009-2010 and 2010-2011. The first stratification unit was between weekdays and weekend days. The second stratification unit was for the time periods that the clerk was present. Because weekends typically receive increased fishing pressure most weekend days are represented in the survey. Time periods were randomly assigned to available days with weekdays and weekend/holiday days being treated separately when time periods were assigned.

The survey utilized instantaneous angler counts combined with angler interviews. Instantaneous angler counts provided fishing pressure estimates and angler interviews provided information necessary for estimating fish species catch rates, mean angler trip length, and mean party size. Two instantaneous counts of the total number of boats/shacks and all shoreline/open anglers present were made each

surveyed day. When counts were not being made, anglers were contacted and interviewed. Angler use and harvest estimates were calculated using Creel Application Software (CAS; Soupier and Brown 2002).

Additional questions asked during interviews were used to obtain angler primary residence, fish species targeted, and angler opinions. Total length (TL; mm) measurements from angler caught fish were recorded during the interview process.

The potential economic value of the Bitter Lake fishery was estimated by multiplying a daily expenditure of \$50 (U.S. Department of Interior, Fish and Wildlife Service, U.S. Department of Commerce, Bureau of Census 2011) by the estimated number of angler days.

Results and Discussion

Fishing Pressure

The proportion of anglers indicating no preference for a target species during the summer ranged from 0% (2008 and 2010) to 4% (2012; Table 1). Of those anglers that indicated a preference their primary target species was Walleye. The proportion of anglers targeting Walleye was very high exceeding 94% for all summers surveyed (Table 1). Northern Pike and Yellow Perch were targeted by few anglers during the summer (Table 1).

A low proportion of anglers interviewed during the winter indicated no preference for target species; the percent of anglers indicating no preference ranged from 11% (2010-2011) to 23% (2009-2010; Table 2). Of those anglers that indicated a preference, the primary target species varied. Northern Pike and Walleye were more heavily targeted during the first three winters surveyed and Yellow Perch became more important in the last four winters. The proportion of anglers targeting Northern Pike ranged from a high of 35% (2006-2007) down to 2% (2009-2010 and 2012-2013; Table 2). The proportion of anglers targeting Walleye ranged from a high of 40% (2007-2008) down to 9% (2010-2011; Table 2). Increased Yellow Perch catch and harvest rates attracted many anglers and resulted in a shift in angler preference during the last four winters surveyed. The proportion of anglers targeting Yellow Perch ranged from a low of 17% (2008-2009) up to 79% (2010-2011; Table 2).

Summer angling pressure ranged from 23,012 (2010) to 136,989 angler hours (2012; Table 3) for each summer period. The substantial increase in angler hours observed from 2010 to 2012 corresponded to increased catch and harvest rates for Walleye. Mean party size ranged from 2.00 (2010) to 2.47 (2012; Table 3) anglers. The mean trip length ranged from 4.17 (2010) to 5.05 hours (2012; Table 3). Most angler hours were attributed to anglers fishing from boats with proportions ranging from 94% (2007) to 99% (2009; Table 3) for all surveyed summers.

Winter angling pressure varied substantially ranging from 6,334 (2008-2009) to 93,432 angler hours (2012-2013; Table 4) for each winter period. The substantial increase in angling pressure from the winter of 2009-2010 to 2011-2012 corresponds to an increase in Yellow Perch catch and harvest rates. Mean party size ranged from 1.67 (2007-2008) to 2.78 anglers (2009-2010; Table 4) and mean trip length ranged from 3.28 (2008-2009) to 5.34 hours (2012-2013; Table 4). Angler hours attributed to anglers fishing from ice shacks ranged from 46% (2008-2009) to 85% (2012-2013; Table 4) and likely varied with winter weather conditions.

Angler Demographics

South Dakota residents comprised a moderate to high proportion of the anglers fishing Bitter Lake during the summer with overall percentages ranging from 63% (2012 and 2013) to 76% (2010; Table 5). Most nonresident anglers fishing Bitter Lake during the summer were from Iowa, Minnesota, Nebraska and North Dakota (Table 5). Home residence of winter anglers was similar to summer with overall proportion ranging from 58% (2012-2013) to 94% (2010-2011; Table 6). Most nonresident anglers fishing Bitter Lake during the winter were from Minnesota, Iowa and Nebraska (Table 6).

Angler Catch and Harvest

Northern Pike

Summer anglers had poor to fair success catching Northern Pike. Overall catch rates ranged from 0.01 (2009) to 0.23 Northern Pike per hour (2013; Table 7). The estimated number of Northern Pike caught each summer ranged from 388 (2009) to 24,726 (2012; Table 9). A low proportion of Northern Pike caught were harvested with overall harvest rates ranging from <0.01 (2009) to 0.03 Northern Pike per hour (2007 and 2012; Table 7). The estimated number of Northern Pike harvested each summer ranged from 78 (2009) to 4,088 (2012; Table 9).

Length frequency analysis indicated a decrease in the mean total length of harvested Northern Pike over the duration of the summer surveys. The mean total length of harvested Northern Pike decreased from a high of 736 mm (29.0 inches) in 2009 to 578 mm (22.8 inches; Figure 1) in 2010. The decrease in mean total length corresponds to increased catch rates and is likely related to increased abundance of small Northern Pike recruiting to the angler catch.

Winter anglers also had poor to fair success catching Northern Pike. Overall catch rates ranged from 0.02 (2008-2009) to 0.15 Northern Pike per hour (2006-2007; Table 8). The estimated number of Northern Pike caught each winter ranged from 127 (2008-2009) to 7,201 (2012-2013; Table 10). A high proportion of Northern Pike caught by anglers were harvested with overall harvest rates ranging from 0.02 (2008-2009 and 2010-2011) to 0.14 Northern Pike per hour (2006-2007; Table 8). The estimated number of Northern Pike harvested ranged from 109 (2008-2009) to 3,583 (2012-2013; Table 10).

Length frequency analysis indicated a trend similar to that observed during the summer surveys. A decrease in mean total length of harvested Northern Pike was observed from 763 mm (30.0 inches) in 2008-2009 to 466 mm (18.3 inches; Figure 2) in 2009-2010. During the last four winters surveyed the mean total length of harvested Northern Pike remained lower than was observed during the first three winters. This corresponds to the trend observed during the summer surveys and is likely the result of increased recruitment and abundance of Northern Pike in Bitter Lake from 2009 to 2013 (Kaufman et al. 2013).

Walleye

Summer anglers had good to excellent success catching Walleye. Overall catch rates ranged from 0.27 (2009) to 1.39 Walleye per hour (2013; Table 7). The estimated number of Walleye caught during the summers ranged from 6,726 (2009) to 144,622 (2013; Table 9). A moderate proportion of Walleye caught by anglers were harvested with overall harvest rates ranging from 0.16 (2009 and 2010)

to 0.44 Walleye per hour (2012; Table 7). The estimated number of Walleye harvested each summer ranged from 3,557 (2010) to 60,855 (2012; Table 9).

Length frequency analysis indicated a relatively consistent size structure of Walleye harvested from Bitter Lake during the summer surveys. The mean total length of harvested Walleye ranged from 448 mm (17.6 inches, 2008) to 471 mm (18.5 inches, 2013; Figure 3) for all summers.

Angler success at capturing Walleye varied substantially among winters surveyed. Overall catch rates ranged from 0.05 (2006-2007) to 0.98 Walleye per hour (2008-2009 and 2012-2013; Table 8). The estimated total catch of Walleye each winter ranged 484 (2006-2007) to 91,652 (2012-2013; Table 10). Low to moderate proportions of Walleye caught by anglers were harvested with overall harvest rates ranging from 0.01 (2006-2007) to 0.59 Walleye per hour (2008-2009; Table 8). The estimated number of Walleye harvested during the winters ranged from 118 (2006-2007) to 5,246 (2011-2012; Table 10).

Length frequency analysis indicated more variation in the size structure of Walleye harvested during the winter surveys when compared to the summer surveys. The mean total length of Walleye harvested during the winters ranged from 435 mm (17.1 inches, 2011-2012) to 507 mm (20.0 inches, 2009-2010; Figure 4). This variation may be due to smaller sample size of harvested Walleye during the winter surveys when compared to the summer surveys.

White Bass

White Bass have recently become a notable component of angler catch in Bitter Lake. The overall catch rates for White Bass remained low during summer surveys from 2007-2010 (≤ 0.2 White Bass per hour; Table 7). Catch rates increased in 2012 and 2013 to 0.6 and 0.5 White Bass per hour, respectively (Table 7). The estimated total catch of White Bass ranged from 197 (2010) to 8,383 (2012; Table 9). Overall harvest rates for White Bass were low and the number harvested ranged from 0 (2007 and 2010) to 1,040 (2012; Table 9). White Bass were harvested infrequently during the summer survey precluding length frequency analysis. Few White Bass were caught during the winter survey precluding analysis.

Yellow Perch

Summer anglers had infrequent success catching Yellow Perch. Overall catch rates were low for all summers except 2012. The estimated number of Yellow Perch caught each summer ranged from 0 (2008 and 2009) to 17,468 (2012; Table 9). Harvest rates were high when anglers caught Yellow Perch. The estimated total harvest of Yellow Perch ranged from 0 (2008 and 2009) to 13,212 (2012; Table 9). Yellow Perch harvest was infrequent during the summer periods precluding length frequency analysis.

Winter anglers had variable success catching Yellow Perch. Overall catch rates ranged from 0.01 (2008-2009) to 2.14 Yellow Perch per hour (2010-2011; Table 8). The estimated number of Yellow Perch caught during the winters ranged from 43 (2008-2009) to 100,097 (2011-2012; Table 10). A high proportion of Yellow Perch caught by anglers were harvested with the overall harvest rates ranging from 0.1 (2008-2009) to 1.21 Yellow Perch per hour (2010-2011; Table 8). The total estimated harvest of Yellow Perch during the winter surveys ranged from 43 (2008-2009) to 85,481 (2011-2012; Table 10).

Length frequency analysis indicated that anglers are harvesting large Yellow Perch. The mean total length of harvested Yellow Perch ranged from 262 mm (10.3 inches, 2011-2012) to 306 mm (12.0 inches, 2008-2009; Figure 5) for all winter periods. Mean total length decreased from the winter of 2008-2009 to 2009-2010 and remained lower through 2012-2013. Decreased size structure coupled with increased catch rates of Yellow Perch during the last four winters surveyed indicated increased recruitment of new year-classes to the angler catch.

Other species

Other species caught in low numbers during the summer and winter angler surveys at Bitter Lake include: Black Crappie, Common Carp and Smallmouth Bass.

Angler Opinions

Angler Satisfaction

During the summers of 2007-2010 and 2012-2013 and the winters of 2006-2007, 2009-2010, 2010-2011, 2011-2012 and 2012-2013 anglers were asked to quantify angling satisfaction considering all factors. The question was changed after the summer of 2008 to include moderately satisfied and moderately dissatisfied. Overall summer angler satisfaction ranged from 51% (2010) to 90% (2012; Table 11) of interviewed anglers. Angler dissatisfaction ranged from 4% (2013) to 36% (2009; Table 11) of interviewed anglers. High angler satisfaction during 2008, 2012 and 2013 corresponds to the high harvest rates and high catch rates for Walleye. Conversely, the high angler dissatisfaction in 2009 and 2010 correspond to the lowest catch rates for Walleye during the summer surveys.

Overall winter angler satisfaction ranged from 58% (2011-2012) to 75% (2010-2011; Table 12) of interviewed anglers. Angler dissatisfaction ranged from 11% (2010-2011) to 25% (2011-2012; Table 12) of interviewed anglers. High angler satisfaction during the winter of 2010-2011 corresponds to the highest observed catch rate for Yellow Perch and the second lowest catch rate for Walleye during the winter surveys. The highest angler dissatisfaction during the winter of 2011-2012 does not correspond to poor catch rates as the Walleye and Yellow Perch catch rates were the second highest observed during this survey. In addition, access was unlimited much of the winter resulting in increased angler hours. Good access and high catch rates typically result in high angler satisfaction which is why the results from the winter of 2011-2012 are difficult to explain.

During the summer of 2012 anglers were asked to quantify angling satisfaction considering size, number and species of fish caught. Most anglers (79%; Table 13) indicated they were satisfied with the fish they caught. A low proportion of anglers (13%; Table 13) indicated they were not satisfied with their catch.

Angling Trip Success

During the summers of 2007, 2008, 2010 and 2013 and the winters of 2006-2007 and 2010-2011, 2011-2012 and 2012-2013 anglers were asked what the most important factor was to consider a fishing trip successful. Anglers interviewed in the summer surveys most frequently indicated that 'catching fish' (ranging from 27% in 2010 to 47% in 2008; Table 14) was the most important factor. Moderate proportions of anglers indicated 'harvesting fish', 'relaxation' and 'participating' as the most important factor. 'Being with friends' and 'other' were cited infrequently.

Winter anglers cited ‘catching fish’ (with 27% in 2006-2007 and 51% in 2010-2011) and ‘participating’ (with 21% in 2010-2011 and 40% in 2006-2007; Table 15) as the most important factors. ‘Relaxation’ and ‘harvesting fish’ were moderately cited. ‘Being with friends’ and ‘other’ were rarely cited by winter anglers.

Northeast South Dakota Panfish Regulation

During the summer of 2009 and winter of 2009-2010 anglers fishing Bitter Lake were asked whether they were in favor of or oppose the special panfish regulation in northeast South Dakota. Most anglers (68% in 2009 and 89% in 2009-2010; Table 16) indicated they were in favor of the special regulation. Few anglers (2% in 2009 and 4% in 2009-2010; Table 16) indicated they were opposed to the regulation.

Northern Pike Spearing

During the summer of 2012 anglers were asked whether they were in favor or against allowing for northern pike spearing through the ice statewide. Most anglers (64%; Table 17) indicated they were in favor of statewide Northern Pike spearing through the ice. A low proportion (10%; Table 17) of anglers were opposed to statewide Northern Pike spearing.

Table 1. Angler primary target species (percentage) by month and overall for anglers fishing Bitter Lake, South Dakota during the summers of 2007-2010 and 2012-2013. *May 2013 includes only May 15-31. ANY=anything, NOP= Northern Pike, WAE=Walleye, YEP=Yellow Perch.

Year	Month	Percent (%) of anglers			
		ANY	NOP	WAE	YEP
2007	May	0.0	15.8	84.2	0.0
	June	2.3	4.6	93.1	0.0
	July	1.0	0.0	99.0	0.0
	August	0.0	1.3	98.8	0.0
	Overall	1.0	2.8	96.2	0.0
2008	May	0.0	1.3	98.7	0.0
	June	0.0	0.0	100.0	0.0
	July	0.0	0.0	100.0	0.0
	August	0.0	0.0	97.3	2.7
	Overall	0.0	0.3	99.2	0.6
2009	May	0.0	0.0	100.0	0.0
	June	2.1	1.0	96.9	0.0
	July	2.6	0.0	97.4	0.0
	August	0.0	0.0	100.0	0.0
	Overall	1.5	0.5	98.0	0.0
2010	May	0.0	0.0	100.0	0.0
	June	0.0	0.0	100.0	0.0
	July	0.0	0.0	100.0	0.0
	August	0.0	0.0	100.0	0.0
	Overall	0.0	0.0	100.0	0.0

Table 1. Continued.

Year	Month	Percent (%) of anglers			
		ANY	NOP	WAE	YEP
2012	May	8.9	3.6	87.5	0.0
	June	2.8	0.0	95.8	0.0
	July	4.7	1.2	94.1	0.0
	August	1.3	0.0	98.7	0.0
	Overall	4.1	1.0	94.5	0.0
2013	*May	7.7	0.0	89.4	0.0
	June	0.0	1.5	98.5	0.0
	July	0.0	0.0	100.0	0.0
	August	2.6	0.0	97.4	0.0
	Overall	2.1	0.5	96.9	0.0

Table 2. Angler primary target species (percentage) by month and overall for anglers fishing Bitter Lake, South Dakota during the winters of 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012 and 2012-2013. ANY=anything, NOP=Northern Pike, WAE=Walleye, YEP=Yellow Perch.

Year	Month	Percent (%) of anglers			
		ANY	NOP	WAE	YEP
2006-2007	December	5.6	33.3	38.9	22.2
	January	13.3	25.3	10.7	50.1
	February	3.9	50.0	15.4	30.8
	March	15.9	43.2	6.8	34.1
	Overall	11.7	35.0	13.5	39.9
2007-2008	December	9.1	13.6	50.0	27.3
	January	13.1	8.3	65.5	13.1
	February	16.7	21.2	31.8	30.3
	March	10.6	44.7	2.1	42.6
	Overall	13.2	20.6	40.2	26.0
2008-2009	December	23.3	13.3	40.0	23.3
	January	15.0	65.0	10.0	10.0
	February	28.6	9.5	42.9	19.1
	March	20.0	20.0	50.0	10.0
	Overall	22.2	25.9	34.6	17.3
2009-2010	December	0.0	0.0	57.1	42.9
	January	27.3	3.0	18.2	51.2
	February	0	0	100	0
	March	0.0	33.3	50.0	16.7
	Overall	22.5	5.0	25.0	47.5
2010-2011	December	9.5	0.0	10.8	79.7
	January	36.4	0	9.1	54.6
	February	0.0	0.0	0.0	100.0
	March	0.0	13.3	0.0	86.7
	Overall	10.6	1.9	8.7	78.9

Table 2. Continued.

Year	Month	Percent (%) of anglers			
		ANY	NOP	WAE	YEP
2011-2012	December	18.7	1.3	22.7	57.3
	January	8.9	1.6	16.1	73.4
	February	12.2	4.4	13.9	69.6
	March	6.9	6.9	13.8	72.4
	Overall	12.0	2.9	16.6	68.5
2012-2013	December	27.3	0.0	25.5	47.3
	January	14.9	0.6	14.9	69.6
	February	20.2	2.3	10.1	67.4
	March	15.8	10.5	10.5	63.2
	Overall	18.4	2.0	14.9	64.7

Table 3. Angler demographics by month and overall including; the number of interviews, estimated angler hours, estimated angler days, estimated economic value (Eco value; \$), estimated trip length (h), average party size, percent (% SD) of interviewed anglers that were South Dakota residents, and percent (% Boat) of angler hours attributed to angling from a boat at Bitter Lake, South Dakota during the summers of 2007-2010 and 2012-2013. *May 2013 includes only May 15-31. One standard error is provided in parentheses when calculated.

Year	Month	# interviews	Angler hours	Angler days	Eco value (\$)	Trip length (hr)	Party size	% SD	% Boat or Shack
2007	May	20	5,710 (1,335)	1,218	60,874	4.69 (---)	2.60 (0.25)	63.2	70.6
	June	86	11,574 (3,319)	2,200	110,019	5.26 (---)	2.47 (0.15)	64.0	98.9
	July	104	9,863 (2,387)	2,163	108,147	4.56 (---)	2.13 (0.17)	72.1	98.8
	August	80	6,222 (1,713)	1,294	64,678	4.81 (---)	2.19 (0.18)	57.5	98.1
	Overall	290	33,369 (4,629)	6,880	344,010	4.85 (---)	2.30 (0.09)	65.1	93.9
2008	May	79	18,661 (5,115)	3,778	188,877	4.94 (0.78)	2.37 (0.61)	78.2	94.9
	June	117	17,232 (5,212)	3,714	185,690	4.64 (1.19)	2.37 (0.60)	71.8	98.4
	July	84	10,421 (4,250)	2,270	113,519	4.59 (---)	2.24 (---)	69.9	99.8
	August	73	6,155 (1,866)	1,288	64,383	4.78 (---)	2.31 (---)	83.8	100.0
	Overall	353	52,469 (8,653)	11,069	553,471	4.74 (0.35)	2.32 (0.21)	75.3	97.6
2009	May	40	6,762 (1,733)	1,421	71,029	4.76 (---)	2.07 (0.05)	87.5	95.8
	June	97	20,897 (8,034)	3,705	185,257	5.64 (---)	2.09 (0.44)	68.0	100.0
	July	39	7,473 (989)	1,763	88,125	4.24 (---)	2.39 (---)	71.8	100.0
	August	23	5,199 (1,019)	996	49,799	5.22 (---)	2.41 (---)	69.6	100.0
	Overall	199	40,331 (8,340)	8,131	406,562	4.96 (---)	2.24 (0.11)	72.9	99.3

Table 3. Continued.

Year	Month	# interviews	Angler hours	Angler days	Eco value (\$)	Trip length (hr)	Party size	% SD	% Boat or Shack
2010	May	16	3,652 (1,146)	1,017	50,864	3.59 (---)	1.78 (---)	93.8	85.4
	June	27	12,349 (6,310)	2,781	139,065	4.44 (---)	2.14 (---)	77.8	100.0
	July	26	4,542 (1,528)	1,039	51,968	4.37 (---)	2.16 (---)	57.7	100.0
	August	9	2,469 (1,347)	578	28,911	4.27 (---)	1.91 (---)	88.9	100.0
	Overall	78	23,012 (6,729)	5,519	275,923	4.17 (---)	2.00 (---)	75.6	97.7
2012	May	60	20,352 (9,061)	4,493	224,636	4.53 (0.73)	2.34 (1.07)	72.7	90.0
	June	72	24,184 (7,091)	5,102	255,106	4.74 (---)	2.49 (0.09)	55.6	97.8
	July	85	32,317 (8,906)	6,476	323,818	4.99 (---)	2.40 (---)	65.5	99.2
	August	79	60,135 (7,991)	10,175	508,756	5.91 (---)	2.66 (---)	59.7	99.5
	Overall	296	136,989 (16,599)	27,127	1,356,326	5.05 (0.18)	2.47 (0.27)	62.5	97.7
2013	*May	39	17,979 (6,986)	3,943	197,138	4.56 (0.87)	2.35 (0.57)	69.2	96.2
	June	67	36,882 (13,190)	7,881	394,039	4.68 (---)	2.55 (0.12)	59.7	97.4
	July	47	35,286 (14,739)	7,444	372,215	4.74 (---)	2.32 (0.84)	61.7	98.0
	August	39	14,305 (3,051)	2,816	140,797	5.08 (1.67)	2.06 (0.56)	61.5	95.3
	Overall	192	104,452 (21,197)	21,898	1,094,885	4.77 (0.47)	2.32 (0.29)	62.5	97.1

Table 4. Overall angler demographics including; the number of interviews, estimated angler hours, estimated angler days, estimated economic value (Eco value; \$), estimated trip length (h), average party size, percent (% SD) of interviewed anglers that were South Dakota residents, and percent (% Boat) of angler hours attributed to angling from a boat at Bitter Lake, South Dakota during the winters of 2006-2007, 2007-2008, 2008-2009, 2009-2010 and 2010-2011. One standard error is provided in parentheses when calculated.

Year	Month	# interviews	Angler hours	Angler days	Eco value (\$)	Trip length (hr)	Party size	% SD	% Boat or Shack
2006-2007	December	18	1,057 (267)	181	9,065	5.83 (---)	1.56 (0.66)	66.7	44.9
	January	75	3,447 (828)	679	33,927	5.08 (0.55)	1.75 (1.50)	78.7	69.6
	February	26	1,135 (289)	-----	-----	-----	1.65 (1.01)	53.9	44.6
	March	44	3,294 (1,136)	750	37,517	4.39 (---)	1.73 (0.80)	61.4	27.1
	Overall	163	8,932 (1,460)	1,776	88,787	5.03 (0.20)	1.68 (0.52)	68.7	47.8
2007-2008	December	22	973 (478)	283	14,142	3.44 (1.04)	1.90 (0.08)	95.5	73.6
	January	84	6,474 (1,843)	1,893	94,649	3.42 (1.64)	1.75 (0.93)	89.3	71.9
	February	66	2,793 (1,083)	726	36,273	3.85 (1.14)	1.49 (1.45)	74.2	60.1
	March	47	1,973 (468)	320	15,989	6.17 (0.89)	1.51 (0.44)	51.1	49.6
	Overall	219	12,212 (2,240)	2,769	138,458	4.41 (0.68)	1.67 (0.43)	77.2	65.7
2008-2009	December	30	836 (448)	244	12,187	3.43 (1.37)	1.82 (1.17)	93.3	46.9
	January	20	1,478 (489)	508	25,395	2.91 (---)	1.63 (0.43)	70.0	68.7
	February	21	1,746 (352)	520	25,982	3.36 (---)	1.90 (1.19)	81.0	59.5
	March	10	2,274 (891)	650	32,486	3.50 (---)	2.65 (0.00)	60.0	19.4
	Overall	81	6,334 (1,165)	1,931	96,555	3.28 (0.38)	2.00 (0.42)	80.3	45.6

Table 4. Continued.

Year	Month	# interviews	Angler hours	Angler days	Eco value (\$)	Trip length (hr)	Party size	% SD	% Boat or Shack
2009-2010	December	7	257 (163)	85	4,269	3.01 (---)	1.57 (---)	85.7	32.7
	January	66	4,146 (2,150)	884	44,200	4.69 (3.41)	1.54 (0.98)	93.9	64.2
	February	1	1,133 (542)	-----	-----	-----	9.00 (---)	0.0	30.2
	March	6	430 (338)	132	6,575	3.27 (---)	1.41 (---)	66.7	16.7
	Overall	80	5,966 (2,249)	1,578	78,915	3.78 (1.51)	2.78 (0.27)	90.0	53.0
2010-2011	December	74	4,970 (2,291)	1,412	70,597	3.52 (2.16)	2.01 (1.39)	98.6	84.9
	January	11	1,087 (355)	212	10,615	5.12 (---)	1.56 (0.16)	100.0	97.7
	February	4	1,887 (212)	240	12,019	7.85 (---)	2.50 (---)	100.0	92.1
	March	15	2,056 (651)	366	18,292	5.62 (0.53)	1.97 (0.59)	66.7	25.6
	Overall	104	10,000 (2,417)	1,992	99,602	5.02 (0.68)	1.90 (0.46)	94.2	75.4
2011-2012	December	75	16,792 (3,885)	3,979	198,957	4.22 (3.06)	1.72 (1.75)	74.7	72.1
	January	124	44,161 (11,294)	9,538	476,901	4.63 (1.22)	1.97 (0.59)	62.1	87.4
	February	115	23,372 (3,173)	4,486	224,299	5.21 (2.46)	2.09 (0.93)	68.4	81.0
	March	29	7,581 (4,342)	1,688	84,421	4.49 (0.64)	1.76 (0.93)	44.8	70.3
	Overall	343	91,906 (13,098)	19,893	994,654	4.62 (1.03)	1.88 (0.57)	65.5	81.6
2012-2013	December	55	15,217 (8,049)	2,904	145,200	5.24 (---)	1.70 (0.89)	61.1	84.8
	January	160	49,368 (10,524)	9,854	492,695	5.01 (2.55)	1.98 (0.97)	67.5	85.2
	February	89	15,019 (4,861)	2,672	133,621	5.62 (3.67)	1.87 (1.31)	44.9	91.7
	March	38	13,829 (5,523)	2,510	125,490	5.51 (0.72)	2.29 (1.15)	44.7	76.1
	Overall	342	93,432 (15,155)	17,497	874,832	5.34 (1.09)	1.96 (0.54)	58.0	84.9

Table 5. State residence (percentage) of anglers fishing Bitter Lake, South Dakota during the summers of 2007-2010 and 2012-2013.

	Percent (%) of anglers					
State	2007	2008	2009	2010	2012	2013
South Dakota	65.1	75.3	72.9	75.6	62.5	62.5
Arizona	0.0	0.3	0.0	0.0	0.0	0.5
Colorado	0.4	0.0	0.5	0.0	0.0	0.0
Indiana	1.0	0.0	0.0	0.0	0.4	0.0
Illinois	0.4	0.0	0.0	0.0	0.0	0.0
Iowa	9.3	7.7	5.5	6.4	9.4	7.3
Kansas	0.4	0.3	0.0	0.0	0.4	0.5
Michigan	0.0	0.0	0.0	1.3	0.0	0.0
Minnesota	18.3	13.1	17.6	15.4	18.8	22.9
Nebraska	1.4	1.7	0.5	0.0	2.9	2.1
North Dakota	2.8	1.1	1.0	1.3	5.1	3.1
Massachusetts	0.0	0.0	0.5	0.0	0.0	0.0
Wisconsin	1.0	0.6	0.0	0.0	0.4	1.0
Missouri	0.0	0.0	0.5	0.0	0.0	0.0
Montana	0.0	0.0	0.5	0.0	0.0	0.0
Wyoming	0.0	0.0	0.5	0.0	0.4	0.0

Table 6. State residence (percentage) of anglers fishing Bitter Lake, South Dakota during the winters of 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012 and 2012-2013.

Percent (%) of anglers							
State	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013
South Dakota	68.7	77.2	80.3	90.0	94.2	65.5	58.0
Iowa	4.3	0.0	0.0	0.0	1.0	11.1	12.1
Minnesota	22.1	20.1	14.8	8.8	3.9	15.5	20.4
Nebraska	2.5	2.3	2.5	0.0	0.0	5.6	6.5
North Dakota	0.0	0.5	1.2	0.0	1.0	0.3	1.2
Wisconsin	1.2	0.0	1.2	0.0	1.0	1.5	1.8
Missouri	0.6	0.0	0.0	0.0	0.0	0.0	0.0
Colorado	0.0	0.0	0.0	1.3	0.0	0.3	0.0
Kansas	0.0	0.0	0.0	0.0	0.0	0.3	0.0

Table 7. Estimated monthly and overall catch rate per hour fished (C/h) and harvest rate per hour fished (H/h) for Northern Pike (NOP), Walleye (WAE), White Bass (WHB) and Yellow Perch (YEP) at Bitter Lake, South Dakota during the summers of 2007-2010 and 2012-2013. *May 2013 includes only May 15-31. One standard error is provided in parentheses when calculated.

Year	Month	NOP		WAE		WHB		YEP	
		C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
2007	May	0.25 (0.16)	0.14 (0.07)	0.20 (0.17)	0.06 (0.02)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
	June	0.04 (0.04)	0.01 (0.01)	1.08 (0.79)	0.20 (0.12)	0.01 (0.01)	0.00 (0.00)	<0.01 (<0.01)	0.00 (0.00)
	July	0.02 (0.01)	0.01 (0.01)	1.36 (0.69)	0.26 (0.14)	0.01 (0.01)	0.00 (0.00)	<0.01 (<0.01)	<0.01 (<0.01)
	August	0.01 (0.01)	0.01 (<0.01)	0.75 (0.42)	0.25 (0.14)	0.02 (0.02)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
	Overall	0.06 (0.04)	0.03 (0.02)	0.95 (0.33)	0.20 (0.06)	0.01 (<0.01)	0.00 (0.00)	<0.01 (<0.01)	<0.01 (<0.01)
2008	May	0.04 (0.02)	0.02 (0.01)	0.54 (0.30)	0.40 (0.22)	<0.01 (<0.01)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
	June	0.03 (0.02)	0.01 (<0.01)	0.77 (0.53)	0.44 (0.30)	0.03 (0.02)	<0.01 (<0.01)	0.00 (0.00)	0.00 (0.00)
	July	0.01 (0.01)	<0.01 (0.01)	0.59 (0.59)	0.40 (0.40)	0.01 (0.01)	<0.01 (<0.01)	0.00 (0.00)	0.00 (0.00)
	August	0.01 (0.01)	0.00 (0.00)	0.55 (0.39)	0.36 (0.26)	0.02 (0.01)	0.01 (---)	0.00 (0.00)	0.00 (0.00)
	Overall	0.03 (0.01)	0.01 (<0.01)	0.62 (0.24)	0.41 (0.15)	0.02 (0.01)	<0.01 (<0.01)	0.00 (0.00)	0.00 (0.00)
2009	May	0.02 (0.02)	0.01 (0.01)	0.15 (0.14)	0.13 (0.12)	0.01 (0.01)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
	June	0.01 (0.01)	<0.01 (<0.01)	0.24 (0.17)	0.13 (0.10)	0.01 (0.01)	<0.01 (<0.01)	0.00 (0.00)	0.00 (0.00)
	July	0.01 (<0.01)	<0.01 (<0.01)	0.41 (0.11)	0.26 (0.07)	0.01 (0.01)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
	August	0.00 (0.00)	0.00 (0.00)	0.38 (0.19)	0.15 (0.10)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
	Overall	0.01 (<0.01)	<0.01 (<0.01)	0.27 (0.11)	0.16 (0.06)	0.01 (0.01)	<0.01 (<0.01)	0.00 (0.00)	0.00 (0.00)

Table 7. Continued.

Year	Month	NOP		WAE		WHB		YEP	
		C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
2010	May	0.08 (0.03)	0.00 (0.00)	0.16 (0.06)	0.10 (0.03)	0.05 (0.04)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
	June	0.14 (0.11)	0.01 (0.01)	0.20 (0.15)	0.10 (0.07)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
	July	0.09 (0.09)	0.04 (0.04)	0.52 (0.58)	0.27 (0.32)	0.00 (0.00)	0.00 (0.00)	0.01 (<0.01)	0.01 (<0.01)
	August	0.05 (0.06)	0.00 (0.00)	0.55 (0.50)	0.30 (0.29)	0.01 (0.02)	0.00 (0.00)	0.08 (0.07)	0.07 (0.06)
	Overall	0.11 (0.06)	0.01 (0.01)	0.29 (0.14)	0.16 (0.08)	0.01 (0.01)	0.00 (0.00)	0.01 (0.01)	0.01 (0.01)
2012	May	0.33 (0.27)	0.08 (0.06)	0.73 (0.84)	0.40 (0.45)	0.17 (0.21)	0.05 (0.09)	<0.01 (<0.01)	<0.01 (<0.01)
	June	0.18 (0.13)	0.03 (0.02)	0.50 (0.31)	0.41 (0.25)	0.06 (0.03)	<0.01 (<0.01)	0.01 (0.01)	0.01 (0.01)
	July	0.15 (0.08)	0.02 (0.01)	0.96 (0.54)	0.51 (0.29)	0.01 (<0.01)	0.00 (0.00)	0.07 (0.03)	0.05 (0.03)
	August	0.15 (0.04)	0.02 (0.01)	1.41 (0.50)	0.44 (0.15)	0.05 (0.02)	0.00 (0.00)	0.25 (0.09)	0.19 (0.06)
	Overall	0.18 (0.05)	0.03 (0.01)	1.04 (0.29)	0.44 (0.12)	0.06 (0.03)	0.01 (0.01)	0.13 (0.04)	0.10 (0.03)
2013	*May	0.17 (0.15)	0.02 (0.02)	0.79 (0.68)	0.26 (0.21)	0.05 (0.06)	0.01 (<0.01)	0.02 (0.02)	0.01 (0.01)
	June	0.17 (0.23)	<0.01 (<0.01)	0.47 (0.42)	0.16 (0.14)	0.00 (0.00)	0.00 (0.00)	<0.01 (<0.01)	<0.01 (<0.01)
	July	0.38 (0.45)	0.02 (0.02)	2.57 (2.61)	0.44 (0.48)	0.10 (0.06)	0.00 (0.00)	0.02 (0.02)	0.02 (0.02)
	August	0.11 (0.04)	0.01 (0.01)	1.54 (0.46)	0.16 (0.05)	0.08 (0.02)	0.00 (0.00)	0.04 (0.02)	0.02 (0.01)
	Overall	0.23 (0.16)	0.01 (0.01)	1.39 (0.76)	0.27 (0.15)	0.05 (0.02)	<0.01 (<0.01)	0.02 (0.01)	0.01 (0.01)

Table 8. Estimated monthly and overall catch rate per hour fished (C/h) and harvest rate per hour fished (H/h) for Northern Pike (NOP), Walleye (WAE) and Yellow Perch (YEP) at Bitter Lake, South Dakota during the winters of 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012 and 2012-2013. One standard error is provided in parentheses when calculated.

Year	Month	NOP		WAE		YEP	
		C/h	H/h	C/h	H/h	C/h	H/h
2006-2007	December	0.37 (0.31)	0.37 (0.31)	0.15 (0.11)	0.04 (0.02)	0.23 (---)	0.19 (---)
	January	0.10 (0.09)	0.09 (0.09)	0.09 (0.09)	0.02 (0.01)	0.30 (0.17)	0.25 (0.15)
	February	0.27 (0.11)	0.26 (0.08)	0.01 (0.01)	0.01 (0.01)	0.13 (0.08)	0.12 (0.08)
	March	0.09 (0.07)	0.08 (0.05)	0.01 (0.01)	0.00 (0.00)	0.38 (0.26)	0.27 (0.17)
	Overall	0.15 (0.06)	0.14 (0.05)	0.05 (0.03)	0.01 (<0.01)	0.30 (0.11)	0.24 (0.08)
2007-2008	December	<0.01 (<0.01)	<0.01 (<0.01)	0.02 (0.02)	<0.01 (<0.01)	0.13 (0.15)	0.13 (0.15)
	January	0.01 (0.01)	0.01 (0.01)	0.18 (---)	0.12 (---)	0.04 (0.03)	0.03 (0.03)
	February	0.08 (0.06)	0.08 (0.06)	0.11 (0.09)	0.06 (0.06)	0.04 (0.04)	0.04 (0.04)
	March	0.14 (0.05)	0.09 (0.02)	0.05 (0.02)	0.03 (<0.01)	0.21 (---)	0.11 (---)
	Overall	0.05 (0.02)	0.04 (0.01)	0.13 (---)	0.08 (---)	0.07 (0.03)	0.06 (0.02)
2008-2009	December	0.01 (0.03)	0.01 (0.03)	0.22 (0.38)	0.06 (0.10)	0.01 (0.02)	0.01 (0.02)
	January	0.05 (0.01)	0.05 (0.01)	0.02 (0.02)	0.01 (0.01)	0.00 (0.00)	0.00 (0.00)
	February	0.01 (0.03)	0.00 (0.00)	0.23 (0.11)	0.17 (0.12)	0.02 (0.04)	0.02 (0.04)
	March	0.01 (---)	0.01 (---)	2.45 (3.56)	1.50 (2.18)	0.00 (0.00)	0.00 (0.00)
	Overall	0.02 (0.01)	0.02 (0.01)	0.98 (1.25)	0.59 (0.76)	0.01 (0.01)	0.01 (0.01)

Table 8. Continued.

Year	Month	NOP		WAE		YEP	
		C/h	H/h	C/h	H/h	C/h	H/h
2009-2010	December	0.00 (0.00)	0.00 (0.00)	0.18 (---)	0.16 (---)	0.73 (---)	0.47 (---)
	January	0.01 (<0.01)	0.01 (<0.01)	0.32 (0.46)	0.04 (0.05)	0.43 (0.67)	0.21 (0.31)
	February	0.10 (---)	0.10 (---)	0.30 (---)	0.00 (---)	0.50 (---)	0.50 (---)
	March	0.04 (---)	0.04 (---)	0.13 (---)	0.13 (---)	1.26 (---)	1.01 (---)
	Overall	0.03 (0.01)	0.03 (0.01)	0.29 (0.31)	0.04 (0.04)	0.52 (0.51)	0.33 (0.27)
2010-2011	December	0.02 (0.01)	<0.01 (<0.01)	0.04 (0.05)	0.02 (0.02)	1.88 (2.73)	1.26 (1.89)
	January	0.04 (0.02)	0.03 (0.02)	0.10 (0.14)	0.02 (0.03)	1.09 (0.96)	0.58 (0.44)
	February	0.01 (<0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.88 (0.48)	0.58 (0.36)
	March	0.16 (0.17)	0.09 (0.09)	0.16 (0.10)	0.04 (0.03)	4.49 (3.22)	2.02 (1.02)
	Overall	0.05 (0.03)	0.02 (0.02)	0.07 (0.04)	0.02 (0.01)	2.14 (1.54)	1.21 (0.94)
2011-2012	December	0.10 (0.07)	0.07 (---)	0.46 (0.19)	0.18 (0.08)	1.57 (0.97)	1.29 (0.82)
	January	0.01 (0.01)	<0.01 (<0.01)	0.31 (---)	0.04 (---)	1.31 (0.52)	1.14 (0.46)
	February	0.02 (0.01)	0.01 (0.01)	0.28 (0.14)	0.01 (0.01)	0.59 (0.24)	0.49 (0.21)
	March	0.05 (0.06)	0.05 (0.05)	0.09 (0.19)	0.02 (0.01)	0.28 (0.37)	0.23 (0.32)
	Overall	0.03 (0.01)	0.02 (<0.01)	0.31 (0.04)	0.06 (0.01)	1.09 (0.30)	0.93 (0.26)

Table 8. Continued.

Year	Month	NOP		WAE		YEP	
		C/h	H/h	C/h	H/h	C/h	H/h
2012-2013	December	0.11 (0.10)	0.06 (0.06)	1.35 (1.43)	0.07 (0.07)	1.62 (1.29)	1.14 (0.93)
	January	0.06 (0.02)	0.02 (0.01)	1.14 (0.77)	0.02 (0.01)	0.88 (0.33)	0.60 (0.27)
	February	0.04 (0.02)	0.02 (0.01)	0.49 (0.37)	0.01 (<0.01)	0.48 (0.39)	0.30 (0.27)
	March	0.13 (0.11)	0.10 (0.10)	0.55 (0.52)	0.02 (0.01)	0.56 (0.81)	0.24 (0.32)
	Overall	0.08 (0.02)	0.04 (0.02)	0.98 (0.46)	0.02 (0.01)	0.89 (0.29)	0.59 (0.21)

Table 9. Estimated monthly and overall catch and harvest of Northern Pike (NOP), Walleye (WAE), White Bass (WHB), Yellow Perch (YEP) and total at Bitter Lake, South Dakota during summers of 2007-2010 and 2012-2013. *May 2013 includes only May 15-31. One standard error is provided in parentheses when calculated.

Year	Month	NOP		WAE		WHB		YEP		Total	
		C	H	C	H	C	H	C	H	C	H
2007	May	1,401 (1,154)	815 (631)	1,146 (946)	337 (122)	0 (0)	0 (0)	0 (0)	0 (0)	2,600 (1,436)	1,206 (588)
	June	412 (244)	129 (74)	12,505 (4,338)	2,266 (662)	59 (63)	0 (0)	12 (11)	0 (0)	12,988 (4,584)	2,395 (720)
	July	171 (51)	74 (29)	13,377 (3,466)	2,582 (704)	67 (35)	0 (0)	23 (14)	23 (14)	13,638 (3,524)	2,678 (723)
	August	67 (24)	29 (0)	4,693 (1,415)	1,573 (454)	110 (54)	0 (0)	0 (0)	0 (0)	4,870 (1,450)	1,601 (454)
	Overall	2,051 (1,181)	1,046 (636)	31,722 (5,807)	6,758 (1,074)	235 (90)	0 (0)	35 (18)	23 (14)	34,096 (6,132)	7,881 (1,262)
2008	May	737 (184)	285 (121)	10,041 (2,780)	7,478 (1,918)	37 (10)	0 (0)	0 (0)	0 (0)	10,816 (2,950)	7,764 (2,003)
	June	542 (257)	97 (40)	13,191 (4,856)	7,613 (2,659)	460 (166)	63 (26)	0 (0)	0 (0)	14,192 (5,138)	7,773 (2,679)
	July	96 (59)	40 (37)	6,119 (3,047)	4,148 (2,075)	144 (35)	8 (8)	0 (0)	0 (0)	6,358 (3,123)	4,196 (2,088)
	August	36 (29)	0 (0)	3,383 (1,267)	2,202 (835)	135 (61)	61 (42)	0 (0)	0 (0)	3,560 (1,334)	2,263 (853)
	Overall	1,410 (323)	423 (133)	32,733 (6,496)	21,442 (3,969)	776 (180)	131 (50)	0 (0)	0 (0)	34,926 (6,830)	21,995 (4,035)
2009	May	130 (120)	32 (38)	1,042 (550)	858 (505)	75 (56)	0 (0)	0 (0)	0 (0)	1,247 (628)	890 (535)
	June	166 (80)	25 (19)	4,945 (1,936)	2,777 (1,237)	238 (120)	16 (17)	0 (0)	0 (0)	5,398 (2,069)	2,818 (1,257)
	July	93 (35)	21 (18)	3,057 (486)	1,940 (307)	85 (97)	0 (0)	0 (0)	0 (0)	3,235 (520)	1,961 (311)
	August	0 (0)	0 (0)	1,952 (684)	776 (429)	0 (0)	0 (0)	0 (0)	0 (0)	1,952 (684)	776 (429)
	Overall	388 (148)	78 (45)	10,996 (2,181)	6,350 (1,437)	399 (163)	16 (17)	0 (0)	0 (0)	11,831 (2,326)	6,444 (1,465)

Table 9. Continued.

Year	Month	NOP		WAE		WHB		YEP		Total	
		C	H	C	H	C	H	C	H	C	H
2010	May	281 (192)	0 (0)	575 (461)	374 (255)	164 (216)	0 (0)	0 (0)	0 (0)	1,019 (862)	374 (255)
	June	1,675 (893)	110 (108)	2,436 (1,087)	1,207 (594)	0 (0)	0 (0)	0 (0)	0 (0)	4,111 (1,912)	1,316 (693)
	July	424 (361)	163 (179)	2,352 (1,477)	1,243 (859)	0 (0)	0 (0)	28 (23)	28 (23)	2,804 (1,819)	1,434 (1,020)
	August	134 (136)	0 (0)	1,364 (674)	732 (381)	34 (34)	0 (0)	199 (122)	166 (122)	1,731 (836)	898 (476)
	Overall	2,515 (991)	272 (209)	6,726 (2,007)	3,557 (1,141)	197 (219)	0 (0)	227 (124)	194 (124)	9,665 (2,899)	4,023 (1,346)
2012	May	6,742 (2,593)	1,527 (765)	14,802 (10,441)	8,096 (5,468)	3,450 (3,137)	940 (1,376)	72 (64)	72 (64)	25,066 (14,792)	10,635 (7,646)
	June	4,332 (2,025)	796 (323)	12,028 (3,944)	9,800 (3,191)	1,510 (117)	100 (64)	324 (140)	324 (140)	18,195 (5,710)	11,020 (3,523)
	July	4,942 (1,787)	656 (225)	30,998 (9,024)	16,539 (4,852)	237 (189)	0 (0)	2,182 (839)	1,709 (645)	38,416 (11,234)	18,904 (5,440)
	August	8,710 (2,164)	1,109 (284)	84,643 (14,424)	26,449 (4,204)	3,186 (1,255)	0 (0)	14,890 (3,481)	11,108 (2,451)	111,429 (17,357)	38,666 (5,394)
	Overall	24,726 (4,324)	4,088 (907)	142,471 (20,348)	60,885 (9,016)	8,383 (3,386)	1,040 (1,377)	17,468 (3,584)	13,212 (2,539)	193,106 (26,055)	79,224 (11,383)
2013	*May	3,027 (2,214)	318 (235)	14,262 (7,236)	4,625 (1,937)	948 (952)	179 (0)	385 (395)	154 (158)	18,622 (9,828)	5,276 (2,048)
	June	6,196 (3,533)	49 (46)	17,489 (10,453)	5,999 (2,872)	0 (0)	0 (0)	96 (1)	96 (1)	23,780 (13,409)	6,144 (2,959)
	July	13,453 (9,491)	686 (603)	90,837 (49,630)	15,458 (9,445)	3,497 (1,249)	0 (0)	793 (466)	793 (466)	108,626 (59,774)	16,937 (10,196)
	August	1,604 (320)	137 (87)	22,033 (5,948)	2,316 (543)	1,071 (104)	0 (0)	506 (174)	268 (151)	25,215 (6,232)	2,722 (682)
	Overall	24,280 (10,372)	1,191 (654)	144,622 (51,576)	28,399 (10,075)	5,516 (1,574)	179 (0)	1,780 (635)	1,311 (514)	176,243 (62,355)	31,079 (10,834)

Table 10. Estimated monthly and overall catch and harvest Northern Pike (NOP), Walleye (WAE), Yellow Perch (YEP) and total at Bitter Lake, South Dakota during the winters of 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012 and 2012-2013. One standard error is provided in parentheses when calculated.

Year	Month	NOP		WAE		YEP		TOTAL	
		C	H	C	H	C	H	C	H
2006-2007	December	387 (167)	387 (167)	158 (112)	45 (24)	246 (227)	200 (185)	790 (357)	632 (263)
	January	342 (161)	315 (152)	292 (100)	68 (21)	1,049 (236)	875 (208)	1,682 (579)	1,257 (486)
	February	311 (123)	290 (113)	10 (8)	5 (8)	146 (96)	138 (92)	467 (95)	433 (95)
	March	283 (174)	247 (135)	24 (28)	0 (0)	1,235 (587)	895 (406)	1,542 (665)	1,142 (441)
	Overall	1,322 (315)	1,239 (287)	484 (152)	118 (33)	2,676 (679)	2,108 (501)	4,482 (956)	3,464 (713)
2007-2008	December	1 (0)	1 (0)	16 (10)	2 (0)	124 (169)	124 (169)	141 (166)	127 (169)
	January	86 (55)	83 (54)	1,188 (44)	779 (83)	232 (124)	219 (123)	1,506 (87)	1,081 (160)
	February	209 (66)	209 (66)	314 (153)	175 (84)	117 (97)	117 (97)	639 (269)	500 (196)
	March	283 (102)	172 (64)	99 (36)	54 (31)	408 (200)	207 (102)	790 (349)	433 (151)
	Overall	579 (133)	466 (106)	1,616 (164)	1,009 (122)	880 (305)	666 (252)	3,075 (479)	2,141 (340)
2008-2009	December	12 (14)	12 (14)	184 (183)	48 (44)	12 (14)	12 (14)	213 (212)	71 (70)
	January	76 (16)	76 (16)	25 (14)	17 (9)	0 (0)	0 (0)	101 (20)	93 (18)
	February	18 (25)	0 (0)	405 (223)	298 (209)	31 (27)	31 (27)	454 (258)	329 (241)
	March	22 (---)	22 (---)	5,559 (7,787)	3,400 (4,773)	0 (0)	0 (0)	5,581 (7,787)	3,422 (4,773)
	Overall	127 (32)	109 (21)	6,174 (7,793)	3,763 (4,778)	43 (30)	43 (30)	6,349 (7,794)	3,915 (4,779)

Table 10. Continued.

Year	Month	NOP		WAE		YEP		TOTAL	
		C	H	C	H	C	H	C	H
2009-2010	December	0 (0)	0 (0)	46 (---)	42 (---)	189 (---)	120 (---)	235 (---)	161 (---)
	January	39 (21)	34 (20)	1,304 (994)	147 (114)	1,798 (1,319)	869 (607)	3,141 (2,340)	1,050 (747)
	February	112 (---)	112 (---)	337 (---)	0 (---)	561 (---)	561 (---)	1,010 (---)	674 (---)
	March	18 (---)	18 (---)	54 (---)	54 (---)	543 (---)	434 (---)	615 (---)	506 (---)
	Overall	170 (21)	164 (20)	1,741 (994)	243 (114)	3,091 (1,319)	1,985 (607)	5,002 (2,340)	2,392 (747)
2010-2011	December	110 (55)	18 (12)	206 (39)	89 (27)	9,355 (5,835)	6,269 (4,473)	9,671 (5,911)	6,377 (4,509)
	January	46 (17)	32 (17)	109 (146)	22 (29)	1,187 (371)	631 (108)	1,342 (292)	685 (114)
	February	25 (4)	13 (12)	25 (23)	25 (23)	1,661 (1,073)	1,091 (799)	1,712 (1,094)	1,129 (834)
	March	322 (328)	179 (168)	320 (167)	82 (56)	9,229 (3,779)	4,152 (818)	9,871 (3,923)	4,412 (870)
	Overall	504 (333)	242 (170)	660 (227)	218 (72)	21,433 (7,044)	12,143 (4,618)	22,596 (7,184)	12,603 (4,669)
2011-2012	December	1,716 (666)	1,116 (186)	7,639 (1,508)	3,084 (738)	26,302 (10,531)	21,729 (9,000)	35,785 (10,941)	25,929 (8,858)
	January	425 (163)	135 (85)	13,777 (5,153)	1,856 (385)	57,801 (12,042)	50,503 (10,210)	72,498 (12,157)	52,701 (9,991)
	February	448 (149)	286 (137)	6,604 (1,650)	179 (163)	13,887 (3,935)	11,503 (3,639)	21,070 (5,342)	12,037 (3,630)
	March	401 (237)	379 (237)	685 (390)	127 (40)	2,107 (843)	1,745 (728)	3,257 (---)	2,316 (---)
	Overall	2,989 (741)	1,916 (341)	28,705 (5,563)	5,246 (849)	100,097 (16,496)	85,481 (14,107)	132,610 (17,206)	92,983 (13,837)

Table 10. Continued.

Year	Month	NOP		WAE		YEP		TOTAL	
		C	H	C	H	C	H	C	H
2012-2013	December	1,679 (448)	938 (287)	20,540 (9,586)	1,094 (461)	24,622 (11,410)	17,410 (8,027)	47,100 (13,934)	19,702 (3,022)
	January	3,169 (152)	986 (407)	56,274 (26,112)	889 (497)	43,615 (11,663)	29,363 (9,442)	103,207 (29,514)	31,387 (8,887)
	February	522 (196)	290 (122)	7,280 (2,793)	68 (43)	7,245 (3,008)	4,534 (2,082)	15,046 (5,504)	4,893 (2,106)
	March	1,831 (608)	1,368 (596)	7,558 (4,416)	225 (75)	7,675 (7,357)	3,306 (2,107)	17,064 (12,099)	4,899 (2,207)
	Overall	7,201 (795)	3,583 (786)	91,652 (28,302)	2,275 (683)	83,137 (18,149)	54,613 (12,742)	182,417 (35,240)	60,880 (9,870)

Table 11. Bitter Lake, South Dakota angler responses (percentage of total) during the summers of 2007-2010 and 2012-2013 to the question: “Considering all factors, how satisfied are you with your fishing trip today?” N is the number of responses. During the summers of 2007 and 2008 (*) moderately satisfied and moderately dissatisfied were not options for angler response.

Response	Percent (%) of anglers					
	*2007 N=260	*2008 N=345	2009 N=91	2010 N=77	2012 N=77	2013 N=178
Very Satisfied	36.2	58.8	15.4	19.5	63.6	42.1
Moderately Satisfied	-----	-----	19.8	15.6	16.9	27.0
Slightly Satisfied	20.4	19.4	17.6	15.6	9.1	16.3
Neutral	23.5	7.8	23.1	13.0	6.5	6.2
Slightly Dissatisfied	14.6	11.3	8.8	19.5	3.9	4.5
Moderately Dissatisfied	-----	-----	5.5	7.8	0.0	3.4
Very Dissatisfied	5.4	2.6	9.9	9.1	0.0	0.6

Table 12. Bitter Lake, South Dakota angler responses (percentage of total) during the winters of 2006-2007, 2009-2010, 2010-2011, 2011-2012 and 2012-2013 to the question: “Considering all factors, how satisfied are you with your fishing trip today?” N is the number of responses. During the winter of 2006-2007 (*) moderately satisfied and moderately dissatisfied were not options for angler response.

Response	Percent (%) of anglers				
	*2006-2007 N=114	2009-2010 N=71	2010-2011 N=89	2011-2012 N=278	2012-2013 N=321
Very Satisfied	49.1	32.4	49.4	25.9	21.5
Moderately Satisfied	-----	15.5	13.5	21.6	26.8
Slightly Satisfied	21.9	11.3	12.4	10.4	12.8
Neutral	12.3	19.7	13.5	17.6	16.5
Slightly Dissatisfied	9.7	2.8	6.7	7.9	6.9
Moderately Dissatisfied	-----	12.7	3.4	13.0	12.2
Very Dissatisfied	7.0	5.6	1.1	3.6	3.4

Table 13. Bitter Lake, South Dakota angler responses during the summer of 2012 to the question: “Considering size, number and species of fish caught, how satisfied are you with your fishing trip today?” N is the number of responses.

	Percent (%) of anglers
Response	2012 N=167
Very Satisfied	40.1
Moderately Satisfied	24.0
Slightly Satisfied	15.0
Neutral	7.8
Slightly Dissatisfied	4.2
Moderately Dissatisfied	6.0
Very Dissatisfied	3.0

Table 14. Bitter Lake, South Dakota angler response (percentage of total) during the summers of 2007- 2008, 2010 and 2013 to the question: “What is the most important factor to you in defining a successful fishing trip?” N is the number of responses.

	Percent (%) of anglers			
Response	2007 N=260	2008 N=345	2010 N=77	2013 N=179
Relaxation	16.9	14.5	36.4	3.9
Harvesting Fish	17.3	29.6	7.8	22.9
Participate	10.4	3.2	11.7	21.2
Catching Fish	42.7	46.7	27.3	33.0
Being with Friends	9.6	3.8	13.0	6.2
Other	3.1	2.3	3.9	12.9

Table 15. Bitter Lake, South Dakota angler response (percentage of total) during the winters of 2006-2007, 2010-2011, 2011-2012 and 2012-2013 to the question: “What is the most important factor to you in defining a successful fishing trip?” N is the number of responses.

Response	Percent (%) of anglers			
	2006-2007 N=114	2010-2011 N=88	2011-2012 N=268	2012-2013 N=315
Relaxation	17.5	9.1	6.0	7.3
Harvesting Fish	10.5	15.9	17.2	16.2
Participate	39.5	20.5	28.0	25.1
Catching Fish	27.2	51.1	40.7	41.9
Being with Friends	2.6	1.1	3.0	2.5
Other	2.6	2.3	5.2	7.0

Table 16. Bitter Lake, South Dakota angler response (percentage of total) during the summer of 2009 and winter of 2009-2010 to the question: “Are you in favor of the reduced panfish limits in northeast South Dakota?” N is the number of responses.

Response	Percent (%) of anglers	
	2009 N=91	2009-2010 N=74
Yes	68.1	89.2
No Opinion	29.7	6.8
No	2.2	4.1

Table 17. Bitter Lake, South Dakota angler response (percentage of total) during the summer of 2012 to the question: “Would you be in favor or against allowing for northern pike spearing through the ice statewide?” N is the number of responses.

Response	Percent (%) of anglers
	2012 N=166
In Favor	63.9
Opposed	10.2
No Opinion	25.9

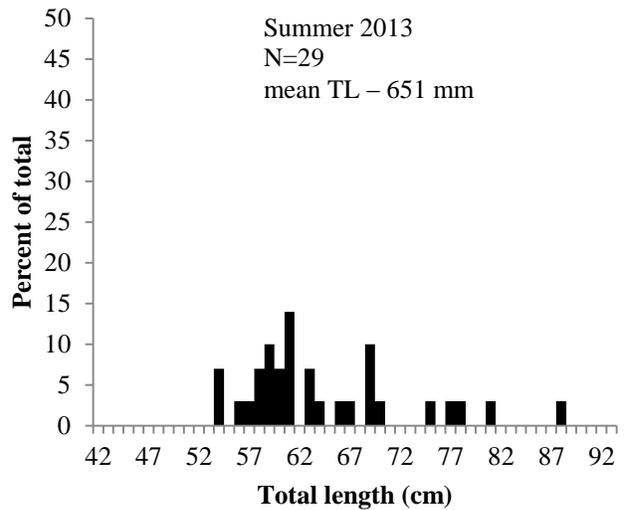
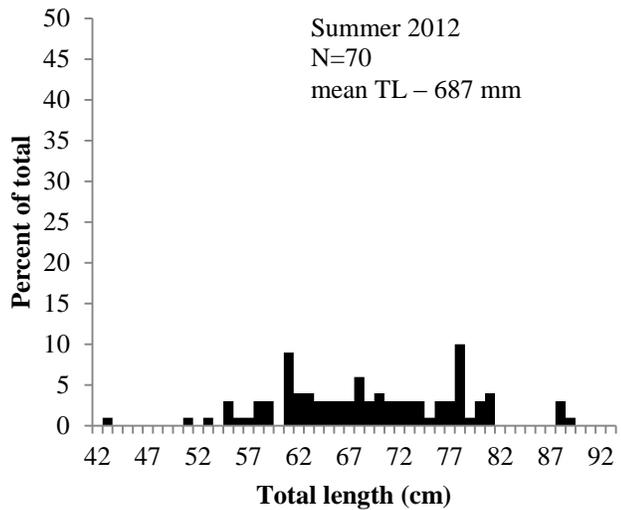
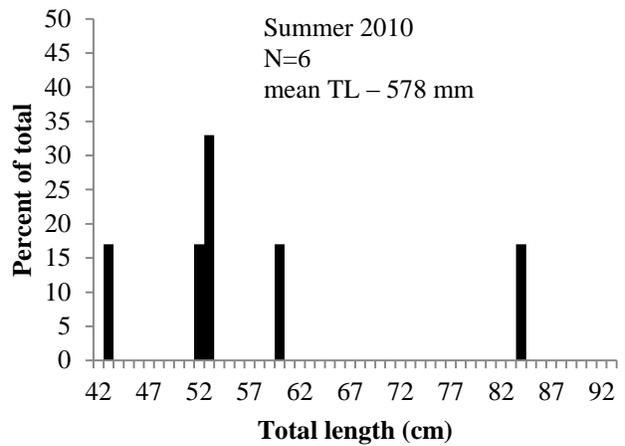
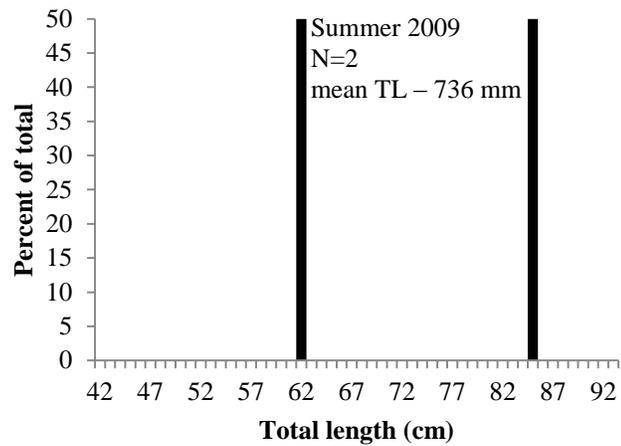
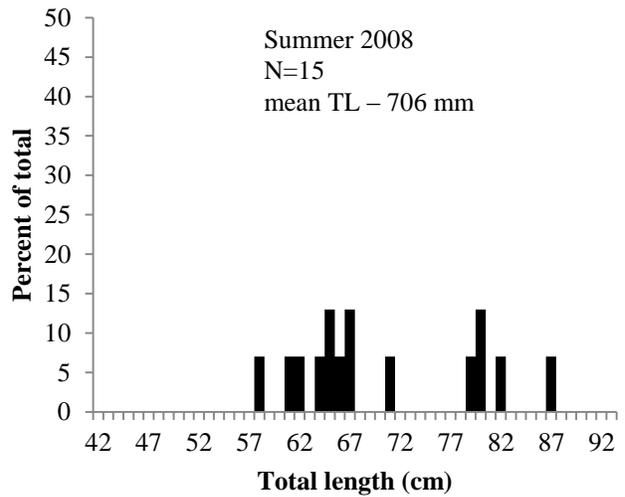
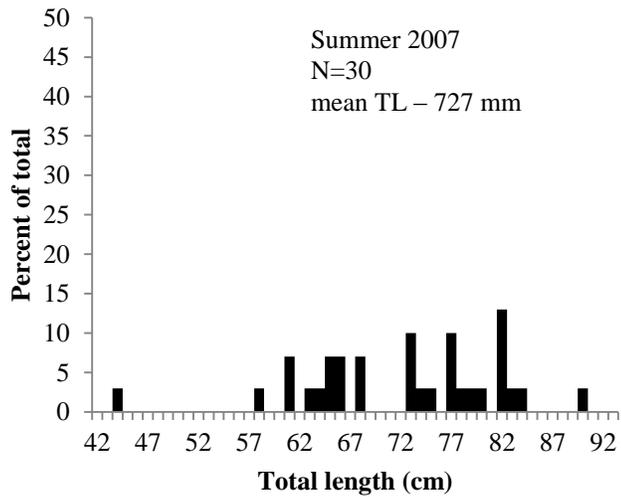


Figure 1. Length frequency histogram of Northern Pike harvested by anglers fishing Bitter Lake during the summers of 2007-2010 and 2012-2013. N is the total number of fish measured and mean TL is the mean total length (mm) of harvested Northern Pike.

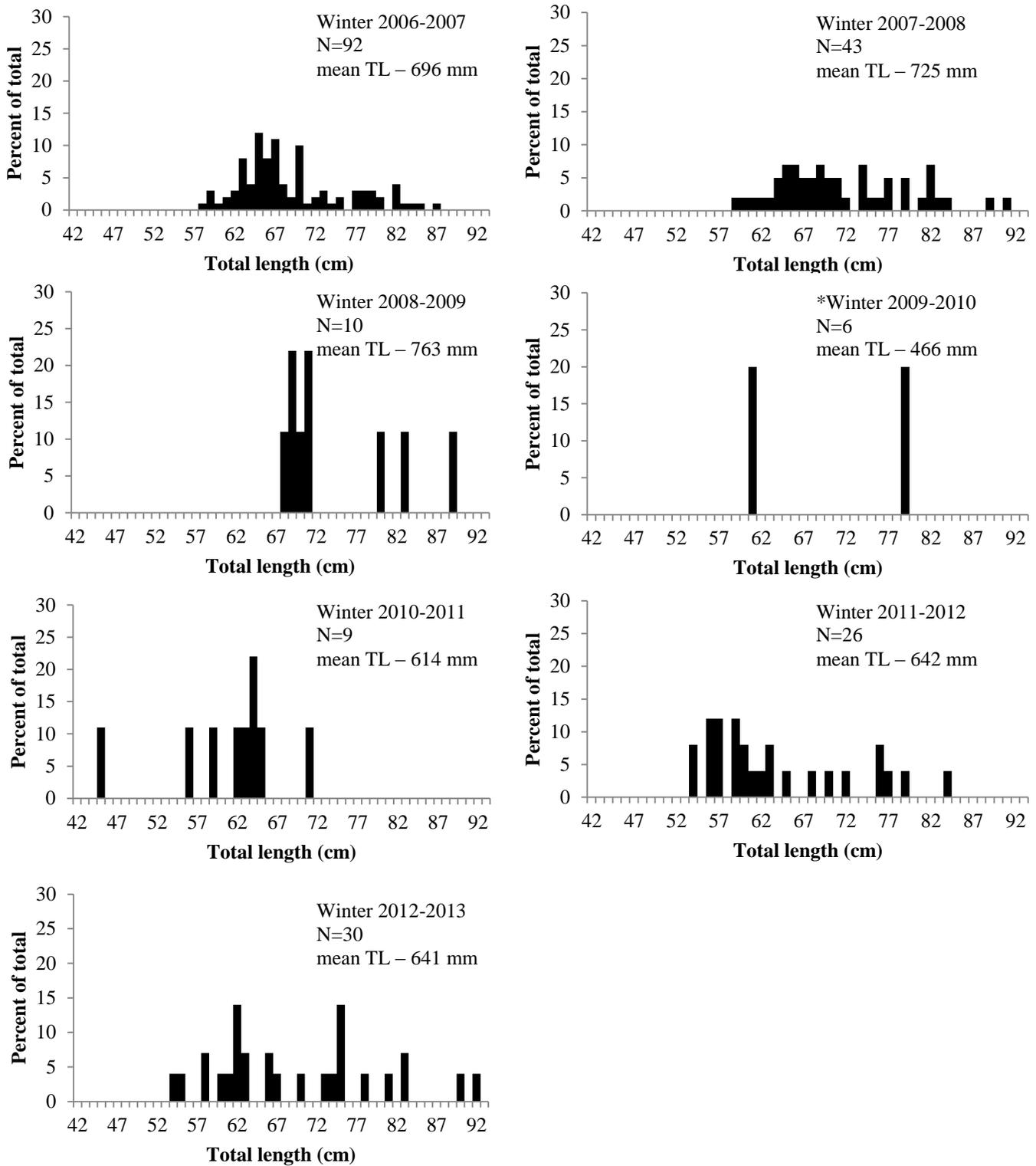


Figure 2. Length frequency histogram of Northern Pike harvested by anglers fishing Bitter Lake during the winters of 2006-2007, 2007-2008, 2009-2010, 2010-2011, 2011-2012 and 2012-2013. N is the total number of fish measured and mean TL is the mean total length (mm) of harvested Northern Pike. Northern Pike less than 42 cm in total length were harvested during the winter of (*) 2009-2010 and were not included in the figure.

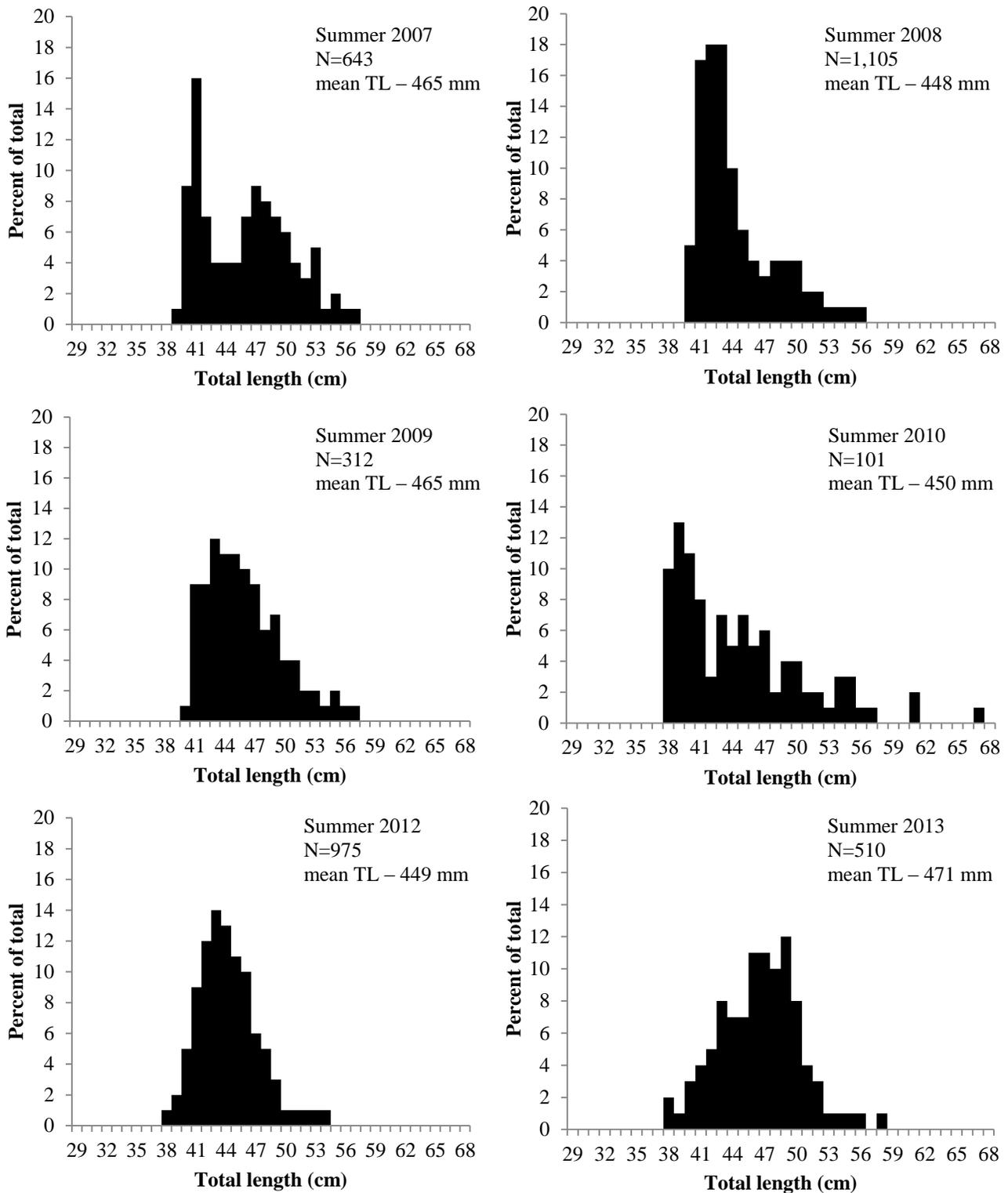


Figure 3. Length frequency histogram of Walleyes harvested by anglers fishing Bitter Lake during the summers of 2007-2010 and 2012-2013. N is the total number of fish measured and the mean TL is the mean total length (mm) of harvested Walleyes.

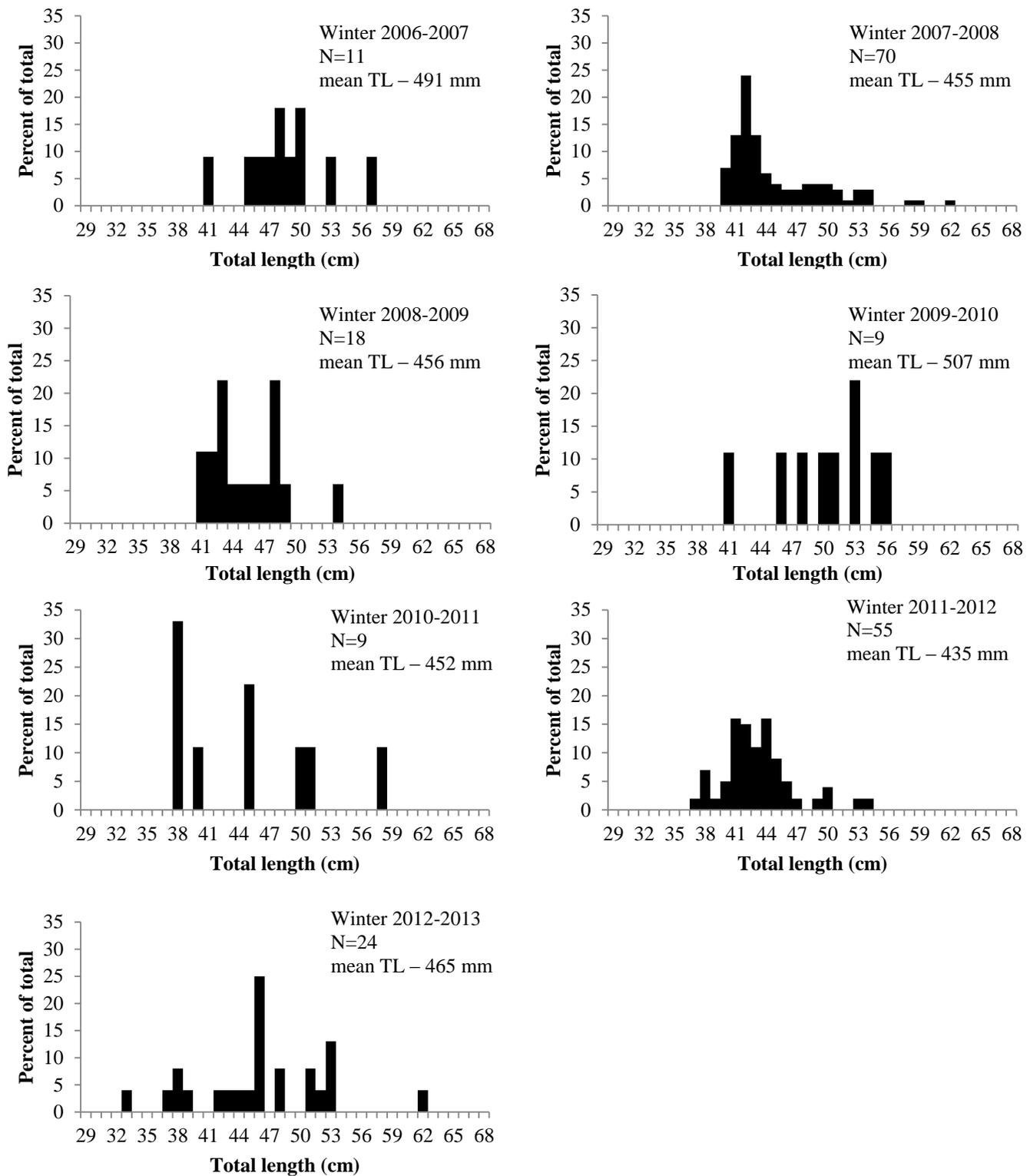


Figure 4. Length frequency histogram of Walleyes harvested by anglers fishing Bitter Lake during the winters of 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012 and 2012-2013. N is the total number of fish measured and the mean TL is the mean total length (mm) of harvested Walleyes.

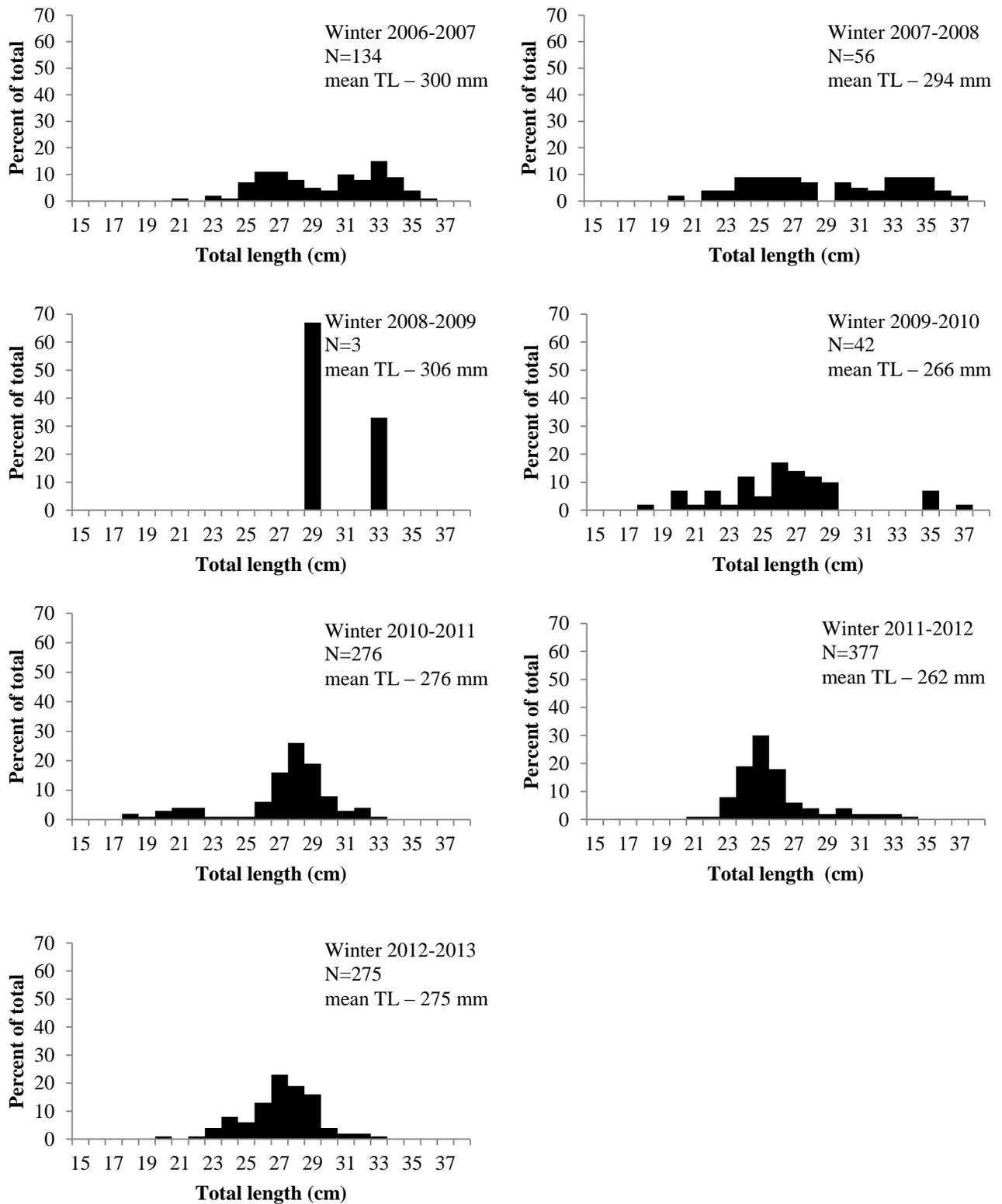


Figure 5. Length frequency histogram of Yellow Perch harvested by anglers fishing Bitter Lake during the winters of 2006-2007, 2007-2008, 2008-2009, 2009-2010, 2010-2011, 2011-2012 and 2012-2013. N is the total number of fish measured and mean TL is the mean total length (mm) of harvested Yellow Perch.

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