SOUTH

DAKOTA

FISHERIES

Angler Use and Harvest Surveys on Brant Lake, Lake County, South Dakota May 1998 – August 2008

South Dakota
Department of
Game, Fish and Parks
Wildlife Division
Joe Foss Building
Pierre, South Dakota 57501-3182

Completion Report
No. 11-12

Angler Use and Harvest Surveys on Brant Lake, Lake County, South Dakota May 1998 – August 2008

David O. Lucchesi

South Dakota Department of Game, Fish and Parks
Regional Office
4500 S Oxbow Ave
Sioux Falls, SD 57106

Dingell-Johnson Project.....F-21-R-41

Job Number.....2109

Date..... February 2010

Aquatics Section Leader
John Lott

Fisheries Program Administrator
Geno Adams

Department Secretary
Jeff Vonk

Wildlife Division Director
Tony Leif

Federal Aid Coordinator
Tanna Zabel

Preface

Information in this report was collected between May 1998 and August 2008. Funding for this project was provided by Federal Aid in Sportfish Restoration, (D-J) Project F-21-R, Job number 2109. Copies of this report and reference to the data are not for publication and can only be made with written permission from the author, Director of the Division of Wildlife, or the Secretary of the South Dakota Department of Game, Fish and Parks, Pierre, South Dakota 57501-3182.

The author would like to acknowledge all the permanent and seasonal employees with the South Dakota Department of Game, Fish and Parks that helped with the collection and entry of the data: Andrew Blau, Brett Flemmer, Kevin Hoffmann, Josh Hagemann , Arron Husman, Bruce Johnson, Gary Knecht, Jeremy Kriese, Chad Lade, Brendan Peterson, Todd St. Sauver, Stan Scubelek, Jason Stahl, Tyler Stubbs, Chris Swiden, Matt Talbert, Mike Upgren, Ryan Wendinger, and Jay Wulf. He would also like to thank Brian Blackwell for providing data used in yield calculations for northeastern South Dakota fisheries.

Executive Summary

Brant Lake is last in a chain of four natural lakes formed by receding glaciers at the end of the last ice age. Located about 30 miles northwest of Sioux Falls, the lake is a popular destination for anglers and boaters. Brant Lake contains a diverse fish community and provides angling opportunities for walleye, yellow perch, northern pike, black crappie, bluegill, smallmouth bass, white bass and black bullheads.

The South Dakota Department of Game, Fish and Parks (SDGFP) actively manages Brant Lake for walleye and yellow perch with frequent stockings. A 356-mm (14-inch) minimum length limit (MLL), placed on the walleye fishery in 1992, was removed in 2000 after evaluation found slowed walleye growth and the stockpiling of small fish under the minimum harvestable length.

The objective of this 11-year creel survey was to document long-term trends in angling use, catch and harvest rates, and catch and harvest of walleyes and other species in this important fishery. By conducting summer and winter surveys, angler use and harvest during these two periods could be compared. Finally, we were able to document changes in the walleye fishery after the removal of the 356-mm (14-inch) MLL.

Brant Lake anglers primarily targeted walleyes during the summer fishery (55% to 80% annually). Walleyes were also the primary target of winter anglers except during the winter of 2005-06 when 48% of angling parties targeted yellow perch.

Brant Lake supported some of the highest summer fishing pressure (per hectare) of any large natural lake in eastern South Dakota. Summer fishing pressure ranged from 13,634 hours (32.5 hours/hectare) in 1999 to 44,346 hours (105.6 hours/hectare) in 2002. Fishing pressure was most closely related to yellow perch abundance; however, higher walleye and black crappie abundance also coincided with high fishing pressure. Mean monthly fishing pressure was highest in June. Shore fishing pressure comprised about

30% of the summer pressure and the highest pressure typically occurred in May when walleye, northern pike and black crappie were more accessible to shore anglers.

On average, winter fishing pressure comprised about 16% of the total annual pressure during 6 years of winter surveys, but it varied from about 1,500 hours in 2004-05 to over 8,000 hours in 2002-03. The low winter fishing pressure of 2004-05 and 2005-06 was related to slow fishing. Peak winter fishing pressure and the highest percentage of anglers fishing in shacks occurred in January. On average, 77% of the winter fishing pressure was done from a shack which was similar to that documented on Lake Thompson.

Over 94% of angling parties fishing Brant Lake were South Dakota residents. Residents of Minnehaha County comprised the largest percentage of resident anglers (> 65%) followed by anglers from Lake and Moody Counties. During the survey period, the summer and winter fisheries on Brant Lake had an estimated average economic impact of about $400,000 and $55,000, respectively.

Summer catch and harvest rates for walleyes over the 11-year period averaged 0.35 walleyes/hour and 0.09 walleyes/hour, respectively. Annual harvest rates never exceeded the South Dakota Game, Fish and Parks (SDGFP) objective of 0.15 walleyes/hour. Some of the highest catch rates and lowest harvest rates occurred under the 356 mm (14-inch) MLL. Mean winter catch and harvest rates for walleyes (0.18/hour and 0.04/hour) were substantially lower than summer rates. No walleye catch or harvest was observed by the creel clerk during the winters of 2004-05 and 2005-06. Decent catch and harvest rates for the corresponding summer fisheries indicate that walleye catchability is low in the winter.

Over the 11-year survey period, summer anglers caught an estimated 90,000 walleyes and harvested about 27,000. Approximately 50% of the walleyes harvested were 356 mm (14 in) or longer. The winter fishery accounted for only 10% of the total walleye harvest during the 6 years of winter survey, and only about 22% of the fish

harvested were 356 mm (14 in) or longer. The low percentage of walleyes over 356 mm (14 inches) suggested that the MLL, when in place, must have further curtailed an already limited winter harvest of walleyes.

Mean summer, winter and total angling yields for walleye over the 11-year period on Brant Lake were estimated at 2.47, 0.23 and 2.70 kg/ha, respectively. These are comparable to yields for other premier walleye fisheries in eastern South Dakota.

Catch and harvest rates for northern pike were low throughout the survey period. Most northern pike were caught incidentally while fishing for walleyes. Few anglers indicated they were targeting northern pike, and less than 25% of the pike caught were harvested.

Large year classes produced in 2000 and 2001 supported the majority of the yellow perch fishery during the survey period. Lake survey gill-net CPUE and angler catch and harvest peaked in 2002 as these large year classes were recruited. The highest estimated harvest (10,419 fish) and harvest rate (0.84/h) were recorded in August, 2002. Harvest rates remained high through 2003, and then steadily declined. Anglers harvested about 75% of their catch and nearly all of these fish were 200 to 300 mm (7.9 to 11.8 in) long.

The highest summer catch and harvest rates of black crappies also occurred during 2002 and 2003. Highest monthly harvest rates occurred in August 2002 and June 2003. The August 2002 harvest occurred when anglers were targeting yellow perch while anglers targeting crappies in June of 2003 caught nearly four fish per hour. May consistently had the highest mean catch and harvest rates. Winter catch and harvest rates were low during the survey period, however, fishing reports indicated that fishing improved in the two winters following this survey. Nearly all the black crappie harvested by anglers were 200 to 300 mm (7.9 to 11.8 in) long (Figure 8). Anglers harvested about 70% of their catch which was similar to other popular crappie fisheries.

Smallmouth bass catch and catch rate increased over the survey period with the highest catch rates recorded over the last 3 years. The 11-year total summer catch and harvest were estimated at 33,972 and 6,019, respectively. The total catch of smallmouth bass was similar to black crappie and second only to walleye and yellow perch. However, only about 20% of the smallmouth bass caught were harvested which is substantially less than the 70-80% percent harvest of yellow perch and black crappie caught by anglers. About 60% of bass harvested were less than 30.5 cm (12 inches) long and only a few bass over 40.6 cm (16 inches) were taken.

Brant Lake provided a limited bluegill fishery. A gradual increase in catch and harvest rates throughout the survey period can probably be attributed to observed increases in submergent vegetation around the shoreline. Although not abundant, large bluegills over 250 mm (10 in) were measured by the clerk each year from 2004 through 2008.

White bass were first recorded by the creel survey in 2006. In 2008, anglers caught nearly 5,000 and harvested about 1,650 white bass. The majority of harvested fish were 210 mm (8.3 inches) to 290 mm (11.4 inches) long.

Black bullhead catch and harvest peaked in 2003 and could probably be attributed to strong production in 2001 when water levels were high. Nearly all of the black bullheads harvested were 200 to 300 mm (7.9 to 11.8 in) long. Channel catfish, green sunfish, common carp and bigmouth buffalo were also caught during the survey period, but catch and harvest rates were very low.

More than 60% of angling parties interviewed in the summers of 2002 and 2003 were satisfied with their fishing trip. Fishing was good for walleye, yellow perch and black crappie these years which likely explains the high satisfaction.

The top reason given by both summer and winter anglers for choosing to fish Brant Lake over other waters was closeness to home (34-65%). Second for summer

angling parties was hearing about a bite (31%), while familiarity with the lake (7-17%) was a popular response with winter anglers.

In summer 2003, three of four angling parties indicated current fishing regulations were easy to understand. However, 24% indicated that current regulations were at least somewhat difficult to understand which was higher than recorded for Lake Thompson anglers (14%).

Several questions about walleye harvest and regulations were asked during the survey period. In the summer of 1999, over 50% of parties interviewed stated they would favor removing a 14-inch minimum length limit on the Madison area lakes. In winter 2003-04 and summer 2004, about 60% of parties indicated that they would rather harvest three 14-inch walleyes over one 17-inch walleye (19%) or four 13-inch walleyes (16-26%). Winter anglers slightly favored harvesting higher numbers of smaller fish over summer anglers. Although a majority of anglers preferred three 14-inch walleyes over the other options, about 64% opposed a daily limit reduction from four to three. Response was also negative to a reduction in the northern pike daily limit.

Responses concerning satisfaction with panfish harvest and regulations were variable. The largest percentage of parties interviewed during summer 2005 favored a reduction in daily panfish limits to 10, while the majority of winter angling parties (2005-06) were opposed to such a change. In 2007-08, both winter and summer anglers gave a nearly identical response to a question about daily panfish limits indicating that they would prefer a daily limit of 15 or more panfish (66 and 67%; yellow perch, bluegills or crappies) over a limit of 10 fish or less (34 and 33%).

Table of Contents

Preface ii

Executive Summary iii

Table of Contents ix

List of Tables x

List of Figures xii

List of Appendices xiv

Introduction 1

Study Site 1

Methods 2

Results and Discussion 3
- Summer 3
  - Fishing Pressure 3
  - Angler Demographics 9
  - Angler Catch and Harvest 10
    - Walleye 10
    - Northern Pike 17
    - Yellow Perch 17
    - Black Crappie 18
    - Smallmouth Bass 21
    - Other 25
- Winter 27
  - Fishing Pressure 27
  - Angler Demographics 31
  - Angler Catch and Harvest 32
    - Walleye 32
    - Other 37
- Angler Opinions 37

Literature Cited 41

Appendices 43

List of Tables

Table 1. Percent of angling parties interviewed primarily targeting a species (or any species) during the summer fishery on Brant Lake, 1998-2008 3

Table 2. Summer totals for the number of interviews and estimates for fishing pressure and fishing pressure per surface hectare of water, angler days and economic value from creel surveys conducted on Brant Lake, May through August, 1998-2008 (80% confidence interval) 5

Table 3. Mean fishing pressure (h and h/ha) and mean catch and harvest statistics for walleyes, yellow perch and northern pike on primary walleye waters in eastern South Dakota creel surveyed between 1996 and 2008. Creel data for the Brant, Herman, Madison and Sinai fisheries were rerun using a corrected version of the CAS program, and therefore, values for catch and harvest rates will be lower than those reported in Lucchesi (2009).....8

Table 4. Estimated number and rate (number per hour) of walleyes caught and harvested by anglers during the summer fishery on Brant Lake, South Dakota, 1998-2008. (80% confidence interval) 13

Table 5. Mean total lengths (mm) of walleyes harvested by summer anglers on eastern South Dakota lakes, 1997-2008.....16

Table 6. Mean number and weight of walleyes harvested per surface hectare (ha) of water for the summer, winter and combined fisheries on eastern South Dakota lakes. Means were calculated over the time periods presented in Table 3 16

Table 7. Estimated number and rate (number per hour) of northern pike caught and harvested by anglers during the summer fishery on Brant Lake, South Dakota, 1998-2008 (80% confidence interval).....18

Table 8. Estimated number and rate (number per hour) of yellow perch caught and harvested by anglers during the summer fishery on Brant Lake, South Dakota, 1998-2008 (80% confidence interval).....19

Table 9. Estimated number and rate (number per hour) of black crappie caught and harvested by anglers during the summer fishery on Brant Lake, South Dakota, 1998-2008 (80% confidence interval).....21

Table 10. Estimated number and rate (number per hour) of smallmouth bass caught and harvested by anglers during the summer fishery on Brant Lake, South Dakota, 1998-2008 (80% confidence interval).....23

Table 11. Estimated number and rate (number per hour) of bluegill caught and harvested by anglers during the summer fishery on Brant Lake, South Dakota, 1998-2008 (80% confidence interval) 25

Table 12. Estimated number and rate (number per hour) of white bass caught and harvested by anglers during the summer fishery on Brant Lake, South Dakota, 1998-2008 (80% confidence interval) 26

Table 13. Estimated number and rate (number per hour) of black bullhead caught and harvested by anglers during the summer fishery on Brant Lake, South Dakota, 1998-2008 (80% confidence interval).....27

Table 14. Percent of angling parties interviewed primarily targeting a species (or any species) during the winter fishery on Brant Lake, 2002-2008. 29

Table 15. Winter totals for the number of interviews and estimates for fishing pressure and fishing pressure per surface hectare of water, angler days and economic value from creel surveys conducted on Brant Lake, December through March, 2002-2008 (80% confidence interval).....30

Table 16. Estimated number and rate (number per hour) of walleyes caught and harvested by anglers during the winter fishery on Brant Lake, South Dakota, 2002-2008. (80% confidence interval) 35

Table 17. Mean total lengths (mm) of walleyes harvested by winter anglers on eastern South Dakota lakes, 1996-2008.....37

Table 18. Estimated number and rate (number per hour) of northern pike caught and harvested by anglers during the winter fishery on Brant Lake, South Dakota, 2002-2008. (80% confidence interval).....38

Table 19. Estimated number and rate (number per hour) of yellow perch caught and harvested by anglers during the winter fishery on Brant Lake, South Dakota, 2002-2008. (80% confidence interval).....38

Table 20. Estimated number and rate (number per hour) of black crappie caught and harvested by anglers during the winter fishery on Brant Lake, South Dakota, 2002-2008. (80% confidence interval).....39

List of Figures

Figure 1. Estimated summer fishing pressure measured in angler hours on Brant Lake, 1998-2008 (bars represent an 80% confidence interval) 5

Figure 2. Catch per unit effort (CPUE) of walleye and yellow perch in 45.7 m (150 ft) experimental-mesh gill nets set during summer fisheries surveys on Brant Lake, 1996-2008 (bars represent an 80% confidence interval) 6

Figure 3. Catch per unit effort (CPUE) of black crappie, smallmouth bass and bluegill in frame nets (19-mm bar-mesh netting; 0.9 m high x 1.5 m wide frames and 18.3 m long leads) set during summer fisheries surveys on Brant Lake, 1996-2008 (bars represent an 80% confidence interval) 7

Figure 4. Mean monthly summer fishing pressure by boat and shore anglers on Brant Lake, 1998-2008 9

Figure 5. South Dakota county of residence for summer (May-August) resident anglers fishing Brant Lake, South Dakota from 2002 through 2008 11

Figure 6. Length frequency of angler-harvested walleyes measured by the creel clerk during summer creel surveys on Brant Lake, 1998-2008 15

Figure 7. Length frequency of angler-harvested yellow perch measured by the creel clerk during summer creel surveys on Brant Lake, 1998-2008 20

Figure 8. Length frequency of angler-harvested black crappie measured by the creel clerk during summer creel surveys on Brant Lake, 1997-2008 22

Figure 9. Length frequency of angler-harvested smallmouth bass measured by the creel clerk during summer creel surveys on Brant Lake, 1998-2008 24

Figure 10. Length frequency of angler-harvested black bullheads measured by the creel clerk during summer creel surveys on Brant Lake, 1998-2008 28

Figure 11. Estimated winter fishing pressure measured in angler hours on Brant Lake, 2002-2008 (bars represent an 80% confidence interval) 30

Figure 12. Mean monthly winter fishing pressure for shack and open-ice anglers on Brant Lake, 2002-2008 31

Figure 13. South Dakota county of residence for winter (December-March) resident anglers fishing Brant Lake, South Dakota from 2002 through 2008 33

Figure 14. Length frequency of angler-harvested walleyes measured by the creel clerk during winter creel surveys on Brant Lake, 2002-2008.....36

List of Appendices

Appendix 1 Summer angler target species frequency totaled by month and over the summer for parties interviewed by the creel clerk during summer creel surveys on Brant Lake, 1998-2008 43

Appendix 2 Monthly and total (May through August) number of angler interviews (# Int), estimated fishing pressure (angler hours), estimated angler days, estimated economic value, estimated trip length (hours), average party size, percent of interviewed parties that were South Dakota (SD) residents, percent of angling activity done by boat and percent of angling activity that occurred during weekends/holidays on Brant Lake, South Dakota (80% confidence interval) 45

Appendix 3 Estimated number of walleye, northern pike, yellow perch, black crappie, smallmouth bass, black bullhead, channel catfish, white bass, bluegill, green sunfish and other species (white sucker and common carp) caught and harvested by month and year during the summer fishery at Brant Lake, South Dakota. (80% confidence interval) 47

Appendix 4 Estimated angler catch rate (C/h) and harvest rate (H/h) of walleye, northern pike, yellow perch, black crappie, smallmouth bass, black bullhead, channel catfish, white bass, bluegill, green sunfish and other species (white sucker and common carp) by month and year during the summer fishery at Brant Lake, South Dakota. (80% confidence interval). 58

Appendix 5 Winter angler target species frequency totaled by month and over the winter for parties interviewed by the creel clerk during winter creel surveys on Brant Lake, 2002-2008. 69

Appendix 6 Monthly and total (December through March) number of angler interviews (# Int), estimated fishing pressure (angler hours), estimated angler days, estimated economic value, estimated trip length (hours), average party size, percent of interviewed parties that were South Dakota (SD) residents, percent of angling activity done by shack and percent of angling activity that occurred during weekends/holidays at Brant Lake, South Dakota (80% confidence interval) 70

Appendix 7 Estimated number of walleye, northern pike, yellow perch and black crappie caught and harvested by month and year during the winter fishery at Brant Lake, South Dakota. (80% confidence interval) 71

Appendix 8 Estimated angler catch rate (C/h) and harvest rate (H/h) of walleye, northern pike, yellow perch and black crappie by month and year during the winter fishery at Brant Lake, South Dakota. (80% confidence interval) 73

Appendix 9 Questions asked during interviews to obtain angler opinions on regulations and trip satisfaction 75

Appendix 10 Yearly fishing pressure (h and h/ha) and catch and harvest statistics for walleyes, yellow perch and northern pike on primary walleye waters in eastern South Dakota creel surveyed between 1996 and 2008. Creel data for the Brant, Herman, Madison and Sinai fisheries were rerun using a corrected version of the CAS program, and therefore, values for catch and harvest rates will be lower than those reported in Lucchesi (2009).....79

Introduction

Brant Lake is last in a chain of four natural lakes formed by receding glaciers at the end of the last ice age. Located about 30 miles northwest of Sioux Falls, the lake is a popular destination for anglers and boaters. Brant Lake contains a diverse fish community and provides angling opportunities for walleye, yellow perch, northern pike, black crappie, bluegill, smallmouth bass, white bass and black bullheads.

The South Dakota Department of Game, Fish and Parks (SDGFP) actively manages Brant Lake for walleye and yellow perch with frequent stockings. A 356-mm (14-inch) minimum length limit (MLL), placed on the walleye fishery in 1992, was removed in 2000 after evaluation found slowed walleye growth and the stockpiling of small fish under the minimum harvestable length.

The objective of this 11-year creel survey was to document long-term trends in angling use, catch and harvest rates, and catch and harvest of walleyes and other species in this important fishery. By conducting summer and winter surveys, angler use and harvest during these periods could be compared. Finally, we were able to document changes in the walleye fishery after the removal of the 356-mm (14-inch) MLL.

Study Site

Brant Lake is a 420 ha (1,037 acre) natural lake located in southeastern Lake County, South Dakota. It derived its name from the large number of white brant (snow geese) that occupy the area during the spring and fall migrations. Brant receives most of its water from lakes Herman, Madison and Round, the upper three lakes in the chain, via Silver Creek. Additional inputs come from a relatively small, local watershed. Outflows form the headwaters of Skunk Creek, which empties into the Big Sioux River in Sioux Falls. Brant Lake has a maximum depth of about 4.3 m (14 feet) and a mean depth of 3.4 m (11 feet).

SDGFP owns and maintains access areas on the east, south, and west sides of the lake. The East Brant Access Area has a double lane boat ramp, dock and large parking

lot. The West Brant Access Area has a new double lane boat ramp with a large parking lot and several shore fishing areas. The South Brant Access Area also offers ample shore fishing opportunities

Methods

A stratified, access-point angler use and harvest survey was conducted from May through August of 1998-2008 and December through March of 2002-2008. The close proximity of Brant, Madison and Herman permitted the surveying of two waters (4-h shift each) within an 8-h day during the summer survey. This design allowed us to creel survey three waters with a single clerk in a 40-h work week. Within each 4-h shift, two instantaneous counts of boat and shore anglers were made from various access points around the lake. Angling parties were also interviewed at these access points.

For the winter survey, the monthly creel survey schedule was divided evenly between Lake Thompson and Lakes Madison and Brant. Within an 8-h shift, two instantaneous counts of ice shacks and open-ice anglers were done consecutively for Brant Lake and Lake Madison and the clerk was permitted to rove between lakes to collect interviews. Interviews were conducted on the ice and at access points during the winter creel survey. Brant Lake was surveyed on at least 10 days each month.

The summer and winter surveys were stratified by weekend and weekdays because the highest pressure typically occurs on weekend days. At least one weekend day was assigned each week. Eight-hour shifts were divided between morning and evening periods so that all daylight hours were surveyed.

Interviews provided information necessary for estimating fish species catch and harvest rates, mean angler trip length, mean party size, percent of anglers targeting various species, residency, and angler opinions. Total length (TL; mm) measurements from angler-caught fish were recorded during the interview process. Angler use, catch and harvest estimates, and other statistics were computed using the Creel Application Software (CAS) designed by Craig Soupir (Soupir and Brown 2002).

Results and Discussion

Summer

Fishing Pressure

Brant Lake anglers primarily targeted walleyes during the summer fishery (Table 1). The percentage of anglers targeting walleyes ranged from 55% in 2006 to 80% in 2004. This was similar to the percentage targeting walleyes on Lake Herman (unpublished data) and higher than on Lake Madison (unpublished data). The percentage of walleye anglers on Brant, Madison and Herman (Madison area lakes) was lower than on other popular walleye fisheries such as Lake Thompson (Lucchesi 2009) and Bitter Lake (Blackwell 2005b), but higher than on more diverse northeastern South Dakota fisheries such as Enemy Swim Lake (Blackwell et al. 2007b) and Pickerel Lake (Blackwell et al. 2007a). Generalist anglers (those not specifically targeting one or two species) comprised the second largest category on Brant Lake (18%) which was similar to Herman (22%) and Madison (17%).

Summer fishing pressure varied greatly by year on Brant Lake (Table 2). Fishing pressure increased from 1998 to 2002, declined from 2003 to 2007, then rebounded in

Table 1. Percent of angling parties interviewed primarily targeting a species (or any species) during the summer fishery on Brant Lake, 1998-2008.

	Percent of anglers targeting					
Year	*Walleye*	*Yellow perch*	*Black crappie*	*Smallmouth bass*	*Black Bullhead*	*Any species*
1998	66	4	1	2	1	26
1999	71	3	1	2	1	22
2000	66	5	4	1	1	23
2001	66	3	2	1	1	27
2002	57	30	5	4	3	1
2003	58	15	8	1	1	17
2004	80	11	6	1	1	1
2005	73	7	3	1	1	15
2006	55	5	7	4	1	28
2007	78	3	3	0	3	13
2008	68	1	4	6	1	20

2008 (Figure 1). Summer fishing pressure ranged from 13,634 hours (32.5 hours/hectare) in 1999 to 44,346 (105.6 hours/hectare) in 2002 (Table 2). Fishing pressure was most closely related to yellow perch abundance; however, high walleye and black crappie abundance also coincided with high fishing pressure (Figures 2 and 3).

Summer fishing pressure on Brant Lake was higher than on other large natural-lake fisheries in eastern South Dakota (Table 3). From 1998-2008, summer fishing pressure averaged 60 hours per hectare (Table 3) which was similar to Pickerel Lake, a natural lake similar in size and also having a diverse fish community.(Table 3). Lakes Herman and Madison received lighter use with less than 20 h/ha of summer fishing pressure over the 11-year survey period. Although the largest (> 3,000 ha) eastern South Dakota walleye fisheries support the highest total fishing pressure, angler use, on a per hectare basis, is substantially lower than on lakes like Brant or Pickerel . In fact, the highest angler use typically occurs on smaller natural waters, small impoundments (> 200 h/ha; Neumann et al. 1993; Lucchesi et al. 2004) and urban lakes (> 1,000 h/ha; unpublished data).

Over the survey period, mean monthly fishing pressure on Brant Lake was highest in June (Figure 4). Summer fishing pressure often peaks in June on eastern South Dakota waters. High walleye catch rates plus favorable summer weather make June a popular month to fish. Peak fishing pressure occurred in June on Lake Thompson (Lucchesi 2009), Pickerel Lake (Blackwell et al. 2007a) and Enemy Swim Lake (Blackwell et al. 2007b). May was the month of peak fishing pressure on Lakes Herman and Madison, and on popular northeastern South Dakota walleye fisheries, Waubay Lake and Bitter Lake (Blackwell and Hubers 2003; Blackwell et al. 2007c). Although fishing pressure on Brant Lake commonly declined by late-summer, good fishing for yellow perch in July and August of 2002 provided some of the highest monthly fishing pressure estimates during the survey period (Appendix 2).

Table 2. Summer totals for the number of interviews and estimates for fishing pressure and fishing pressure per surface hectare of water, angler days and economic value from creel surveys conducted on Brant Lake, May through August, 1998-2008 (80% confidence interval).

Year	*Number of interviews*	*Angler hours*	*Angler hours/ hectare*	*Angler days*	*Economic value*
1998	190	14,257 (2,701)	33.9 (6.4)	4,230	$258,030
1999	185	13,634 (1,817)	32.5 (4.3)	3,261	$198,165
2000	164	17,966 (3,918)	42.8 (9.3)	4,740	$289,162
2001	203	29,843 (4,258)	71.1 (10.1)	7,979	$486,744
2002	448	44,346 (4,438)	105.6 (10.6)	11,198	$603,108
2003	285	28,220 (3,644)	67.2 (8.7)	7,199	$439,137
2004	463	30,668 (4,154)	73.0 (9.9)	8,266	$504,245
2005	288	31,760 (4,481)	75.6 (10.7)	9,538	$581,790
2006	257	22,053 (3,451)	52.5 (8.2)	6,177	$376,815
2007	123	14,857 (2,509)	35.4 (5.8)	3,369	$205,505
2008	271	30,627 (4,372)	72.9 (10.4)	7,813	$476,594

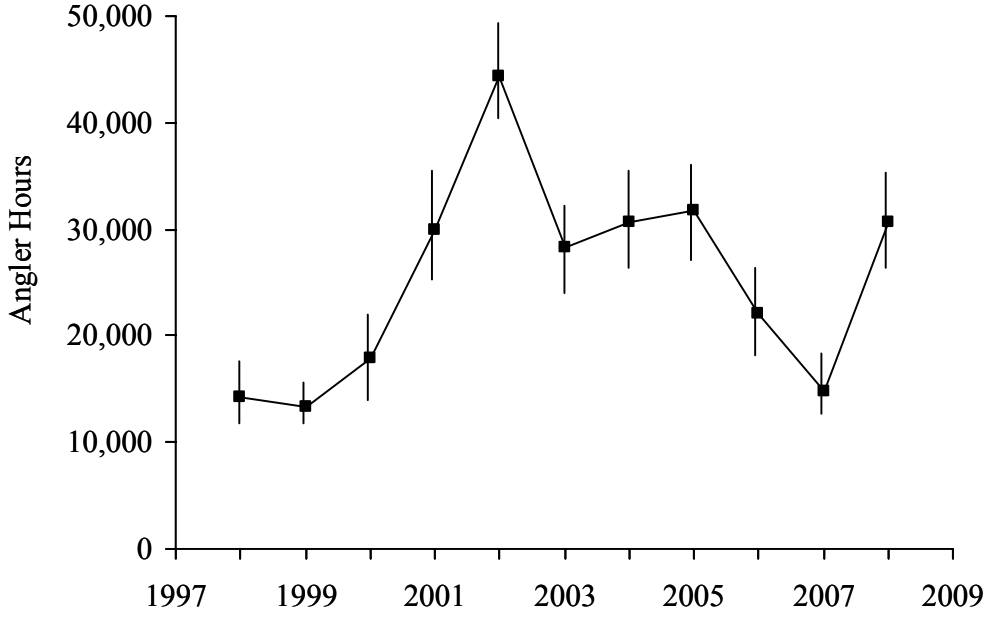
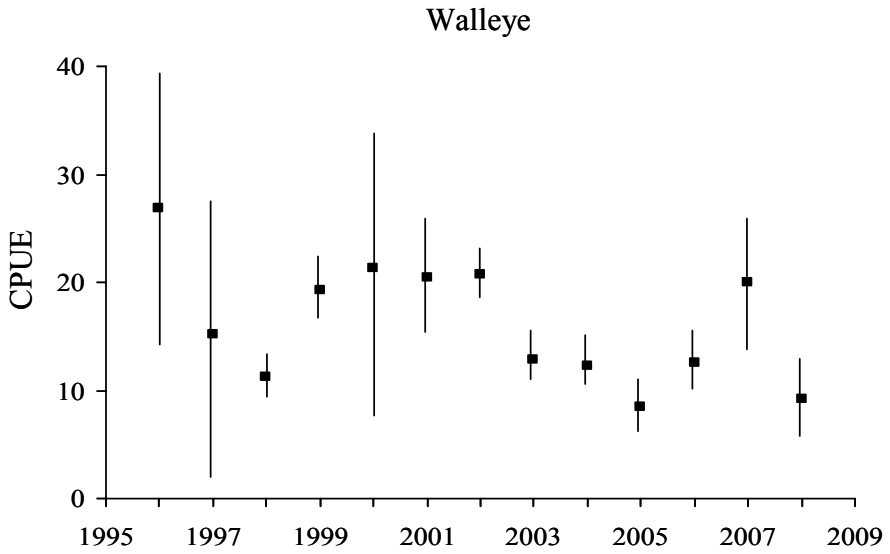


Figure 1. Estimated summer fishing pressure measured in angler hours on Brant Lake, 1998-2008 (bars represent an 80% confidence interval).



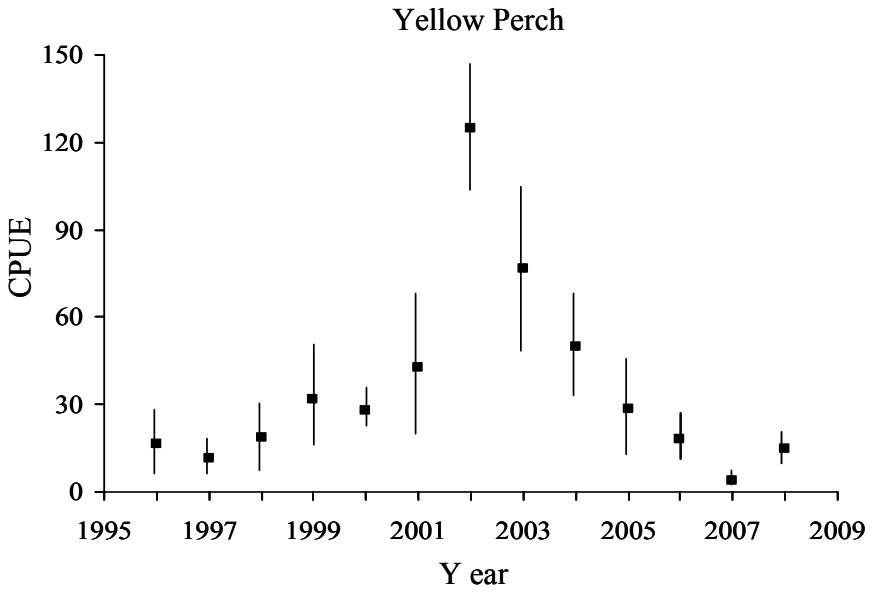


Figure 2. Catch per unit effort (CPUE) of walleye and yellow perch in 45.7 m (150 ft) experimental-mesh gill nets set during summer fisheries surveys on Brant Lake, 1996-2008 (bars represent an 80% confidence interval).

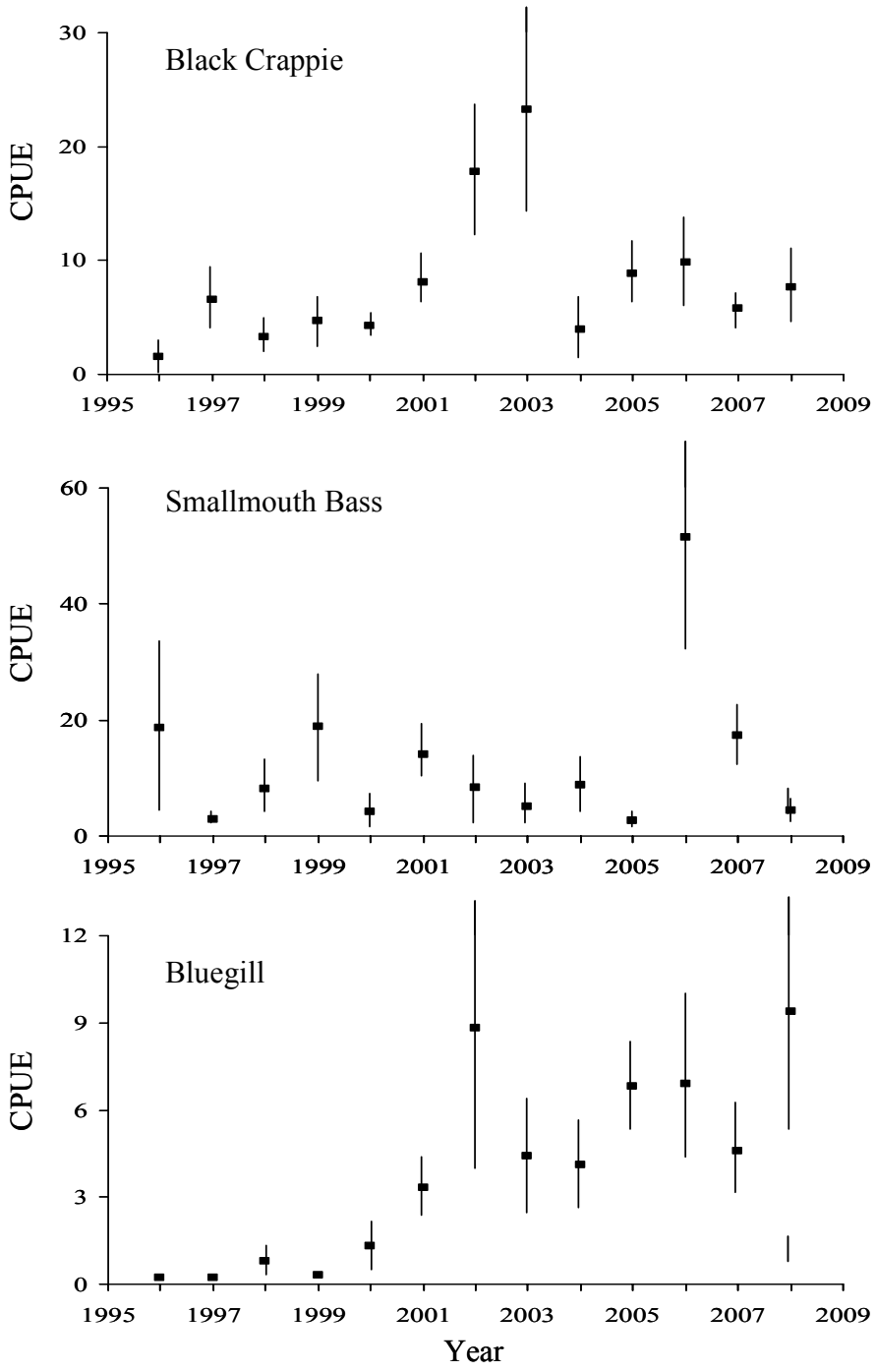


Figure 3. Catch per unit effort (CPUE; one overnight set) of black crappie, smallmouth bass and bluegill captured frame nets (19-mm bar-mesh netting; 0.9 m high x 1.5 m wide frames and 18.3 m long leads) set during summer fisheries surveys on Brant Lake, 1996-2008 (bars represent an 80% confidence interval).

Table 3. Mean fishing pressure (h and h/ha) and mean catch and harvest statistics for walleyes, yellow perch and northern pike on primary walleye waters in eastern South Dakota creel surveyed between 1996 and 2008. Creel data for the Brant, Herman, Madison and Sinai fisheries were rerun using a corrected version of the CAS program, and therefore, values for catch and harvest rates will be lower than those reported in Lucchesi (2009).

			Surface			*Walleye*			*Yellow perch*			*Northern pike*		
			area	*Fishing pressure*		*Catch*	*Harvest*		*Catch*	*Catch*		*Catch*	*Catch*	
Lake/season	*County*	*Period*	*(ha)*	*(h)*	*(h/ha)*	*rate*	*rate*	*per ha*	*rate*	*rate*	*per ha*	*rate*	*rate*	*per ha*
Summer														
Bitter	Day	2000-2008	4,010	46,950	11.7	0.84	0.28	3.24	0.01	0.01	0.07	0.21	0.04	0.48
Brant	Lake	1998-2008	420	25,293	60.2	0.35	0.09	5.71	0.13	0.10	7.69	0.01	0.003	0.16
Enemy Swim	Day	a	870	35,910	41.3	0.26	0.07	2.72	0.18	0.04	1.53	0.04	0.01	0.29
Herman	Lake	1998-2008	521	9,420	18.1	0.28	0.09	1.54	0.05	0.04	0.62	0.01	0.003	0.06
Madison	Lake	1998-2008	1,070	20,595	19.2	0.26	0.07	1.33	0.43	0.22	4.20	0.01	0.002	0.05
Pickerel	Day	b	377	21,285	56.5	0.34	0.09	5.14	0.14	0.04	2.28	0.17	0.03	1.73
Poinsett	Hamlin	1997-2004	3,200	57,786	18.1	0.41	0.13	2.27	0.03	0.02	0.42	0.07	0.01	0.20
Sinai	Brookings	2005-2008	696	19,902	28.6	0.49	0.11	3.10	0.31	0.20	5.97	0.002	0.001	0.02
Thompson	Kingsbury	1997-2008	e	120,383	21.0	0.65	0.27	5.56	0.06	0.04	0.81	0.10	0.02	0.31
Waubay	Day	1997-2008	6,289	108,841	17.3	0.98	0.21	3.60	0.52	0.20	3.53	0.14	0.03	0.48
Fall														
Madison	Lake	2005-2008	1,070	12,717	11.9	0.42	0.02	0.31	1.05	0.77	7.98	0.002	0.001	0.01
Winter														
Bitter	Day	1999-2008	4,010	17,657	4.4	0.29	0.10	0.93	0.18	0.14	0.64	0.20	0.12	0.52
Brant	Lake	2002-2008	420	5,060	12.0	0.18	0.04	0.62	0.01	0.01	0.19	0.003	0.001	0.01
Enemy Swim	Day	c	870	13,781	15.8	0.12	0.04	0.65	0.40	0.11	1.82	0.07	0.04	0.66
Madison	Lake	2002-2008	1,070	10,229	9.6	0.06	0.03	0.26	0.99	0.38	8.58	0.004	0.004	0.07
Pickerel	Day	d	377	7,235	19.2	0.06	0.02	0.59	0.71	0.32	8.73	0.02	0.001	0.17
Poinsett	Hamlin	1997-2002	3,200	20,771	6.5	0.55	0.11	0.89	0.23	0.21	1.63	0.03	0.02	0.12
Thompson	Kingsbury	1997-2008	e	26,255	4.8	0.20	0.08	0.38	0.07	0.06	0.30	0.03	0.01	0.07
Waubay	Day	1997-2008	6,289	105,473	16.8	0.34	0.07	1.14	1.24	0.86	14.50	0.06	0.04	0.60

a. 1997-1998, 2000-2008
b. 1997-1998, 2000-2001, 2006-2008
c. 1997-1998, 2000-2008
d. 1997-1998, 2000-2001, 2006-2008
e. Surface area decreased from about 6,576 ha to 4,559 ha from 1997 to 2000

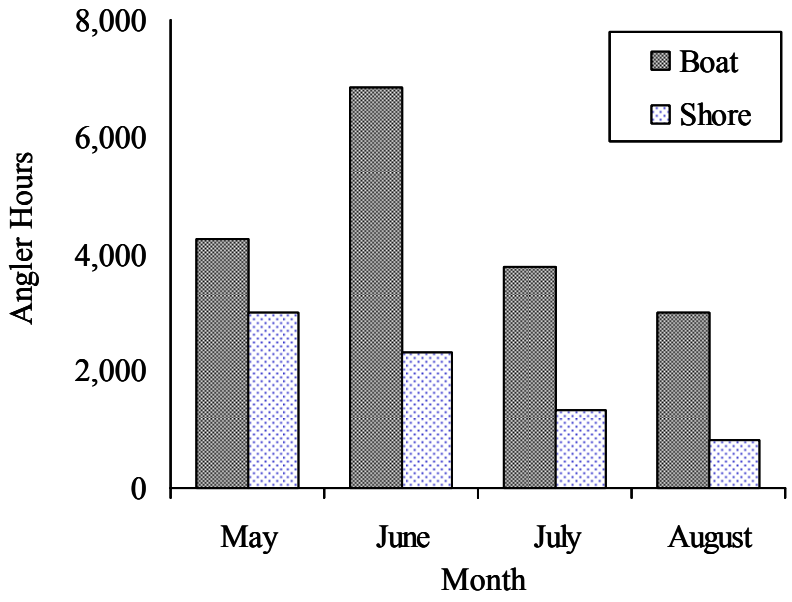


Figure 4. Mean monthly summer fishing pressure by boat and shore anglers on Brant Lake, 1998-2008.

Shore fishing pressure made up about 30% of the total summer fishing pressure on Brant Lake (Figure 4) and comprised a similar percentage of the total pressure on Lake Madison. However, shore fishing made up over 50% of the total fishing pressure on Lake Herman and only a small fraction of the pressure on Lake Thompson (Lucchesi 2009). The large contribution of shore fishing pressure to total fishing pressure on the Madison area lakes most likely reflects the excellent access provided to shore anglers. The highest shore fishing pressure usually occurred in May when walleye, northern pike and black crappie were most accessible to anglers.

Angler Demographics

Over 94% of angling parties fishing Brant Lake were South Dakota residents (Appendix 2). Non-resident participation exceeded 10% in only three of the 44 summer months surveyed. Non-resident use on nearby lakes Herman and Madison has also been less than 10% (unpublished data). The only exception has been the fall yellow perch fishery on Lake Madison where non-residents comprised 10% to 20% of the parties interviewed in 3 of the 4 years surveyed (unpublished data).

Comparable fisheries in northeastern South Dakota typically see higher non-resident use. The percentage of non-resident anglers fishing Enemy Swim and Pickerel Lake has increased from around 10% in the late-1990s to over 30% since 2000 (Blackwell 2005c; Blackwell et al. 2007a; Blackwell et al. 2007b). Popular large-lake walleye fisheries like Lake Thompson (Lucchesi 2009), Bitter Lake (Blackwell et al. 2007c) and Waubay Lake (Blackwell 2005a) also attract a substantially higher percentage of non-resident anglers than the Madison area lakes in the summer.

Residents of Minnehaha County comprised about 70% of angling parties interviewed on Brant Lake during the summers of 2002 through 2008 (Figure 5). Not surprisingly, most of Minnehaha County residents were from Sioux Falls. Lake County was the only other county contributing a large percentage of anglers. Annual variation in the percentage of anglers using Brant Lake by county was relatively small (Figure 5). The mean annual economic impact of the Brant Lake summer fishery was estimated at about $400,000 based on a value of $61 per trip (U.S. Department of the Interior, Fish and Wildlife Service, U.S. Bureau of Commerce Bureau of Census 2007).

Angler Catch and Harvest

Walleye

Summer catch and harvest rates for walleyes over the 11-year period averaged 0.35 walleyes/hour and 0.09 walleyes/hour, respectively. Annual harvest rates never exceeded the South Dakota Game, Fish and Parks (SDGFP 1994) objective of 0.15 walleyes/hour (Table 4). Some of the highest catch rates but lowest harvest rates occurred in 1998 and 1999 under the 356 mm (14-inch) minimum length limit (MLL). Under the MLL, walleye growth slowed and a large percentage of walleyes caught were less than 356 mm (14-inches) long. Anglers were generally dissatisfied with having to release nearly 90% of their catch and with the small size of walleyes in all the Madison area lakes, and consequently, supported the removal of the MLL.

Mean walleye catch and harvest rates on Brant Lake were similar to those for other popular walleye fisheries in eastern South Dakota (Table 3). Summer catch rates

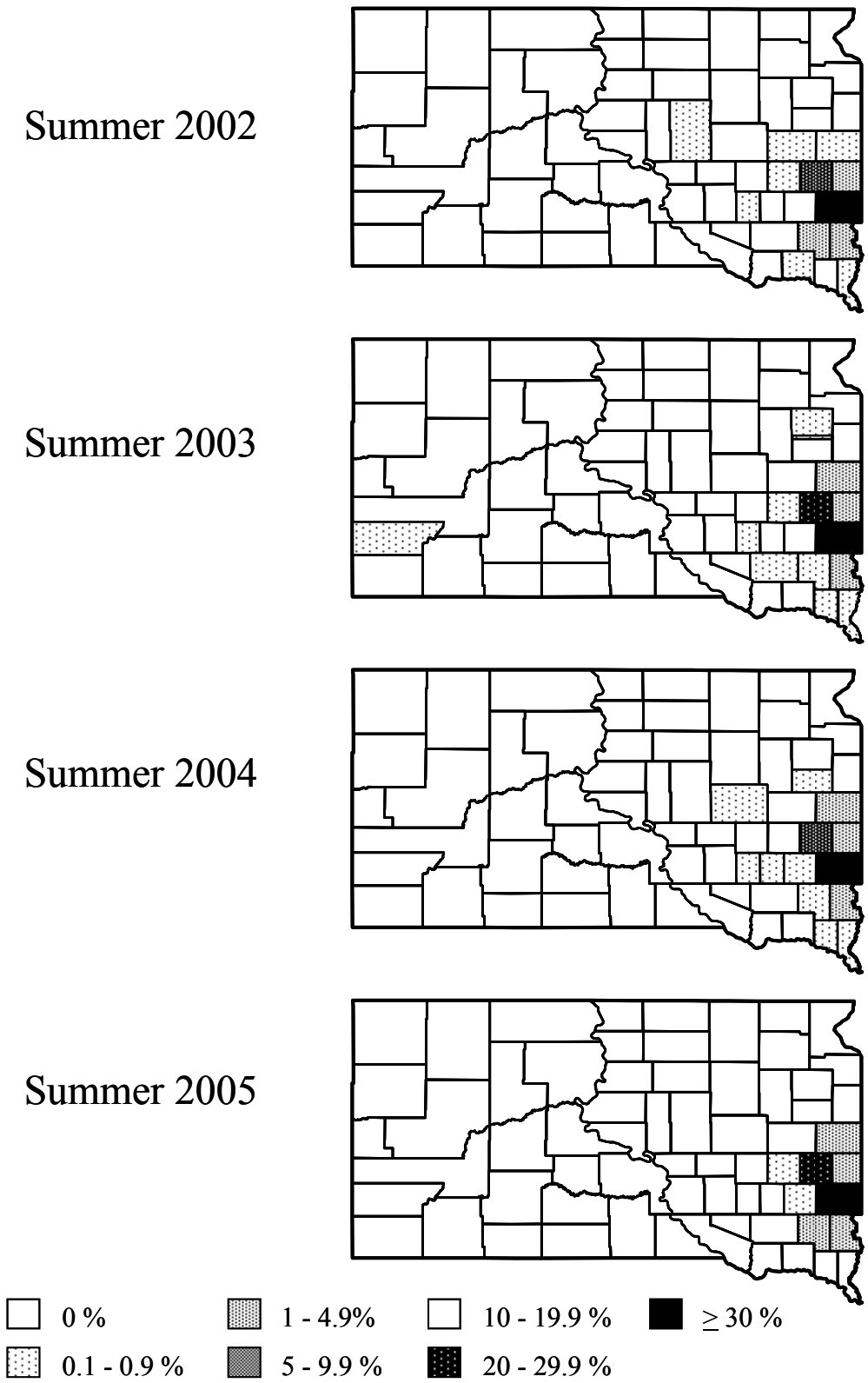


Figure 5. South Dakota county of residence for summer (May-August) resident anglers fishing Brant Lake, South Dakota from 2002 through 2008.

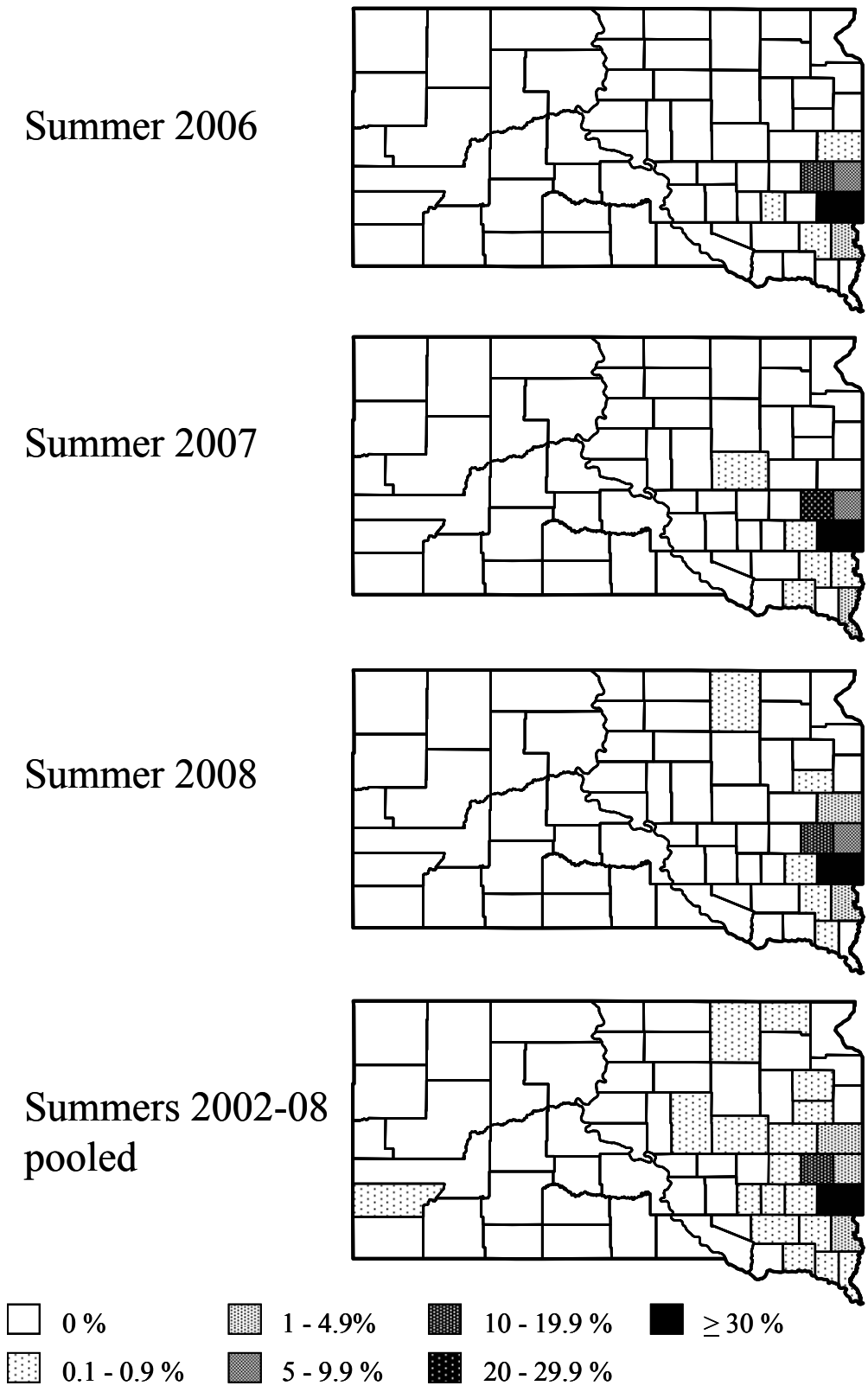


Figure 5. Continued

Table 4. Estimated number and rate (number per hour) of walleyes caught and harvested by anglers during the summer fishery on Brant Lake, South Dakota, 1998-2008. (80% confidence interval).

Year	*Catch*	*Harvest*	*Catch rate*	*Harvest rate*
1998	6,873 (1,931)	488 (276)	0.48 (0.26)	0.03 (0.03)
1999	7,573 (1,610)	830 (287)	0.56 (0.18)	0.06 (0.03)
2000	7,603 (1,989)	2,305 (1,119)	0.42 (0.19)	0.13 (0.09)
2001	5,868 (1,286)	3,405 (690)	0.20 (0.06)	0.11 (0.03)
2002	10,506 (2,188)	3,093 (968)	0.24 (0.07)	0.07 (0.03)
2003	22,158 (6,609)	2,911 (1,494)	0.79 (0.33)	0.10 (0.06)
2004	6,895 (2,053)	3,799 (960)	0.22 (0.10)	0.12 (0.05)
2005	4,832 (1,677)	3,930 (1,324)	0.15 (0.08)	0.12 (0.06)
2006	5,905 (1,431)	1,492 (471)	0.27 (0.12)	0.07 (0.04)
2007	2,664 (754)	1,751 (461)	0.18 (0.09)	0.12 (0.04)
2008	9,523 (3,104)	2,769 (1,019)	0.31 (0.14)	0.09 (0.04)

were 0.25-0.35 walleyes/h on five of 10 fisheries surveyed, and harvest rates were 0.07-0.13 walleyes/h on seven of those fisheries (Table 3). Mean summer harvest rates on all of these lakes were less than the SDGFP objective of 0.15/h suggesting that this objective rate may be unachievable on most waters, especially over longer periods of time. Only the fisheries in Bitter Lake, Lake Thompson and Waubay Lake were able support a harvest rate above 0.15 walleye/h over several years (Table 3).

Over the 11-year survey period, summer anglers caught and harvested an estimated 90,400 and 26,773 walleyes, respectively (Appendix 3). Annual walleye harvest increased after the removal of the MLL in 2000 and has been relatively stable

since (Table 4). This increase was in part due to the harvest of smaller fish as nearly 50% of the walleyes harvested were less than 356 mm (14-in) long. Since 2000, annual percentages of harvested walleyes 356 mm (14-in) and longer in the summer fishery have varied between 12% in 2003 and 94% in 2006 (Figure 6). Very few walleyes less than 305 mm (12 in) long were harvested (Figure 6), except in 2003, when larger fish were scarce and several hundred walleyes between 250 mm (9.8 inches) and 300 mm (11.8 inches) were taken. Annual mean lengths of harvested walleyes varied from 301 mm (12 in) in 2003 to 413 mm (16.2 in) in 2006 (Table 5).

Mean lengths of walleyes harvested from Brant Lake were similar to mean lengths documented for other southeastern South Dakota walleye fisheries managed under statewide regulations (Table 5). On average, anglers harvested slightly smaller walleyes on Lake Sinai and Lake Herman and larger walleyes on Lake Madison and Lake Thompson. Mean lengths for harvested walleyes on northeastern South Dakota waters managed under 356-mm (14-inch, lakes Enemy Swim, Pickerel, Poinsett and Waubay (2004-2008)) and 406-mm (16-inch, Bitter Lake and Waubay Lake (1997-2003)) MLL were larger as expected.

The mean summer, winter and total walleye angling yields over the 11-year period on Brant Lake were estimated at 2.47, 0.23 and 2.70 kg/ha, respectively (Table 6). The mean total yield for the Brant Lake walleye fishery was comparable to yields for other premier walleye fisheries in eastern South Dakota (Table 6). The mean walleye yield was also estimated for two of the Missouri River Reservoirs, Lake Oahe (110,660 ha or 273,330 acres) and Lake Sharpe (25,000 ha or 61,750 acres). Mean open-water (April – September) walleye angling yields for the period of 1991 through 2000 were 2.12 kg/ha for Lake Oahe and 2.66 kg/ha for Lake Sharpe. In all cases where summer and winter yield was estimated, the summer fishery comprised a much larger proportion of the total yield than the winter fishery (Table 6).

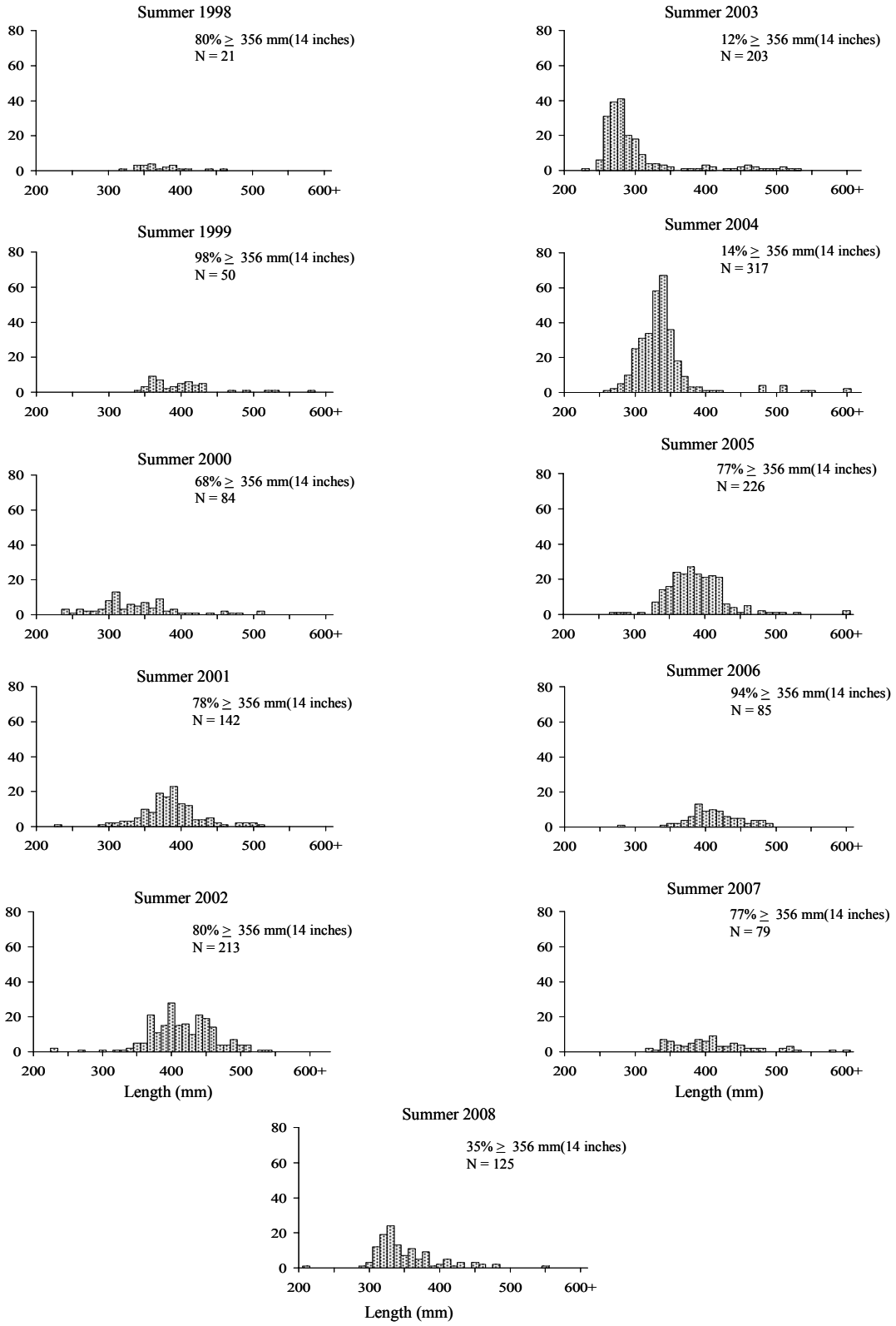


Figure 6. Length frequency of angler-harvested walleyes measured by the creel clerk during summer creel surveys on Brant Lake, 1998-2008.

Table 5. Mean total lengths (mm) of walleyes harvested by summer anglers on eastern South Dakota lakes, 1997-2008.

Year	*Bitter*	*Brant*	*Enemy Swim*	*Herman*	*Madison*	*Pickerel*	*Poinsett*	*Sinai*	*Thompson*	*Waubay*
1997			403			398	403		386	414
1998		374	399	355	376	383	392		355	406
1999		393		407	386		387		392	455
2000	424	339	379	344	326	431	414		386	478
2001	434	386	388	324	333	375	455		384	489
2002	429	396	399	369	355		383		373	473
2003	437	301	403	395	439		424		397	446
2004	438	338	406	403	419		480		384	384
2005	438	388	418	320	330			375	387	387
2006	458	413	401	314	387	400		338	383	385
2007	465	405	428	380	413	402		375	378	401
2008	448	343	446	376	423	402		348	398	414
Mean	441	371	406	362	381	399	417	359	384	428

Table 6. Mean number and weight of walleyes harvested per surface hectare (ha) of water for the summer, winter and combined fisheries on eastern South Dakota lakes. Means were calculated over the time periods presented in Table 3.

		Mean summer yield		*Mean winter yield*		*Mean total yield*	
Lake	*County*	*Number per ha*	*Weight per ha (kg)*	*Number per ha*	*Weight per ha (kg)*	*Number per ha*	*Weight per ha (kg)*
Bitter	Day	3.24	2.65	0.93	0.41	4.17	3.06
Brant	Lake	5.71	2.47	0.62	0.23	6.33	2.70
Enemy Swim	Day	2.72	1.54	0.65	0.39	3.37	1.93
Herman	Lake	1.54	0.74				
Madison	Lake	1.33	0.76	0.26	0.11	1.59	0.87
Pickerel	Day	5.14	3.03	0.59	0.30	5.73	3.33
Poinsett	Hamlin	2.27	1.50	0.89	0.49	3.16	1.99
Sinai	Brookings	3.10	1.24				
Thompson	Kingsbury	5.56	2.84	0.38	0.20	5.76	3.04
Waubay	Day	3.60	2.66	1.14	0.24	4.74	2.90

Baccante and Colby (1996) described walleye yield in terms of quartiles based on data from 168 North American walleye populations. The 25% quartile corresponded to a 0.50 kg/ha yield, 50% to a 1.24 kg/ha yield and 75% to a 2.95 kg/ha yield. The walleye

yield for Brant Lake approached the 75% quartile. Except for Lake Madison, walleye yields for South Dakota populations were above the 50% quartile, and yields for the four best fisheries were at or above the 75% quartile. Yields for Missouri River Reservoirs were also above the 50% quartile. The walleye yield on Brant Lake was the highest among the three Madison area lakes and was similar to yields for some of the best walleye fisheries.

Northern Pike

Catch and harvest rates for northern pike throughout the survey period (Table 7) were low when compared to other eastern South Dakota lakes. Just over 3,000 northern pike were caught in 11 years and only 760 were harvested (Appendix 3). Catch and harvest rates were similar to those observed on Lake Herman and Lake Madison (Table 3), but lower than those recorded on newly-filled waters like Bitter Lake (Blackwell 2005b), Cattail-Kettle Lake (Blackwell 2005d) or Pickerel Lake (Blackwell et al. 2007a). Northern pike were often caught incidentally while fishing for walleyes as few anglers indicated that they were primarily targeting northern pike, and typically, less than 25% of the pike caught were harvested (Table 3).

Yellow Perch

Large yellow perch year classes produced in 2000 and 2001 supported the majority of the yellow perch fishery during the survey period. Lake survey gill-net CPUE (Figure 2) and angler catch and harvest (Table 8) peaked in 2002 as these large year classes were recruited. The highest estimated harvest (10,419 fish) and harvest rate (0.84/h) were recorded in August, 2002 (Appendices 3 and 4). Harvest rates remained high through 2003, and then steadily declined (Appendix 4). Anglers harvested about 75% of their catch and nearly all of these fish were 200 to 300 mm (7.9-11.8 in) long (Figure 7).

Yellow perch fisheries across eastern South Dakota benefited from strong natural reproduction in 2001. The 2001 year class provided some of the best perch fishing of the last 10-years on Lakes Madison, Herman, Sinai (unpublished data) and Thompson

Table 7. Estimated number and rate (number per hour) of northern pike caught and harvested by anglers during the summer fishery on Brant Lake, South Dakota, 1998-2008. (80% confidence interval).

Year	*Catch*	*Harvest*	*Catch rate*	*Harvest rate*
1998	702 (227)	163 (68)	0.05 (0.03)	0.01 (0.004)
1999	396 (139)	103 (42)	0.03 (0.01)	0.008 (0.003)
2000	63 (27)	15 (13)	0.004 (0.002)	0.0009 (0.0007)
2001	115 (58)	57 (26)	0.004 (0.002)	0.002 (0.001)
2002	728 (310)	143 (64)	0.02 (0.008)	0.003 (0.001)
2003	106 (71)	62 (59)	0.004 (0.003)	0.002 (0.002)
2004	95 (56)	31 (29)	0.003 (0.002)	0.001 (0.001)
2005	34 (35)	0	0.001 (0.0008)	0
2006	193 (77)	62 (45)	0.009 (0.005)	0.003 (0.002)
2007	120 (39)	55 (31)	0.008 (0.003)	0.004 (0.002)
2008	579 (146)	69 (39)	0.02 (0.02)	0.002 (0.002)

(Lucchesi 2009). More consistent natural reproduction on Lake Madison and Lake Sinai have provided periods of good yellow perch fishing since 2003, and these lakes have not experienced the steady decline in summer harvest like Brant Lake and Lake Thompson.

Black Crappie

The highest summer catch and harvest rates of black crappies also occurred in 2002 and 2003 (Table 9). The highest monthly harvest rates occurred in August 2002 and June 2003. In August 2002, black crappies were incidentally caught by anglers targeting yellow perch, while anglers primarily targeting black crappies enjoyed

Table 8. Estimated number and rate (number per hour) of yellow perch caught and harvested by anglers during the summer fishery on Brant Lake, South Dakota, 1998-2008. (80% confidence interval).

Year	*Catch*	*Harvest*	*Catch rate*	*Harvest rate*
1998	320 (186)	219 (101)	0.02 (0.01)	0.02 (0.007)
1999	702 (285)	326 (202)	0.05 (0.03)	0.02 (0.02)
2000	2,578 (1,302)	2,156 (1,328)	0.14 (0.11)	0.12 (0.10)
2001	358 (94)	130 (82)	0.01 (0.005)	0.004 (0.003)
2002	26,105 (6,350)	20,180 (5,475)	0.59 (0.18)	0.46 (0.15)
2003	9,518 (2,298)	6,928 (1,825)	0.34 (0.12)	0.25 (0.09)
2004	2,560 (874)	2,394 (848)	0.08 (0.05)	0.08 (0.05)
2005	1,758 (509)	1,490 (429)	0.06 (0.02)	0.05 (0.02)
2006	1,028 (577)	502 (255)	0.05 (0.04)	0.02 (0.02)
2007	460 (273)	390 (259)	0.03 (0.03)	0.03 (0.03)
2008	410 (146)	300 (137)	0.01 (0.006)	0.01 (0.005)

exceptionally high catch rates (nearly four fish per hour) in June 2003 (Appendix 1). Highest mean catch and harvest rates primarily occurred in May (Appendix 4). The 11-year mean black crappie catch and harvest rates were similar on Brant Lake and Lake Madison, however, the best crappie fishing has occurred in the last 5 years on Lake Madison (unpublished data). Nearly all of the black crappie harvested were 200 to 300 mm (7.9 to 11.8 in) long (Figure 8). Anglers harvested about 70% of their catch, similar to the percentage harvested on Lake Thompson (Lucchesi 2009) and Waubay Lake (Blackwell and Hubers 2003).

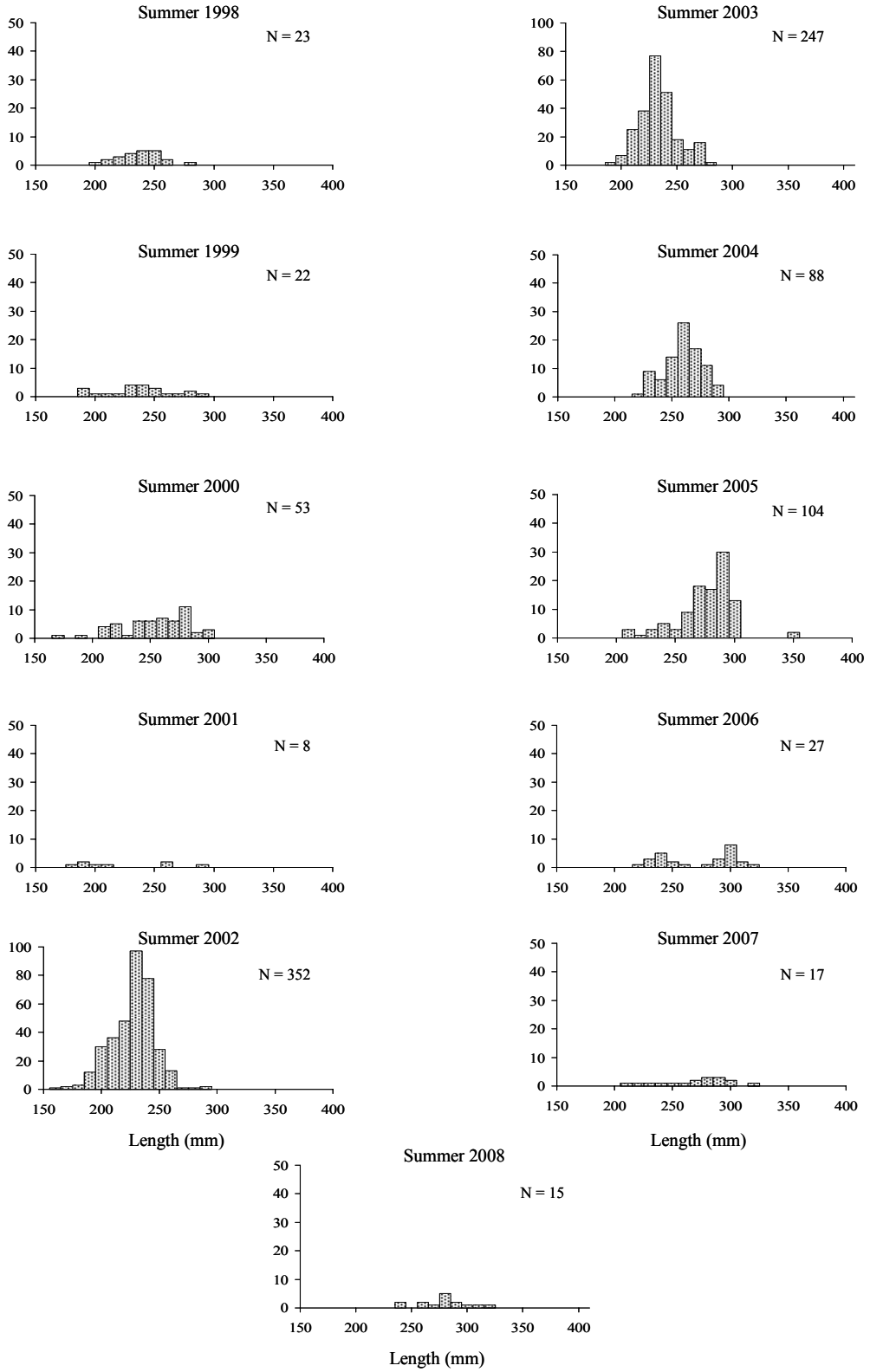


Figure 7. Length frequency of angler-harvested yellow perch measured by the creel clerk during summer creel surveys on Brant Lake, 1998-2008.

Table 9. Estimated number and rate (number per hour) of black crappie caught and harvested by anglers during the summer fishery on Brant Lake, South Dakota, 1998-2008. (80% confidence interval).

Year	*Catch*	*Harvest*	*Catch rate*	*Harvest rate*
1998	1,017 (1,141)	720 (993)	0.07 (0.08)	0.05 (0.07)
1999	186 (83)	85 (66)	0.01 (0.007)	0.006 (0.005)
2000	2,690 (2,577)	901 (871)	0.15 (0.15)	0.05 (0.04)
2001	440 (219)	440 (219)	0.01 (0.008)	0.01 (0.008)
2002	9,785 (6,639)	4,018 (2,070)	0.22 (0.17)	0.09 (0.06)
2003	8,593 (4,607)	5,206 (2,467)	0.30 (0.22)	0.18 (0.10)
2004	5,945 (1,567)	5,585 (1,582)	0.19 (0.04)	0.18 (0.04)
2005	600 (459)	472 (454)	0.02 (0.01)	0.01 (0.01)
2006	1,686 (786)	1,071 (655)	0.08 (0.04)	0.05 (0.04)
2007	347 (195)	257 (139)	0.03 (0.03)	0.03 (0.03)
2008	2,281 (1,397)	1,756 (1,275)	0.07 (0.07)	0.06 (0.05)

Smallmouth Bass

Smallmouth bass catch and catch rate increased over the survey period with the highest catch rates recorded over the last 3 years (Table 10). The 11-year total summer catch and harvest were estimated at 33,972 and 6,019, respectively (Appendix 3). The total catch of smallmouth bass was similar to black crappie and second only to walleye and yellow perch. However, anglers only harvested about one of every five smallmouth bass caught (Appendix 3). About 60% of bass harvested were less than 305 mm (12 inches) long and only a few over 406 mm (16 inches) were harvested (Figure 9).

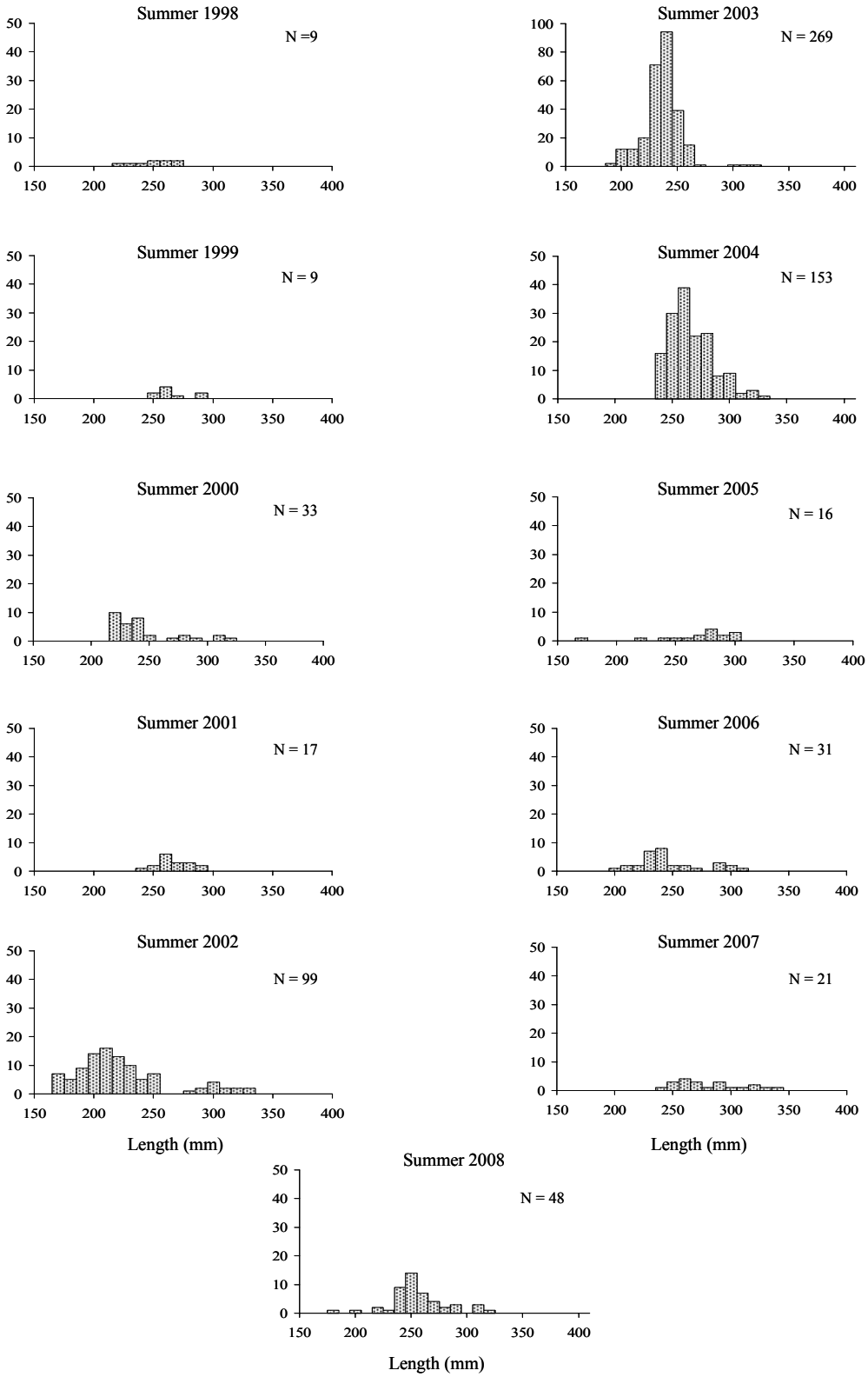


Figure 8. Length frequency of angler-harvested black crappie measured by the creel clerk during summer creel surveys on Brant Lake, 1998-2008.

Many large eastern South Dakota natural lakes support excellent smallmouth bass fisheries. Summer catch rates of 0.27-0.52 fish/h on Enemy Swim Lake (Blackwell 2005c; Blackwell et al. 2007b) and 0.14-0.71 fish/h on Pickerel Lake (Blackwell et al. 2007a) have been documented. Anglers were more willing to harvest smaller bass (< 305 mm or 12 inches) on Brant Lake than on either Enemy Swim Lake or Pickerel Lake. The percentage of angling parties targeting smallmouth bass varied little on Brant Lake (Table 1), but it is beginning to increase on some lakes in the northeast (Blackwell et al. 2007a).

Table 10. Estimated number and rate (number per hour) of smallmouth bass caught and harvested by anglers during the summer fishery on Brant Lake, South Dakota, 1998-2008. (80% confidence interval).

Year	*Catch*	*Harvest*	*Catch rate*	*Harvest rate*
1998	1,681 (1,064)	132 (58)	0.12 (0.09)	0.009 (0.005)
1999	1,314 (889)	102 (91)	0.10 (0.07)	0.008 (0.007)
2000	1,697 (722)	61 (63)	0.09 (0.06)	0.003 (0.003)
2001	984 (393)	659 (255)	0.03 (0.01)	0.02 (0.009)
2002	4,658 (965)	987 (358)	0.11 (0.03)	0.02 (0.009)
2003	3,607 (946)	856 (318)	0.13 (0.07)	0.03 (0.02)
2004	1,872 (395)	659 (353)	0.06 (0.02)	0.02 (0.01)
2005	1,419 (503)	250 (161)	0.04 (0.02)	0.008 (0.006)
2006	5,969 (1,849)	998 (214)	0.27 (0.13)	0.05 (0.02)
2007	5,412 (1,057)	594 (119)	0.37 (0.12)	0.04 (0.02)
2008	5,359 (3,631)	721 (252)	0.18 (0.13)	0.02 (0.01)

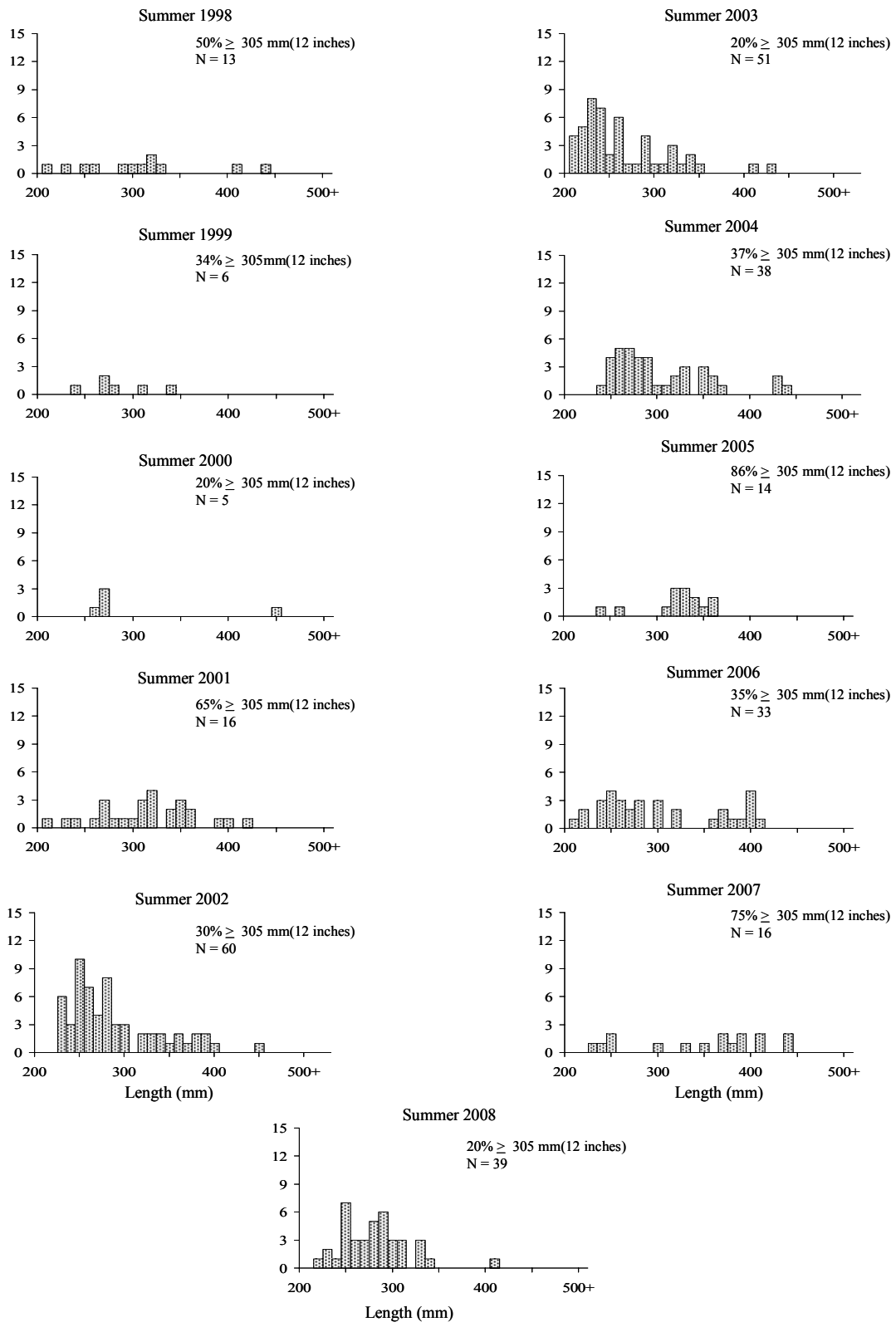


Figure 9. Length frequency of angler-harvested smallmouth bass measured by the creel clerk during summer creel surveys on Brant Lake, 1998-2008.

Other Species

Brant Lake had a limited bluegill fishery during the survey period (Table 11). However, a gradual increase in catch and harvest rates can probably be attributed to observed increases in submergent vegetation around the shoreline. Highest mean monthly catch and harvest rates occurred in August (Appendix 4). Although not abundant, large bluegills (> 250 mm or 9.8 inches) were measured each year from 2004 through 2008.

Table 11. Estimated number and rate (number per hour) of bluegill caught and harvested by anglers during the summer fishery on Brant Lake, South Dakota, 1998-2008. (80% confidence interval).

Year	*Catch*	*Harvest*	*Catch rate*	*Harvest rate*
1998	0	0	0	0
1999	0	0	0	0
2000	10 (16)	10 (16)	0.0006 (0.0009)	0.0006 (0.0009)
2001	0	0	0	0
2002	1,787 (638)	952 (449)	0.04 (0.02)	0.02 (0.01)
2003	318 (232)	23 (24)	0.01 (0.01)	0.0008 (0.0008)
2004	362 (142)	344 (141)	0.01 (0.003)	0.01 (0.004)
2005	466 (153)	165 (60)	0.01 (0.007)	0.005 (0.003)
2006	1,122 (603)	574 (297)	0.05 (0.03)	0.03 (0.02)
2007	44 (40)	44 (40)	0.003 (0.003)	0.003 (0.003)
2008	265 (220)	230 (240)	0.009 (0.003)	0.008 (0.004)

White bass were first recorded in the creel survey in 2006 (Table 12). In 2008, anglers caught nearly 5,000 and harvested about 1,650 white bass. The majority of harvested fish were 210 mm (8.3 inches) to 290 mm (11.4 inches) long.

Black bullhead catch and harvest peaked in 2003 (Table 13) which was similar to lakes Herman and Madison. The 2003 fishery could probably be attributed to strong production in 2001 when water levels were high. Nearly all of the black bullheads harvested were 200 to 300 mm (7.9 to 11.8 in) long (Figure 10). Channel catfish, green

Table 12. Estimated number and rate (number per hour) of white bass caught and harvested by anglers during the summer fishery on Brant Lake, South Dakota, 1998-2008. (80% confidence interval).

Year	*Catch*	*Harvest*	*Catch rate*	*Harvest rate*
1998	0	0	0	0
1999	0	0	0	0
2000	0	0	0	0
2001	0	0	0	0
2002	0	0	0	0
2003	0	0	0	0
2004	0	0	0	0
2005	0	0	0	0
2006	238 (109)	106 (79)	0.01 (0.005)	0.005 (0.004)
2007	52 (39)	35 (36)	0.003 (0.003)	0.002 (0.004)
2008	4,998 (7,999)	1,631 (2,369)	0.16 (0.27)	0.05 (0.08)

Table 13. Estimated number and rate (number per hour) of black bullhead caught and harvested by anglers during the summer fishery on Brant Lake, South Dakota, 1998-2008. (80% confidence interval).

Year	*Catch*	*Harvest*	*Catch rate*	*Harvest rate*
1998	751 (247)	310 (232)	0.05 (0.02)	0.02 (0.02)
1999	605 (226)	315 (169)	0.04 (0.02)	0.02 (0.02)
2000	1,221 (605)	862 (564)	0.07 (0.05)	0.05 (0.04)
2001	302 (386)	189 (241)	0.01 (0.01)	0.006 (0.008)
2002	5,000 (993)	491 (255)	0.11 (0.03)	0.01 (0.006)
2003	5,375 (2,024)	1,932 (1,515)	0.19 (0.08)	0.07 (0.06)
2004	2,809 (599)	436 (93)	0.09 (0.03)	0.01 (0.008)
2005	1,847 (808)	20 (24)	0.06 (0.03)	0.0006 (0.0008)
2006	1,736 (489)	304 (305)	0.08 (0.02)	0.01 (0.01)
2007	470 (266)	411 (262)	0.03 (0.01)	0.03 (0.01)
2008	874 (726)	660 (611)	0.03 (0.03)	0.02 (0.03)

sunfish, common carp and bigmouth buffalo were also caught during the survey period (Appendix 3), but catch and harvest rates were very low (Appendix 4).

Winter

Fishing Pressure

Walleyes were the primary target of winter anglers, except during the winter of 2005-2006 when 48% targeted yellow perch (Table 14). Over the 6-year survey period,

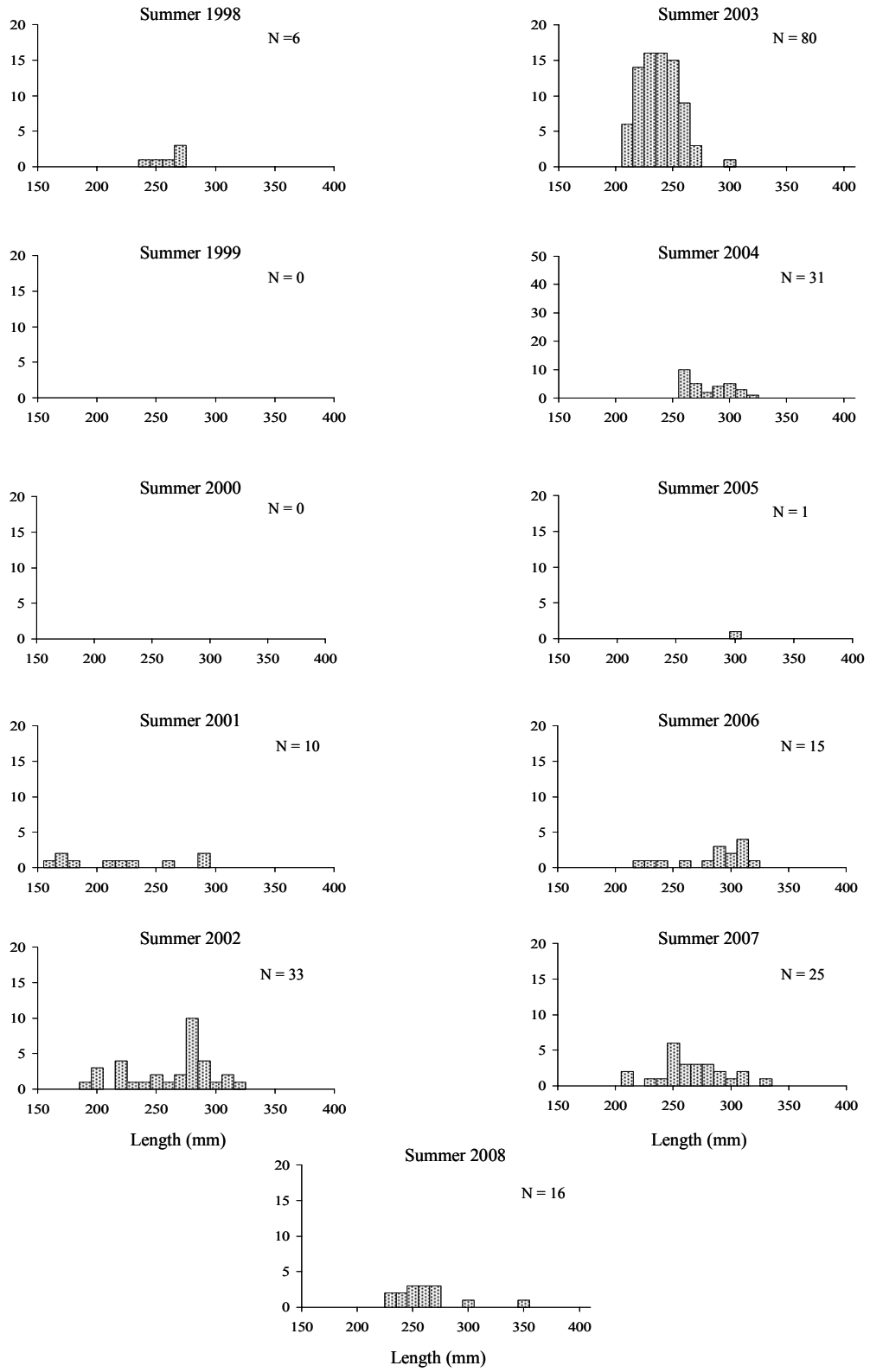


Figure 10. Length frequency of angler-harvested black bullhead measured by the creel clerk during summer creel surveys on Brant Lake, 1998-2008.

Table 14. Percent of angling parties interviewed primarily targeting a species (or any species) during the winter fishery on Brant Lake, 2002-2008.

	Percent of anglers targeting					
Year	*Walleye*	*Yellow perch*	*Black crappie*	*Northern pike*	*Smallmouth bass*	*Any species*
2002-03	79	10	0	0	0	11
2003-04	88	4	0	0	0	8
2004-05	48	26	10	0	0	16
2005-06	26	48	2	2	0	22
2006-07	88	4	1	0	1	6
2007-08	50	13	17	1	0	19

18% of winter angling parties targeted yellow perch, followed by black crappie (7%), and generalists comprised about 14% of angling parties. Overall, the percentage of angling parties targeting a specific species and the percent of generalist anglers were similar for the summer and winter fisheries.

Winter fishing pressure varied greatly from about 1,500 hours during the winter of 2004-05 to over 8,000 hours in the winter of 2002-03 (Table 15 and Figure 11). The low fishing pressure in the winters of 2004-05 and 2005-06 was caused by poor ice fishing success. Winter fishing pressure comprised between 5% (2004-05) and 30% (2006-07) of the total annual fishing pressure. The mean contribution of winter fishing pressure to total pressure was 16% during the 6 years of winter surveys.

The contribution of the winter fishery to total annual pressure varied by year on Lake Thompson, however, the average contribution (19%) was similar to Brant Lake (Lucchesi 2009). Winter fisheries on Bitter, Enemy Swim, Pickerel and Poinsett generated 20% to 30% of the annual fishing pressure and the winter fishery for yellow perch on Waubay Lake was nearly 50% of the total. Lakes with good winter fisheries for panfish generally supported higher fishing pressure (Table 3).

Peak winter fishing pressure on Brant Lake occurred in January (Figure 12). Thicker ice in January and February made for safer vehicle travel and allowed the use

Table 15. Winter totals for the number of interviews and estimates for fishing pressure and fishing pressure per surface hectare of water, angler days and economic value from creel surveys conducted on Brant Lake, December through March, 1997-2008.

Year	*Number of interviews*	*Angler hours*	*Angler hours/ hectare*	*Angler days*	*Economic value*
2002-03	151	8,098 (1,697)	19.3 (4.0)	1,064	$64,912
2003-04	155	7,651 (1,970)	18.2 (4.7)	1,409	$85,950
2004-05	58	1,561 (488)	3.7 (1.2)	312	$19,032
2005-06	46	1,606 (408)	3.8 (1.0)	597	$36,419
2006-07	136	6,642 (1,772)	15.8 (4.2)	1,562	$95,332
2007-08	151	4,799 (1,151)	11.4 (2.7)	562	$34,319

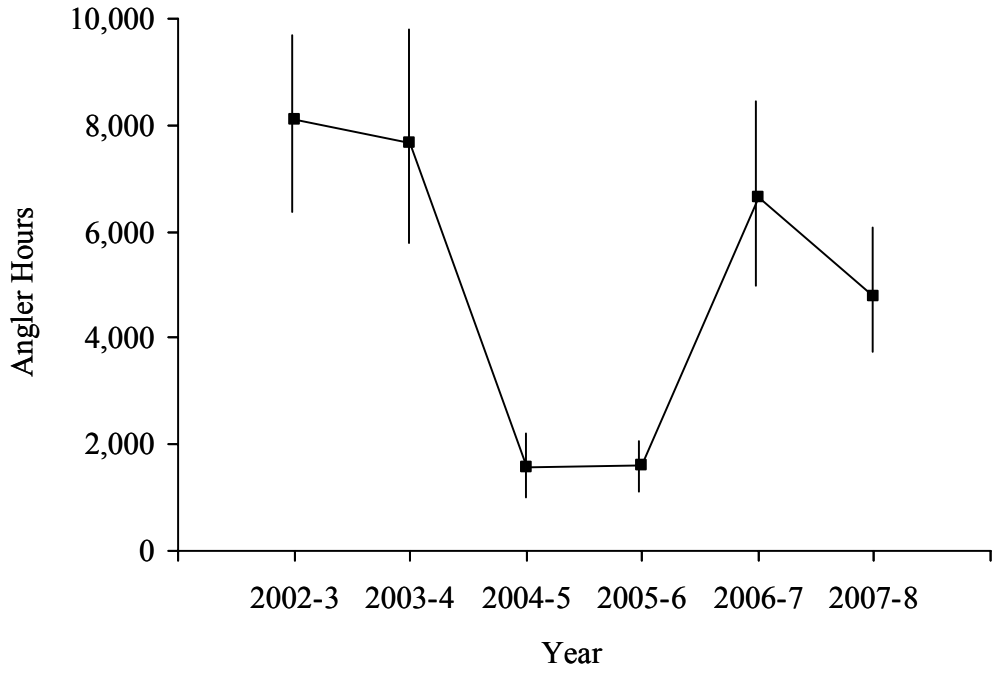


Figure 11. Estimated winter fishing pressure measured in angler hours on Brant Lake, 2002-2008 (bars represent an 80% confidence interval).

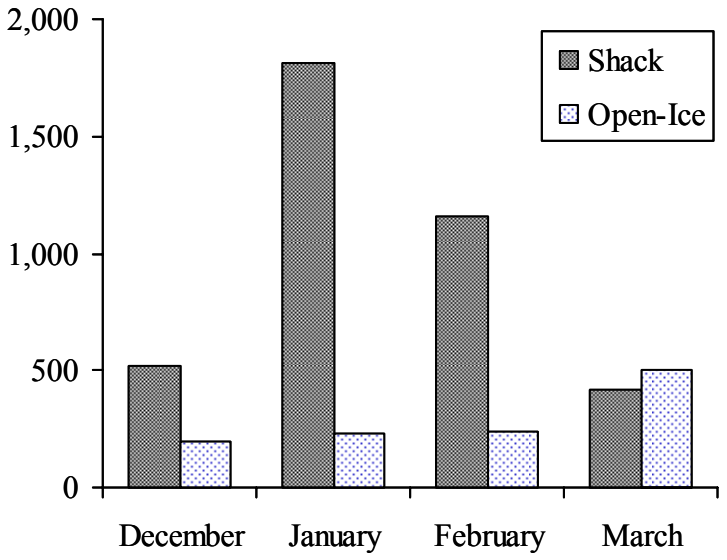


Figure 12. Mean monthly winter fishing pressure for shack and open-ice anglers on Brant Lake, 2002-2008.

of permanent shacks. The highest percentage of anglers fishing in ice shacks occurred in January (89%) and February (83%, Figure 12), and on average, 77% of the winter fishing pressure was done from a shack. The percentages of shack and open-ice anglers were similar on Brant Lake and Lake Thompson (Lucchesi 2009).

Angler Demographics

Throughout the survey period, about 97% of winter anglers on Brant Lake were South Dakota residents. The percentage of non-resident anglers using the fishery varied from 1% in 2007-08 to 7% in 2003-04 (Appendix 6). Winter participation by non-residents on Lake Madison was also less than 5% except during the winter of 2002-03 (unpublished data) when the yellow perch harvest rate was 2.72 fish/h.

Non-resident participation in winter fisheries has been higher on other eastern South Dakota lakes. From 1997 through 2008, about 20% of winter anglers on Lake Thompson were non-residents (Lucchesi 2009). Non-resident participation on Enemy

Swim Lake reached 42% during the winter of 2003-04 with a majority of anglers targeting bluegills (Blackwell 2005c). Non-resident participation on Waubay Lake varied between 20% and 40% from 1999 through 2004 (Blackwell and Hubers 2003; Blackwell 2005a). Non-residents comprised more than half (55%) of the anglers in the winter 2005-06 bluegill and black crappie fishery on Pickerel Lake and about 40% of these angling parties were from Minnesota (Blackwell et al. 2007a). Nearly all winter fisheries with high non-resident participation provided exceptional panfishing opportunity.

As with the summer fishery, Minnehaha County residents comprised a large percentage (65%) of the parties fishing Brant Lake in the winter (Figure 13). The only other county contributing a large percentage of anglers was Lake. Annual variation in percentage of anglers by county was low (Figure 13).

The mean annual economic impact of the Brant Lake summer fishery was estimated at about $55,000 based at a value of $61 per trip (U.S. Department of the Interior, Fish and Wildlife Service, U.S. Bureau of Commerce Bureau of Census 2007).

Angler Catch and Harvest

Walleye

Walleye catch and harvest rates on Brant Lake averaged 0.18 walleyes/hour and 0.04 walleyes/hour, respectively (Table 16). This was well below the SDGFP objective harvest rate of 0.15 walleyes/h, and none of the annual winter harvest rates exceeded that objective. No walleye catch or harvest was documented during the winters of 2004-05 and 2005-06 (Table 16). Decent catch and harvest rates for the corresponding summer fisheries (Table 4) indicate that walleye catchability is low in the winter. Therefore, it is not surprising that winter harvest comprised only a small percentage (about 10%) of the total harvest.

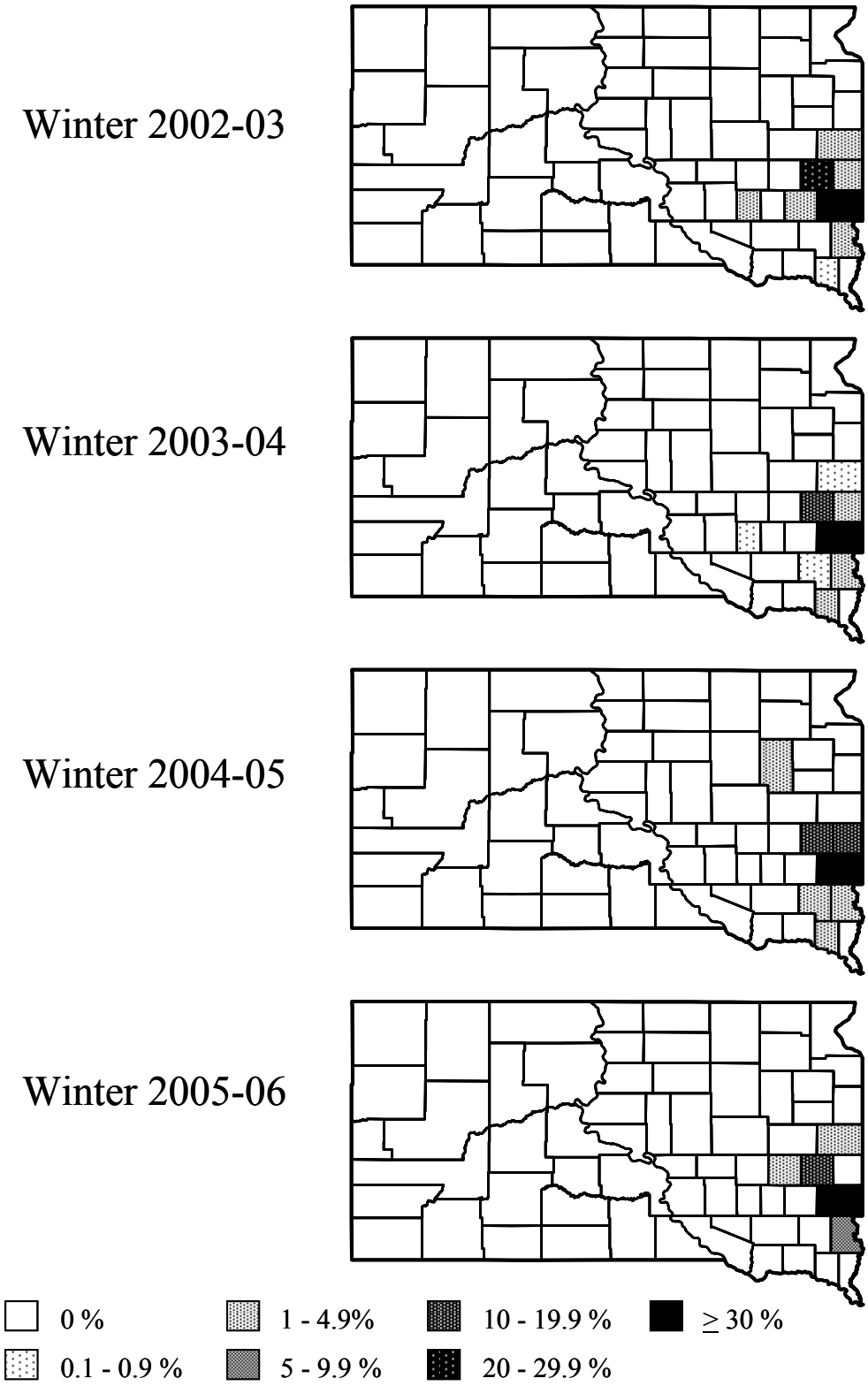


Figure 13. South Dakota county of residence for winter (December-March) resident anglers fishing Brant Lake, South Dakota from 2002 through 2008.

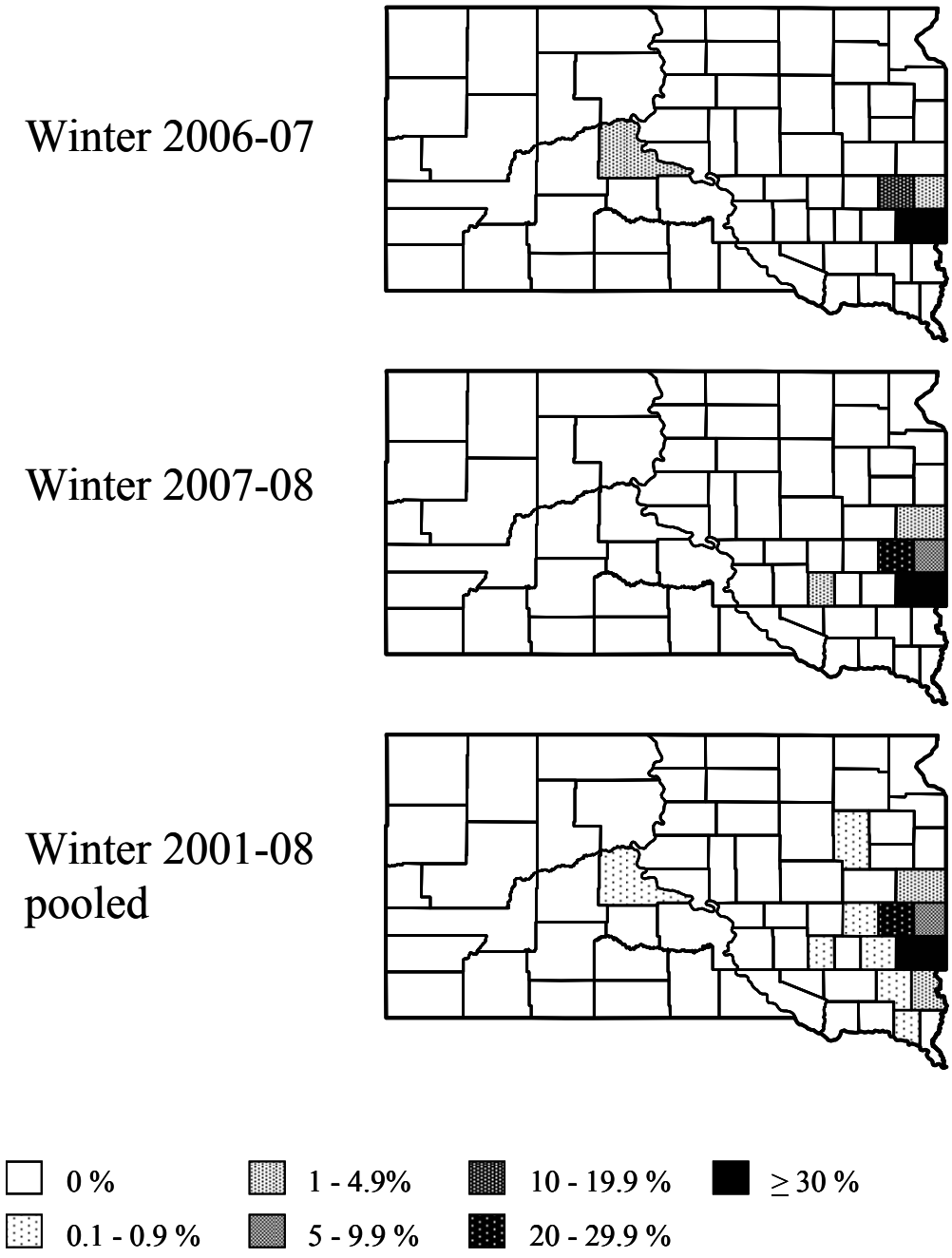


Figure 13. Continued

Table 16. Estimated number and rate (number per hour) of walleyes caught and harvested by anglers during the winter fishery on Brant Lake, South Dakota, 2002-2008. (80% confidence interval).

Year	*Catch*	*Harvest*	*Catch rate*	*Harvest rate*
2002-03	3,902 (1,331)	539 (198)	0.48 (0.42)	0.07 (0.07)
2003-04	1,091 (581)	568 (241)	0.14 (0.08)	0.07 (0.04)
2004-05	0	0	0	0
2005-06	0	0	0	0
2006-07	2,389 (797)	459 (127)	0.36 (0.25)	0.07 (0.04)
2007-08	439 (279)	153 (115)	0.09 (0.08)	0.03 (0.03)

Mean winter catch and harvest rates for walleyes on Brant Lake were similar to rates for Lake Madison, Pickerel Lake and Enemy Swim Lake (Table 3). Highest winter catch rates were found on Lake Poinsett (0.55/h), Waubay Lake (0.34/h) and Bitter Lake (0.29/h). Minimum length limits on these waters helped to increase catch rates and depress harvest rates. Winter catch rates on all other waters surveyed, except Lake Thompson, were less than the 0.18 walleyes/hour recorded for Brant Lake (Table 3). All mean harvest rates were well below the SDGFP objective of 0.15 walleyes/h suggesting that this objective may be unrealistic for winter fisheries in eastern South Dakota.

The winter fishery accounted for only 10% of the annual walleye harvest on Brant Lake. Winter fishery contribution to total walleye harvest was only 6% on Lake Thompson, but was higher for the winter fisheries on Bitter Lake (22%), Lake Poinsett (28%) and Waubay Lake (24%). The Pickerel Lake winter fishery had a mean winter walleye contribution (10%) similar to Brant Lake.

Only 22% of walleyes harvested during the winter on Brant Lake were 356-mm (14-in) or longer (Figure 14). That would suggest that the 356 mm (14-inch) MLL, in place from 1992 though 1999, may have further curtailed the limited winter harvest of walleyes during that period. The 6-year mean length of winter-harvested walleyes was 339 mm or just over 13-inches long which was shorter than the mean length of harvested fish on any other water surveyed (Table 17). Mean lengths of harvested walleyes were substantially higher on lakes with 356 mm (14 in) and 406 mm (16 in) MLLs (Table 17).

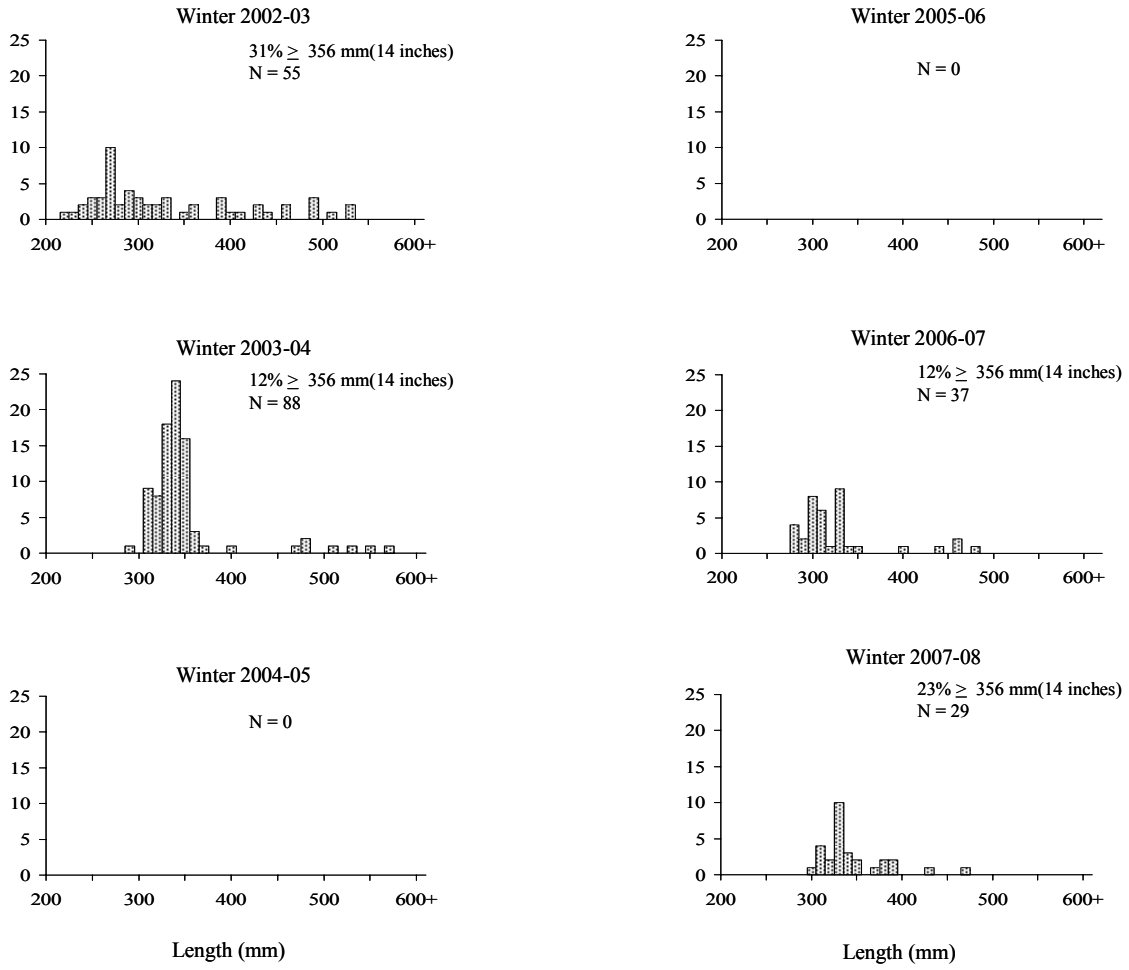


Figure 14. Length frequency of angler-harvested walleyes measured by the creel clerk during winter creel surveys on Brant Lake, 2002-2008.

Table 17. Mean total lengths (mm) of walleyes harvested by winter anglers on eastern South Dakota lakes, 1996-2008.

Year	*Bitter*	*Brant*	*Enemy Swim*	*Pickerel*	*Poinsett*	*Thompson*	*Waubay*
1996-97							473
1997-98			404		382	354	378
1998-99					384	368	447
1999-00	420				389	383	480
2000-01	430		378		411	363	493
2001-02	511		438		376	384	472
2002-03	449	333	409			381	477
2003-04	439	350	414	381		361	394
2004-05	457		427	428		382	384
2005-06	442		397	407		386	384
2006-07	419	329	428	393		400	392
2007-08	454	345	414	408		365	392
Mean	447	339	412	403	388	375	431

Other Species

Winter catch and harvest rates for northern pike (Table 18), yellow perch (Table 19) and black crappie (Table 20) were low throughout the survey period. Only one yellow perch and one black crappie were observed during the winter of 2005-06. One northern pike was the only fish observed in the winter 2003-04 survey. Open-water anglers enjoyed good fishing for yellow perch and black crappie immediately following these slow winter periods. Fishing reports indicate that fishing pressure and harvest of walleyes, yellow perch and black crappie have increased in the two winters following this survey.

Angler Opinions

Anglers were asked a variety of questions about angler satisfaction and preference with respect to regulations and harvest options during the survey period (Appendix 9). More than 60% of angling parties interviewed in the summers of 2002 and 2003 were satisfied with their fishing trip (Appendix 9, Questions 3, and 4). Catch and harvest rates for walleye, yellow perch and black crappie were high these years which likely explains the high satisfaction. In comparison, angler satisfaction varied more on Lake Thompson, with only 38% satisfied in 2002 and 85% satisfied in 2003 (Lucchesi 2009). The top

Table 18. Estimated number and rate (number per hour) of northern pike caught and harvested by anglers during the winter fishery on Brant Lake, South Dakota, 2002-2008. (80% confidence interval).

Year	*Catch*	*Harvest*	*Catch rate*	*Harvest rate*
2002-03	42 (17)	0	0.005 (0.003)	0
2003-04	33 (13)	30 (10)	0.004 (0.008)	0.004 (0.005)
2004-05	5 (3)	5 (3)	0.003 (0.002)	0.003 (0.002)
2005-06	0	0	0	0
2006-07	7 (8)	0	0.001 (0.001)	0
2007-08	10 (10)	0	0.002 (0.002)	0

Table 19. Estimated number and rate (number per hour) of yellow perch caught and harvested by anglers during the winter fishery on Brant Lake, South Dakota, 2002-2008. (80% confidence interval).

Year	*Catch*	*Harvest*	*Catch rate*	*Harvest rate*
2002-03	385 (63)	381 (62)	0.05 (0.02)	0.05 (0.02)
2003-04	0	0	0	0
2004-05	0	0	0	0
2005-06	9 (15)	9 (15)	0.006 (0.009)	0.006 (0.009)
2006-07	18 (16)	8 (0)	0.003 (0.003)	0.001 (0.0003)
2007-08	68 (42)	65 (42)	0.01 (0.01)	0.01 (0.01)

Table 20. Estimated number and rate (number per hour) of black crappie caught and harvested by anglers during the winter fishery on Brant Lake, South Dakota, 2002-2008. (80% confidence interval).

Year	*Catch*	*Harvest*	*Catch rate*	*Harvest rate*
2002-03	99 (45)	95 (45)	0.01 (0.008)	0.01 (0.007)
2003-04	52 (53)	26 (30)	0.007 (0.007)	0.003 (0.004)
2004-05	0	0	0	0
2005-06	6 (6)	0	0.004 (0.004)	0
2006-07	0	0	0	0
2007-08	307 (240)	234 (182)	0.06 (0.07)	0.05 (0.06)

reason given by both summer and winter anglers for choosing to fish Brant Lake over other waters was closeness to home (34-65%) (Appendix 9, Question 7). Second for summer angling parties was hearing about a bite (31%), while familiarity with the lake (7-17%) and hearing about a bite (4-15%) were popular responses with winter anglers. A higher percentage of angling parties on Brant Lake gave closeness to home as the primary reason for fishing a lake than on Lake Thompson (Lucchesi 2009) which would be expected since Brant Lake is closer to urban areas.

In summer 2003, three of four angling parties indicated current fishing regulations were easy to understand (Appendix 9, Question 5). However, 24% indicated that current regulations were at least somewhat difficult to understand which was higher than recorded for Lake Thompson anglers (14%, Lucchesi 2009).

Several questions about walleye harvest and regulations were asked during the survey period (Appendix 9, Questions 1, 6, 8, 9,10 and 11). In the summer of 1999, over 50% of parties interviewed stated they would favor removing a 14-inch MLL on the

Madison area lakes. In winter 2003-04 and summer 2004, about 60% of parties indicated that they would prefer to harvest three 14-inch walleyes over one 17-inch walleye (19%) or four 13-inch walleyes (16-26%). Winter anglers slightly favored harvesting higher numbers of smaller fish over summer anglers. Although a majority of anglers preferred three 14-inch walleyes over the other options, they opposed (about 64%) a reduction in walleye limits from four to three. Anglers also opposed a reduction in the northern pike daily limit.

Responses concerning satisfaction with panfish harvest and regulations were variable (Appendix 9, Questions 9-11). The largest percentage of parties interviewed during summer 2005 favored a reduction in daily panfish limits to 10, while the majority of winter angling parties (2005-06) opposed such a change. In 2007-08, winter and summer anglers both indicated they would prefer a daily limit of 15 or more panfish (66 and 67%; yellow perch, bluegills or crappies) over a limit of 10 fish or less (34 and 33%).

Literature Cited

Baccante, D. A., and P. J. Colby. 1996. Harvest, density and reproductive characteristics of North American walleye populations. *Ann. Zool. Fennici* 33:601-615

Blackwell, B. G. 2005a. Waubay Lake, South Dakota, angler use and harvest surveys, December 2002 – August 2004. South Dakota Department of Game, Fish and Parks, Progress Report 05-10, Pierre.

Blackwell, B. G. 2005b. Bitter Lake, South Dakota, angler use and harvest surveys, December 1999 – August 2004. South Dakota Department of Game, Fish and Parks, Progress Report 05-17, Pierre.

Blackwell, B. G. 2005c. Enemy Swim Lake, South Dakota, angler use and harvest surveys, December 1997 – August 2004. South Dakota Department of Game, Fish and Parks, Progress Report 05-12, Pierre.

Blackwell, B. G. 2005d. Cattail-Kettle Lake, South Dakota, angler use and harvest surveys, December 1998 – August 2004. South Dakota Department of Game, Fish and Parks, Progress Report 05-09, Pierre.

Blackwell, B. G., and M. J. Hubers. 2003. Angler use, sport fish harvest, and fish community surveys for Waubay Lake, Day County, SD December 1996 – August 2002. South Dakota Department of Game, Fish and Parks, Progress Report 03-06, Pierre.

Blackwell, B. G., R. J. Braun, S. J. Kennedy, T. M. Kaufman, and M. J. Ermer. 2007a. Pickerel Lake, South Dakota, angler use and harvest surveys, May 1997 – August 2006. South Dakota Department of Game, Fish and Parks, Progress Report 07-17, Pierre.

Blackwell, B. G., M. J. Ermer, R. J. Braun, S. J. Kennedy, and T. M. Kaufman. 2007b. Enemy Swim Lake, South Dakota Angler Use and Harvest Surveys, December 2004-August 2006. South Dakota Department of Game, Fish and Parks, Progress Report 07-18, Pierre.

Blackwell, B. G., T. M. Kaufman, M. J. Ermer, R. J. Braun, S. J. Kennedy. 2007c. Bitter Lake, South Dakota Angler Use and Harvest Surveys, December 2004-August 2006. South Dakota Department of Game, Fish and Parks, Progress Report 07-21, Pierre.

Lucchesi, D. O. 2009. Angler use and harvest surveys on Lake Thompson, Kingsbury County, May 1997 – August 2008. South Dakota Department of Game, Fish and Parks, Annual Report 09-16, Pierre.

Lucchesi, D. O., T. R. St. Sauver, B. A. Johnson, and K. A. Hoffmann. 2004. Region III small impoundment strategic plan, 2004-2009. South Dakota Department of Game, Fish and Parks, Special Report 04-13, Pierre.

Neumann, R. M., D. W. Willis, and D. D. Mann. 1993. Evaluation of largemouth bass slot limits in South Dakota waters. South Dakota Department of Game, Fish and Parks, Completion Report 93-13, Pierre.

Soupir, C. A., and M. L. Brown. 2002. Comprehensive evaluation and modification of the South Dakota angler creel program. South Dakota Department of Game, Fish and Parks, Completion Report 02-10, Pierre.

South Dakota Department of Game, Fish and Parks (SDGFP), Wildlife Division. 1994. Systematic approach to management – fisheries. South Dakota Department of Game, Fish and Parks, Pierre.

United States Department of the Interior, Fish and Wildlife Service and United States Department of Commerce, Bureau of the Census. 2007. 2006 National survey of fishing, hunting, and wildlife-associated recreation. U.S. Government Printing Office, Washington, DC.

Appendix 1. Summer angler target species frequency totaled by month and over the summer for parties interviewed by the creel clerk during summer creel surveys on Brant Lake, 1998-2008.

		Percent of anglers targeting					
Year	*Month*	*Walleye*	*Yellow perch*	*Black crappie*	*Smallmouth bass*	*Black Bullhead*	*Any species/ Other species*
1998	May	75	0	2	4	0	17
	June	69	2	0	2	0	27
	July	49	16	0	0	2	33
	August	71	0	0	0	2	27
	Total	66	4	1	2	1	25
1999	May	75	2	0	2	4	17
	June	77	0	2	0	0	21
	July	65	2	2	4	0	27
	August	64	8	0	3	0	25
	Total	71	3	1	2	1	22
2000	May	69	0	0	0	3	28
	June	77	3	0	0	0	20
	July	55	6	10	2	0	27
	August	53	18	6	0	0	23
	Total	66	5	4	1	1	23
2001	May	66	0	3	0	0	31
	June	77	2	1	0	0	20
	July	47	7	3	0	3	40
	August	50	6	0	6	0	38
	Total	66	3	2	1	1	27
2002	May	81	5	7	2	5	0
	June	63	19	10	2	4	2
	July	52	38	2	5	3	0
	August	37	54	3	5	0	1
	Total	57	30	5	4	3	1
2003	May	77	0	12	1	0	10
	June	74	0	11	0	2	13
	July	40	33	3	2	0	22
	August	13	56	2	4	0	25
	Total	58	15	8	1	1	17
2004	May	86	0	10	2	0	2
	June	89	5	4	1	0	1
	July	77	20	2	0	0	1
	August	41	51	2	3	0	3
	Total	80	11	6	1	1	1
2005	May	58	0	9	0	4	29
	June	83	7	2	0	0	8
	July	81	7	0	0	0	12
	August	47	14	6	3	0	30
	Total	73	7	3	1	1	15

Appendix 1. Continued

		Percent of anglers targeting					
Year	*Month*	*Walleye*	*Yellow perch*	*Black crappie*	*Smallmouth bass*	*Black Bullhead*	*Any species*
2006	May	70	3	5	1	1	20
	June	50	4	12	4	1	29
	July	57	4	6	6	0	27
	August	21	21	0	8	4	46
	Total	55	5	7	4	1	28
2007	May	83	4	6	0	4	3
	June	86	0	2	0	5	7
	July	64	0	0	0	0	36
	August	50	6	0	0	0	44
	Total	78	3	3	0	3	13
2008	May	79	0	1	2	1	17
	June	71	2	7	8	1	11
	July	44	3	6	3	0	44
	August	49	3	6	11	0	31
	Total	68	1	4	6	1	20

Appendix 2. Monthly and total (May through August) number of angler interviews (# Int), estimated fishing pressure (angler hours), estimated angler days, estimated economic value, estimated trip length (hours), average party size, percent of interviewed parties that were South Dakota (SD) residents, percent of angling activity done by boat and percent of angling activity that occurred during weekends/holidays on Brant Lake, South Dakota (80% confidence interval).

Year	*Month*	*# Int*	*Angler hours*	*Angler days*	*Economic value*	*Trip length (h)*	*Party size*	*% SD residents*	*% boat anglers*	*% weekends or holidays*
1998	May	55	6,067 (2,295)	1,728	$105,408	3.51 (0.77)	2.20 (0.49)	100	49	44
	June	51	4,131 (1,273)	1,354	$82,594	3.05 (0.48)	1.56 (1.24)	98	64	75
	July	43	2,538 (540)	664	$40,504	3.82 (0.58)	1.77 (1.37)	100	60	52
	August	41	1,521 (343)	494	$30,134	3.08 (--)	1.55 (1.04)	100	59	60
	Total	190	14,257 (2,701)	4,230	$258,030	3.37 (0.27)	1.77 (0.54)	99	57	56
1999	May	56	5,132 (1,414)	1,406	$85,768	3.65 (1.39)	1.81 (1.41)	100	48	51
	June	44	2,463 (384)	643	$39,228	3.83 (0.60)	1.70 (0.76)	100	49	64
	July	49	2,675 (737)	1,133	$69,142	2.36 (0.74)	2.12 (1.27)	98	49	39
	August	36	3,364 (780)	490	$29,870	6.87 (--)	1.98 (1.00)	97	63	61
	Total	185	13,634 (1,817)	3,261	$198.165	4.18 (0.42)	1.90 (0.57)	99	52	53
2000	May	36	5,115 (2,754)	1,470	$89,659	3.48 (1.12)	2.18 (1.74)	97	42	34
	June	60	6,736 (2,406)	1,471	$89,715	4.58 (0.41)	1.92 (1.15)	98	55	56
	July	51	4,849 (1,347)	1,128	$68,808	4.30 (0.43)	2.02 (1.44)	98	56	64
	August	17	1,265 (401)	448	$27,363	2.82 (--)	1.56 (0.28)	94	49	53
	Total	164	17,966 (3,918)	4,740	$289,162	3.79 (0.32)	1.92 (0.64)	98	52	52
2001	May	66	10,767 (3,631)	2,382	$145,307	4.52 (2.47)	2.26 (2.00)	98	59	68
	June	86	9,972 (1,748)	2,645	$161,350	3.77 (1.66)	2.13 (1.61)	100	78	73
	July	32	4,609 (1,003)	1,344	$81,968	3.43 (0.62)	2.39 (1.46)	100	66	63
	August	19	4,495 (939)	1,396	$85,153	3.22 (0.46)	2.04 (0.66)	94	80	42
	Total	203	29,843 (4,258)	7,979	$486,744	3.74 (0.77)	2.21 (0.76)	99	65	69
2002	May	89	8,966 (1,781)	2,660	$162,293	3.37 (0.72)	1.90 (1.19)	97	64	71
	June	127	9,335 (2,245)	2,509	$153,073	3.72 (1.88)	2.20 (2.54)	98	73	64
	July	129	13,710 (2,414)	3,188	$194,491	4.30 (1.05)	2.09 (3.75)	94	81	48
	August	103	12,335 (2,378)	2,784	$169,850	4.43 (0.75)	2.09 (2.39)	89	83	46
	Total	448	44,346 (4,438)	11,198	$683,108	3.96 (0.59)	2.07 (1.32)	95	77	55
2003	May	95	8,850 (2,692)	2,263	$138,069	3.91 (0.86)	1.97 (2.33)	98	57	53
	June	87	8,402 (1,596)	2,764	$168,593	3.04 (2.71)	2.16 (2.39)	98	63	59
	July	58	5,944 (1,420)	1,475	$89,971	4.03 (1.28)	2.19 (2.15)	97	73	41
	August	45	5,024 (1,211)	1,076	$65,623	4.67 (0.65)	2.22 (1.23)	98	85	50
	Total	285	28,220 (3,644)	7,199	$439,137	3.92 (0.78)	2.13 (1.04)	98	67	52

Appendix 2. Continued

Year	*Month*	*# Int*	*Angler hours*	*Angler days*	*Economic value*	*Trip length (h)*	*Party size*	*% SD residents*	*% boat anglers*	*% weekends or holidays*
2004	May	189	10,541 (2,927)	2,655	$161,965	3.97 (1.82)	2.05 (2.47)	98	68	38
	June	159	12,593 (2,635)	3,271	$199,525	3.85 (1.59)	2.11 (3.42)	94	75	48
	July	56	3,804 (846)	973	$59,346	3.91 (1.01)	2.07 (1.44)	93	75	44
	August	59	3,730 (1,016)	1,192	$72,693	3.13 (1.74)	2.07 (2.01)	83	86	20
	Total	463	30,668 (4,154)	8,266	$504,245	3.71 (0.79)	2.07 (1.22)	94	74	48
2005	May	53	5,470 (1,951)	2,509	$153,049	2.18 (0.57)	1.88 (1.01)	94	74	64
	June	132	20,170 (3,878)	4,943	$301,523	4.08 (1.44)	2.19 (1.34)	95	93	42
	July	67	3,928 (919)	1,028	$62,725	3.82 (1.23)	2.11 (1.34)	94	85	62
	August	36	2,193 (620)	673	$41,035	3.26 (--)	2.04 (0.66)	94	80	61
	Total	288	31,760 (4,481)	9,538	$581,790	3.33 (0.50)	2.05 (0.56)	94	88	50
2006	May	77	4,251 (1,243)	1,513	$92,281	2.81 (--)	1.74 (1.39)	95	62	58
	June	89	8,948 (1,770)	2,177	$132,804	4.11 (0.67)	2.07 (3.50)	96	77	32
	July	67	6,737 (2,598)	1,676	$102,228	4.02 (0.44)	2.32 (2.91)	98	82	42
	August	24	2,117 (693)	630	$38,434	3.36 (--)	1.56 (0.44)	100	80	63
	Total	257	22,053 (3,451)	6,177	$376,815	3.57 (0.28)	1.92 (1.19)	97	76	48
2007	May	48	3,072 (1,093)	819	$49,959	3.75 (3.49)	1.63 (1.43)	96	60	61
	June	44	6,300 (1,757)	1,518	$92,602	4.15 (1.71)	2.07 (1.66)	100	67	32
	July	14	4,123 (1,349)	820	$50,001	5.03 (--)	1.78 (0.60)	86	89	60
	August	17	1,363 (441)	289	$17,615	4.72 (--)	1.82 (0.69)	94	83	39
	Total	123	14,857 (2,509)	3,369	$205,505	4.41 (0.97)	1.82 (0.59)	96	73	46
2008	May	104	11,331 (2,720)	3,372	$205,712	3.36 (1.33)	1.76 (1.32)	97	56	52
	June	100	11,660 (3,138)	2,711	$165,409	4.30 (0.92)	2.03 (1.22)	96	72	56
	July	32	3,322 (1,098)	812	$49,546	4.09 (--)	2.14 (0.81)	97	70	49
	August	35	4,314 (816)	1,092	$66,621	3.95 (--)	2.39 (1.40)	89	77	52
	Total	271	30,627 (4,372)	7,813	$476,594	3.92 (0.40)	2.08 (0.60)	96	67	53

Appendix 3. Estimated number of walleye, northern pike, yellow perch, black crappie, smallmouth bass, black bullhead, channel catfish, white bass, bluegill, green sunfish and other species (white sucker and common carp) caught and harvested by month and year during the summer fishery at Brant Lake, South Dakota. (80% confidence interval).

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		catch	harvest	catch	harvest	catch	harvest	catch	harvest	catch	harvest
Walleye	1998	4,665 (1,816)	401 (270)	789 (74)	30 (37)	576 (292)	26 (34)	843 (581)	31 (27)	6,873 (1,931)	488 (276)
	1999	4,126 (1,225)	456 (261)	1,077 (799)	104 (76)	491 (291)	39 (35)	1,879 (607)	231 (86)	7,573 (1,610)	830 (287)
	2000	2,062 (361)	793 (559)	4,309 (1,863)	884 (814)	975 (592)	610 (526)	257 (69)	18 (22)	7,603 (1,989)	2,305 (1,119)
	2001	2,629 (1,102)	1,535 (598)	2,964 (622)	1,854 (343)	16 (20)	16 (20)	259 (228)	0	5,868 (1,286)	3,405 (690)
	2002	1,052 (372)	772 (397)	3,287 (1,547)	1,404 (846)	2,899 (708)	609 (170)	3,268 (1,329)	308 (191)	10,506 (2,188)	3,093 (968)
	2003	10,245 (5,572)	1,225 (406)	8,573 (3,440)	1,345 (1,412)	2,505 (884)	327 (268)	835 (123)	14 (13)	22,158 (6,609)	2,911 (1,494)
	2004	3,588 (1,752)	2,212 (700)	3,033 (1,055)	1,492 (651)	274 (173)	95 (84)	0	0	6,895 (2,053)	3,799 (960)
	2005	133 (140)	105 (135)	4,517 (1,668)	3,674 (1,314)	153 (88)	136 (85)	29 (33)	15 (11)	4,832 (1,677)	3,930 (1,324)
	2006	1,064 (565)	608 (345)	1,278 (487)	375 (163)	2,161 (924)	395 (226)	1,402 (798)	114 (161)	5,905 (1,431)	1,492 (471)
	2007	426 (73)	294 (272)	1,140 (682)	675 (270)	655 (239)	551 (223)	443 (202)	231 (126)	2,664 (754)	1,751 (461)
	2008	2,806 (1,564)	903 (406)	5,499 (2,627)	1,727 (924)	368 (60)	0	850 (532)	139 (134)	9,523 (3,104)	2,769 (1,019)
	Total	32,796	9,304	36,466	13,564	11,073	2,804	10,065	1,101	90,400	26,773

Appendix 3. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		catch	harvest	catch	harvest	catch	harvest	catch	harvest	catch	harvest
Northern Pike	1998	477 (204)	158 (68)	163 (93)	0	49 (31)	0	13 (8)	5 (5)	702 (227)	163 (68)
	1999	119 (68)	58 (36)	23 (18)	7 (10)	119 (106)	13 (12)	134 (57)	24 (15)	396 (139)	103 (42)
	2000	16 (21)	0	0	0	15 (13)	15 (13)	32 (12)	0	63 (27)	15 (13)
	2001	44 (23)	44 (23)	59 (49)	14 (11)	0	0	13 (22)	0	115 (58)	57 (26)
	2002	360 (281)	43 (32)	105 (50)	23 (21)	177 (110)	35 (34)	86 (45)	42 (38)	728 (310)	143 (64)
	2003	57 (58)	50 (58)	0	0	49 (42)	12 (14)	0	0	106 (71)	62 (59)
	2004	32 (35)	15 (18)	63 (43)	16 (23)	0	0	0	0	95 (56)	31 (29)
	2005	0	0	34 (35)	0	0	0	0	0	34 (35)	0
	2006	69 (50)	0	49 (48)	33 (45)	32 (34)	0	43 (--)	29 (--)	193 (77)	62 (45)
	2007	59 (25)	28 (21)	61 (30)	27 (22)	0	0	0	0	120 (39)	55 (31)
	2008	187 (98)	20 (21)	115 (65)	38 (31)	115 (7)	0	162 (86)	11 (10)	579 (146)	69 (39)
	Total	1,420	416	672	158	556	75	483	111	3,131	760

Appendix 3. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		catch	harvest	catch	harvest	catch	harvest	catch	harvest	catch	harvest
Yellow Perch	1998	107 (135)	43 (66)	85 (62)	73 (62)	35 (32)	25 (21)	93 (107)	78 (39)	320 (186)	219 (101)
	1999	61 (45)	14 (18)	51 (33)	7 (11)	149 (124)	122 (123)	441 (250)	183 (159)	702 (285)	326 (202)
	2000	1,130 (1,054)	982 (999)	760 (637)	615 (637)	670 (422)	559 (600)	18 (22)	0 (0)	2,578 (1,302)	2,156 (1,328)
	2001	0	0	110 (59)	56 (40)	16 (17)	0	232 (72)	74 (71)	358 (94)	130 (82)
	2002	1,094 (2,699)	920 (2,409)	1,997 (1,518)	1,555 (1,314)	9,510 (3,147)	7,286 (2,378)	13,504 (4,565)	10,419 (4,098)	26,105 (6,350)	20,180 (5,475)
	2003	225 (210)	189 (207)	392 (138)	294 (126)	5,092 (1,247)	3,995 (687)	3,809 (1,913)	2,450 (1,673)	9,518 (2,298)	6,928 (1,825)
	2004	205 (116)	198 (116)	2,090 (863)	1,974 (839)	153 (38)	121 (38)	112 (59)	101 (52)	2,560 (874)	2,394 (848)
	2005	32 (45)	32 (45)	1,195 (418)	1,119 (399)	273 (128)	246 (115)	258 (257)	93 (96)	1,758 (509)	1,490 (429)
	2006	117 (97)	117 (97)	274 (188)	255 (204)	186 (191)	120 (119)	451 (502)	10 (9)	1,028 (577)	502 (255)
	2007	0	0	263 (178)	214 (173)	84 (171)	84 (171)	113 (115)	92 (88)	460 (273)	390 (259)
	2008	44 (38)	44 (38)	235 (121)	203 (126)	25 (42)	0	106 (59)	53 (41)	410 (146)	300 (137)
	Total	3,015	2,539	7,452	6,365	16,193	12,558	19,137	13,553	45,797	35,015

Appendix 3. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		catch	harvest	catch	harvest	catch	harvest	catch	harvest	catch	harvest
Black Crappie	1998	938 (1,140)	641 (993)	75 (28)	75 (28)	0	0	4 (5)	4 (5)	1,017 (1,141)	720 (993)
	1999	29 (36)	29 (36)	70 (57)	47 (53)	23 (22)	9 (14)	64 (43)	0	186 (83)	85 (66)
	2000	2,177 (2,571)	509 (860)	273 (147)	223 (111)	107 (79)	107 (79)	133 (83)	62 (46)	2,690 (2,577)	901 (871)
	2001	226 (169)	226 (169)	174 (123)	174 (123)	40 (64)	40 (64)	0	0	440 (219)	440 (219)
	2002	1,083 (2,127)	278 (252)	899 (771)	337 (207)	787 (522)	547 (265)	7,016 (6,220)	2,856 (2,027)	9,785 (6,639)	4,018 (2,070)
	2003	3,329 (2,434)	1,899 (1,103)	4,633 (3,902)	2,936 (2,199)	304 (217)	207 (160)	327 (171)	164 (92)	8,593 (4,607)	5,206 (2,467)
	2004	4,326 (1,150)	4,159 (1,440)	1,619 (595)	1,426 (652)	0	0	0	0	5,945 (1,567)	5,585 (1,582)
	2005	331 (447)	331 (447)	174 (80)	118 (81)	8 (5)	8 (5)	87 (65)	15 (20)	600 (459)	472 (454)
	2006	653 (602)	635 (600)	537 (331)	323 (251)	106 (31)	50 (42)	390 (382)	63 (61)	1,686 (786)	1,071 (655)
	2007	184 (169)	133 (112)	51 (44)	40 (35)	52 (61)	52 (61)	60 (62)	32 (42)	347 (195)	257 (139)
	2008	708 (709)	607 (700)	1,440 (1,201)	1,087 (1,064)	7 (12)	0	126 (78)	62 (41)	2,281 (1,397)	1,756 (1,275)
	Total	13,984	9,447	9,945	6,786	1,434	1,020	8,207	3,258	33,570	20,511

Appendix 3. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		catch	harvest	catch	harvest	catch	harvest	catch	harvest	catch	harvest
Smallmouth Bass	1997	1,038 (1,046)	73 (50)	211 (126)	18 (10)	252 (126)	29 (24)	180 (78)	12 (15)	1,681 (1,064)	132 (58)
	1999	268 (232)	14 (18)	427 (822)	0	194 (104)	41 (58)	425 (224)	47 (67)	1,314 (889)	102 (91)
	2000	269 (159)	0	814 (558)	20 (20)	520 (401)	41 (60)	94 (152)	0	1,697 (722)	61 (63)
	2001	61 (64)	18 (28)	29 (31)	29 (31)	262 (184)	157 (138)	632 (340)	455 (222)	984 (393)	659 (255)
	2002	443 (222)	62 (51)	1,289 (498)	390 (272)	1,588 (450)	310 (185)	1,338 (657)	225 (131)	4,658 (965)	987 (358)
	2003	1,078 (609)	346 (282)	1,113 (544)	50 (33)	1,057 (471)	379 (145)	359 (81)	81 (--)	3,607 (946)	856 (318)
	2004	891 (254)	376 (350)	945 (301)	254 (91)	29 (35)	29 (35)	7 (9)	0	1,872 (395)	659 (353)
	2005	105 (77)	26 (27)	959 (476)	216 (159)	81 (82)	8 (5)	274 (116)	0	1,419 (503)	250 (161)
	2006	600 (437)	65 (49)	3,048 (1,405)	599 (13)	1,369 (1,120)	252 (191)	952 (18)	82 (82)	5,969 (1,849)	998 (214)
	2007	376 (174)	45 (37)	1,295 (145)	33 (39)	2,578 (932)	437 (94)	1,163 (444)	79 (50)	5,412 (1,057)	594 (119)
	2008	1,111 (459)	120 (57)	2,657 (1,101)	347 (172)	387 (225)	7 (5)	1,204 (3,422)	247 (176)	5,359 (3,631)	721 (252)
	Total	6,240	1,145	12,787	1,956	8,317	1,690	6,628	1,228	33,972	6,019

Appendix 3. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		catch	harvest	catch	harvest	catch	harvest	catch	harvest	catch	harvest
Black Bullhead	1998	247 (151)	112 (89)	307 (179)	198 (214)	181 (76)	0	16 (21)	0	751 (247)	310 (232)
	1999	166 (111)	150 (101)	55 (49)	16 (14)	234 (172)	136 (134)	151 (81)	13 (11)	605 (226)	3125 (169)
	2000	633 (569)	518 (539)	399 (183)	343 (166)	123 (80)	0	65 (53)	0	1,221 (605)	862 (564)
	2001	0	0	0	0	302 (386)	189 (241)	0	0	302 (386)	189 (241)
	2002	173 (165)	113 (130)	913 (268)	268 (130)	2,435 (775)	110 (177)	1,478 (535)	0	5,000 (993)	491 (255)
	2003	1,421 (1,502)	1,235 (1,447)	2,758 (1,295)	593 (441)	722 (330)	62 (64)	473 (228)	43 (60)	5,375 (2,024)	1,932 (1,515)
	2004	498 (95)	117 (68)	1,415 (228)	261 (13)	822 (543)	58 (62)	74 (62)	0	2,809 (599)	436 (93)
	2005	14 (20)	0	931 (520)	20 (24)	163 (68)	0	739 (614)	0	1,847 (808)	20 (24)
	2006	73 (55)	21 (27)	733 (322)	222 (301)	362 (227)	61 (38)	568 (285)	0	1,736 (489)	304 (305)
	2007	243 (199)	184 (193)	227 (177)	227 (177)	0	0	0	0	470 (266)	411 (262)
	2008	15 (22)	0	803 (725)	660 (611)	16 (14)	0	41 (32)	0	874 (726)	660 (611)
	Total	3,483	2,450	8,541	2,808	5,360	616	3,605	56	20,989	5,930

Appendix 3. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		catch	harvest	catch	harvest	catch	harvest	catch	harvest	catch	harvest
Channel Catfish	1998	0	0	30 (41)	30 (41)	10 (14)	10 (14)	0	0	40 (43)	40 (43)
	1999	0	0	0	0	0	0	0	0	0	0
	2000	16 (21)	16 (21)	16 (23)	16 (23)	0	0	0	0	32 (31)	32 (31)
	2001	0	0	0	0	0	0	0	0	0	0
	2002	0	0	0	0	0	0	0	0	0	0
	2003	54 (84)	0	0	0	0	0	0	0	54 (84)	0
	2004	6 (8)	0	48 (57)	48 (57)	97 (66)	30 (39)	0	0	151 (88)	78 (69)
	2005	0	0	0	0	0	0	8 (10)	0	8 (10)	0
	2006	0	0	0	0	21 (21)	15 (18)	0	0	21 (21)	15 (18)
	2007	0	0	0	0	0	0	0	0	0	0
	2008	0	0	0	0	7 (13)	0	0	0	7 (13)	0
	Total	76	16	94	94	135	55	8	0	313	165

Appendix 3. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		catch	harvest	catch	harvest	catch	harvest	catch	harvest	catch	harvest
White Bass	1998	0	0	0	0	0	0	0	0	0	0
	1999	0	0	0	0	0	0	0	0	0	0
	2000	0	0	0	0	0	0	0	0	0	0
	2001	0	0	0	0	0	0	0	0	0	0
	2002	0	0	0	0	0	0	0	0	0	0
	2003	0	0	0	0	0	0	0	0	0	0
	2004	0	0	0	0	0	0	0	0	0	0
	2005	0	0	0	0	0	0	0	0	0	0
	2006	161 (81)	29 (31)	41 (48)	41 (48)	36 (54)	36 (54)	0	0	238 (109)	106 (79)
	2007	17 (15)	0	35 (36)	35 (36)	0	0	0	0	52 (39)	35 (36)
	2008	300 (180)	0	779 (207)	140 (20)	472 (222)	91 (82)	3,447 (7,991)	1,400 (2,367)	4,998 (7,999)	1,631 (2,369)
	Total	478	29	855	216	508	127	3,447	1,400	5,288	1,772

Appendix 3. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		catch	harvest	catch	harvest	catch	harvest	catch	harvest	catch	harvest
Bluegill	1998	0	0	0	0	0	0	0	0	0	0
	1999	0	0	0	0	0	0	0	0	0	0
	2000	0	0	0	0	10 (16)	10 (16)	0	0	10 (16)	10 (16)
	2001	0	0	0	0	0	0	0	0	0	0
	2002	36 (96)	36 (96)	177 (104)	106 (66)	259 (116)	67 (41)	1,315 (611)	743 (432)	1,787 (638)	952 (449)
	2003	71 (126)	0	11 (17)	11 (17)	37 (29)	12 (16)	199 (192)	0	318 (232)	23 (24)
	2004	41 (37)	34 (36)	297 (136)	297 (136)	18 (17)	7 (8)	6 (9)	6 (9)	362 (142)	344 (141)
	2005	0	0	193 (105)	115 (53)	47 (49)	6 (7)	226 (100)	44 (27)	466 (153)	165 (60)
	2006	0	0	463 (282)	388 (263)	112 (101)	31 (28)	547 (523)	155 (135)	1,122 (603)	574 (297)
	2007	0	0	0	0	26 (32)	26 (32)	18 (25)	18 (25)	44 (40)	44 (40)
	2008	0	0	238 (219)	211 (239)	17 (14)	8 (14)	11 (16)	11 (16)	265 (220)	230 (240)
	Total	148	70	1,379	1,128	526	167	2,322	977	4,375	2,342

Appendix 3. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		catch	harvest	catch	harvest	catch	harvest	catch	harvest	catch	harvest
Green Sunfish	1998	0	0	0	0	0	0	0	0	0	0
	1999	0	0	0	0	0	0	0	0	0	0
	2000	0	0	0	0	0	0	0	0	0	0
	2001	0	0	0	0	0	0	0	0	0	0
	2002	0	0	0	0	0	0	0	0	0	0
	2003	53 (39)	53 (39)	84 (68)	34 (25)	45 (31)	45 (31)	28 (40)	28 (40)	210 (93)	160 (69)
	2004	0	0	0	0	0	0	0	0	0	0
	2005	0	0	0	0	0	0	8 (10)	8 (10)	8 (10)	8 (10)
	2006	0	0	0	0	0	0	0	0	0	0
	2007	0	0	0	0	0	0	0	0	0	0
	2008	0	0	0	0	0	0	0	0	0	0
	Total	53	53	84	34	45	45	36	36	218	168

Appendix 3. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		catch	harvest	catch	harvest	catch	harvest	catch	harvest	catch	harvest
Other	1998	10 (13)	10 (13)	0	0	10 (12)	10 (12)	0	0	20 (25)	20 (25)
	1999	57 (46)	0	0	0	0	0	16 (14)	0	73 (49)	0
	2000	16 (20)	0	0	0	21 (18)	0	0	0	37 (27)	0
	2001	20 (24)	20 (24)	0	0	0	0	0	0	20 (24)	20 (24)
	2002	69 (107)	17 (27)	76 (48)	0	75 (46)	41 (34)	65 (65)	10 (14)	285 (160)	68 (45)
	2003	72 (57)	43 (52)	43 (31)	15 (22)	37 (36)	0	0	0	151 (75)	58 (56)
	2004	6 (8)	0	50 (41)	0	0	0	3 (5)	0	60 (42)	0
	2005	14 (18)	0	0	0	13 (14)	0	15 (23)	0	42 (32)	0
	2006	0	0	53 (49)	0	0	0	0	0	53 (49)	0
	2007	17 (24)	0	0	0	0	0	0	0	17 (24)	0
	2008	56 (35)	0	39 (48)	39 (48)	0	0	0	0	95 (60)	39 (48)
	Total	337	90	261	54	456	51	99	10	853	205

Appendix 4. Estimated angler catch rate (C/h) and harvest rate (H/h) of walleye, northern pike, yellow perch, black crappie, smallmouth bass, black bullhead, channel catfish, white bass, bluegill, green sunfish and other species (white sucker and common carp) by month and year during the summer fishery at Brant Lake, South Dakota. (80% confidence interval).

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
Walleye	1998	0.77	0.07	0.19	0.007	0.23	0.01	0.55	0.02	0.48	0.03
		(0.72)	(0.10)	(0.05)	(0.01)	(0.16)	(0.02)	(0.55)	(0.02)	(0.26)	(0.03)
	1999	0.80	0.09	0.44	0.04	0.18	0.01	0.56	0.07	0.56	0.06
		(0.32)	(0.07)	(0.33)	(0.03)	(0.32)	(0.02)	(0.26)	(0.03)	(0.18)	(0.03)
	2000	0.40	0.16	0.64	0.13	0.20	0.13	0.20	0.01	0.42	0.13
		(0.34)	(0.21)	(0.45)	(0.17)	(0.18)	(0.14)	(0.17)	(0.02)	(0.19)	(0.09)
	2001	0.24	0.14	0.30	0.19	0.004	0.004	0.06	0	0.20	0.11
		(0.12)	(0.07)	(0.12)	(0.07)	(0.005)	(0.005)	(0.06)		(0.06)	(0.03)
	2002	0.12	0.09	0.35	0.15	0.21	0.04	0.26	0.03	0.24	0.07
		(0.07)	(0.06)	(0.26)	(0.13)	(0.08)	(0.02)	(0.16)	(0.02)	(0.07)	(0.03)
	2003	1.16	0.14	1.02	0.16	0.42	0.06	0.17	0.003	0.79	0.10
		(1.02)	(0.09)	(0.57)	(0.19)	(0.17)	(0.05)	(0.08)	(0.002)	(0.33)	(0.06)
	2004	0.34	0.21	0.24	0.12	0.07	0.03	0	0	0.22	0.12
		(0.28)	(0.14)	(0.13)	(0.07)	(0.07)	(0.04)			(0.10)	(0.05)
	2005	0.02	0.02	0.22	0.18	0.04	0.03	0.01	0.007	0.15	0.12
		(0.03)	(0.02)	(0.14)	(0.11)	(0.03)	(0.03)	(0.02)	(0.007)	(0.08)	(0.06)
	2006	0.25	0.14	0.14	0.04	0.32	0.06	0.66	0.05	0.27	0.07
		(0.34)	(0.21)	(0.08)	(0.03)	(0.29)	(0.08)	(0.29)	(0.08)	(0.12)	(0.04)
	2007	0.13	0.09	0.18	0.11	0.16	0.13	0.32	0.17	0.18	0.12
		(0.09)	(0.05)	(0.18)	(0.05)	(0.09)	(0.07)	(0.24)	(0.13)	(0.09)	(0.04)
	2008	0.25	0.08	0.47	0.15	0.11	0	0.20	0.03	0.31	0.09
		(0.20)	(0.05)	(0.32)	(0.12)	(0.04)		(0.15)	(0.03)	(0.14)	(0.04)
	Mean	0.41	0.11	0.38	0.12	0.18	0.05	0.27	0.04	0.35	0.09

Appendix 4. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
Northern Pike	1998	0.08 (0.08)	0.03 (0.007)	0.04 (0.03)	0	0.02 (0.02)	0	0.009 (0.008)	0.003 (0.005)	0.05 (0.03)	0.01 (0.004)
	1999	0.02 (0.01)	0.01 (0.009)	0.009 (0.008)	0.003 (0.005)	0.04 (0.04)	0.005 (0.005)	0.04 (0.03)	0.007 (0.004)	0.03 (0.01)	0.008 (0.003)
	2000	0.003 (0.004)	0	0	0	0.003 (0.003)	0.003 (0.003)	0.03 (0.01)	0	0.004 (0.002)	0.0009 (0.0007)
	2001	0.004 (0.003)	0.004 (0.003)	0.006 (0.005)	0.001 (0.001)	0	0	0.003 (0.005)	0	0.004 (0.002)	0.002 (0.001)
	2002	0.04 (0.03)	0.005 (0.003)	0.01 (0.01)	0.002 (0.002)	0.01 (0.005)	0.003 (0.001)	0.007 (0.004)	0.003 (0.003)	0.02 (0.008)	0.003 (0.001)
	2003	0.007 (0.008)	0.006 (0.006)	0	0	0.008 (0.008)	0.002 (0.003)	0	0	0.004 (0.003)	0.002 (0.002)
	2004	0.003 (0.004)	0.002 (0.002)	0.005 (0.004)	0.001 (0.002)	0	0	0	0	0.003 (0.002)	0.001 (0.001)
	2005	0	0	0	0	0.002 (0.001)	0	0	0	0.001 (0.0008)	0
	2006	0.02 (0.01)	0	0.006 (0.006)	0.004 (0.005)	0.005 (0.007)	0	0.02 (--)	0.01 (--)	0.009 (0.005)	0.003 (0.002)
	2007	0.02 (0.01)	0.01 (0.009)	0.01 (0.007)	0.004 (0.004)	0	0	0	0	0.008 (0.003)	0.004 (0.002)
	2008	0.02 (0.01)	0.002 (0.003)	0.01 (0.01)	0.003 (0.005)	0.03 (0.01)	0	0.04 (0.02)	0.003 (0.003)	0.02 (0.02)	0.002 (0.002)
	Mean	0.02	0.006	0.009	0.002	0.01	0.001	0.01	0.002	0.01	0.003

Appendix 4. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
Yellow Perch	1998	0.02 (0.02)	0.007 (0.01)	0.02 (0.01)	0.02 (0.01)	0.01 (0.01)	0.01 (0.007)	0.06 (0.08)	0.05 (0.04)	0.02 (0.01)	0.02 (0.007)
	1999	0.01 (0.01)	0.003 (0.004)	0.02 (0.01)	0.003 (0.004)	0.06 (0.09)	0.05 (0.08)	0.13 (0.12)	0.05 (0.07)	0.05 (0.03)	0.02 (0.02)
	2000	0.22 (0.38)	0.19 (0.35)	0.11 (0.13)	0.09 (0.13)	0.14 (0.10)	0.13 (0.14)	0.01 (0.02)	0	0.14 (0.11)	0.12 (0.10)
	2001	0	0	0.01 (0.01)	0.006 (0.003)	0.004 (0.004)	0	0.05 (0.02)	0.02 (0.02)	0.01 (0.005)	0.004 (0.003)
	2002	0.12 (0.32)	0.10 (0.28)	0.21 (0.20)	0.17 (0.17)	0.69 (0.32)	0.53 (0.23)	1.09 (0.52)	0.84 (0.43)	0.59 (0.18)	0.46 (0.15)
	2003	0.03 (0.02)	0.02 (0.02)	0.05 (0.03)	0.04 (0.03)	0.86 (0.57)	0.67 (0.44)	0.76 (0.52)	0.49 (0.37)	0.34 (0.12)	0.25 (0.09)
	2004	0.02 (0.05)	0.02 (0.05)	0.17 (0.09)	0.16 (0.09)	0.04 (0.05)	0.03 (0.04)	0.03 (0.02)	0.03 (0.02)	0.08 (0.05)	0.08 (0.05)
	2005	0.006 (0.009)	0.006 (0.009)	0.06 (0.03	0.06 (0.03)	0.07 (0.04)	0.06 (0.04)	0.12 (0.15)	0.04 (0.08)	0.06 (0.02)	0.05 (0.02)
	2006	0.03 (0.03)	0.03 (0.03)	0.03 (0.01)	0.03 (0.02)	0.03 (0.09)	0.02 (0.06)	0.21 (0.25)	0.005 (0.002)	0.05 (0.04)	0.02 (0.02)
	2007	0	0	0.04 (0.08)	0.03 (0.06)	0.02 (0.04)	0.02 (0.04)	0.08 (0.18)	0.07 (0.14)	0.03 (0.03)	0.03 (0.03)
	2008	0.004 (0.006)	0.004 (0.006)	0.02 (0.01)	0.02 (0.01)	0.008 (0.01)	0	0.02 (0.02)	0.01 (0.01)	0.01 (0.006)	0.01 (0.005)
	Mean	0.04	0.03	0.07	0.06	0.18	0.14	0.23	0.15	0.13	0.10

Appendix 4. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
Black Crappie	1998	0.15 (0.21)	0.11 (0.17)	0.02 (0.01)	0.02 (0.01)	0	0	0.003 (0.003)	0.003 (0.003)	0.07 (0.08)	0.05 (0.07)
	1999	0.006 (0.007)	0.006 (0.007)	0.03 (0.03)	0.02 (0.02)	0.009 (0.009)	0.004 (0.005)	0.02 (0.02)	0	0.01 (0.007)	0.006 (0.005)
	2000	0.43 (0.58)	0.10 (0.02)	0.04 (0.05)	0.03 (0.05)	0.02 (0.02)	0.02 (0.02)	0.11 (0.11)	0.05 (0.06)	0.15 (0.15)	0.05 (0.04)
	2001	0.02 (0.02)	0.02 (0.02)	0.02 (0.01)	0.02 (0.01)	0.009 (0.01)	0.009 (0.01)	0	0	0.01 (0.008)	0.01 (0.008)
	2002	0.12 (0.24)	0.03 (0.03)	0.10 (0.10)	0.04 (0.03)	0.06 (0.05)	0.04 (0.03)	0.57 (0.70)	0.23 (0.25)	0.22 (0.17)	0.09 (0.06)
	2003	0.38 (0.58)	0.21 (0.20)	0.55 (0.51)	0.35 (0.24)	0.05 (0.05)	0.03 (0.04)	0.07 (0.07)	0.03 (0.03)	0.30 (0.22)	0.18 (0.10)
	2004	0.41 (--)	0.39 (--)	0.13 (0.06)	0.11 (0.06)	0	0	0	0	0.19 (0.04)	0.18 (0.04)
	2005	0.06 (0.08)	0.06 (0.08)	0.009 (0.005)	0.006 (0.004)	0.002 (0.001)	0.002 (0.001)	0.04 (0.03)	0.007 (--)	0.02 (0.01)	0.01 (0.01)
	2006	0.15 (0.16)	0.15 (0.15)	0.06 (0.05)	0.04 (0.04)	0.02 (0.02)	0.007 (0.02)	0.18 (0.22)	0.03 (0.05)	0.08 (0.04)	0.05 (0.04)
	2007	0.05 (0.05)	0.04 (0.03)	0.008 (0.007)	0.006 (0.006)	0.01 (0.02)	0.01 (0.02)	0.04 (0.05)	0.02 (0.03)	0.03 (0.03)	0.03 (0.03)
	2008	0.06 (0.07)	0.05 (0.06)	0.12 (0.20)	0.09 (0.15)	0.002 (0.004)	0	0.03 (0.02)	0.01 (0.01)	0.07 (0.07)	0.06 (0.05)
	Mean	0.17	0.11	0.10	0.07	0.02	0.01	0.10	0.03	0.10	0.07

Appendix 4. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
Smallmouth Bass	1998	0.17 (0.24)	0.01 (0.01)	0.05 (0.05)	0.004 (0.002)	0.10 (0.05)	0.01 (0.009)	0.12 (0.07)	0.008 (0.009)	0.12 (0.09)	0.009 (0.005)
	1999	0.05 (0.05)	0.003 (0.004)	0.17 (0.34)	0	0.07 (0.04)	0.02 (0.02)	0.13 (0.11)	0.01 (0.03)	0.10 (0.07)	0.008 (0.007)
	2000	0.05 (0.05)	0	0.12 (0.14)	0.003 (0.003)	0.11 (0.09)	0.009 (0.02)	0.07 (0.12)	0	0.09 (0.06)	0.003 (0.003)
	2001	0.006 (0.006)	0.002 (0.003)	0.003 (0.003)	0.003 (0.003)	0.06 (0.03)	0.03 (0.03)	0.14 (0.08)	0.10 (0.05)	0.03 (0.01)	0.02 (0.009)
	2002	0.05 (0.03)	0.007 (0.007)	0.14 (0.09)	0.04 (0.04)	0.12 (0.02)	0.02 (0.01)	0.11 (0.10)	0.02 (0.01)	0.11 (0.03)	0.02 (0.009)
	2003	0.12 (0.20)	0.04 (0.06)	0.13 (0.09)	0.006 (0.005)	0.18 (0.07)	0.06 (0.02)	0.07 (0.03)	0.02 (--)	0.13 (0.07)	0.03 (0.02)
	2004	0.08 (0.03)	0.04 (0.03)	0.08 (0.03)	0.02 (0.01)	0.008 (0.03)	0.008 (0.03)	0.002 (--)	0	0.06 (0.02)	0.02 (0.01)
	2005	0.02 (0.03)	0.005 (0.005)	0.05 (0.03)	0.01 (0.01)	0.02 (0.01)	0.002 (0.001)	0.13 (0.06)	0	0.04 (0.02)	0.008 (0.006)
	2006	0.14 (0.12)	0.02 (0.01)	0.34 (0.20)	0.07 (0.02)	0.20 (0.28)	0.04 (0.05)	0.45 (0.43)	0.04 (0.07)	0.27 (0.13)	0.05 (0.02)
	2007	0.13 (0.07)	0.01 (0.01)	0.21 (0.08)	0.005 (0.006)	0.63 (0.39)	0.11 (0.08)	0.85 (0.64)	0.06 (0.05)	0.37 (0.12)	0.04 (0.02)
	2008	0.10 (0.08)	0.01 (0.009)	0.23 (0.12)	0.03 (0.03)	0.12 (0.17)	0.002 (0.002)	0.28 (0.81)	0.06 (0.04)	0.18 (0.13)	0.02 (0.01)
	Mean	0.08	0.01	0.14	0.02	0.15	0.03	0.21	0.03	0.14	0.02

Appendix 4. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
White Bass	1998	0	0	0	0	0	0	0	0	0	0
	1999	0	0	0	0	0	0	0	0	0	0
	2000	0	0	0	0	0	0	0	0	0	0
	2001	0	0	0	0	0	0	0	0	0	0
	2002	0	0	0	0	0	0	0	0	0	0
	2003	0	0	0	0	0	0	0	0	0	0
	2004	0	0	0	0	0	0	0	0	0	0
	2005	0	0	0	0	0	0	0	0	0	0
	2006	0.04 (0.02)	0.007 (0.009)	0.005 (0.006)	0.005 (0.006)	0.005 (0.008)	0.005 (0.008)	0	0	0.01 (0.005)	0.005 (0.004)
	2007	0.003 (--)	0	0.006 (0.006)	0.006 (0.006)	0	0	0	0	0.003 (0.003)	0.002 (0.004)
	2008	0.03 (0.02)	0	0.07 (0.03)	0.01 (0.007)	0.14 (0.14)	0.03 (0.03)	0.80 (1.97)	0.32 (0.62)	0.16 (0.27)	0.05 (0.08)
	Mean[a]	0.02	0.002	0.03	0.007	0.05	0.01	0.27	0.11	0.06	0.02

[a] 2006-2008

Appendix 4. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
Black Bullhead	1998	0.04 (0.03)	0.02 (0.02)	0.07 (0.05)	0.05 (0.05)	0.07 (0.02)	0	0.01 (0.01)	0	0.05 (0.02)	0.02 (0.02)
	1999	0.03 (0.03)	0.03 (0.03)	0.02 (0.02)	0.007 (0.005)	0.09 (0.08)	0.05 (0.07)	0.04 (0.02)	0.004 (0.003)	0.04 (0.02)	0.02 (0.02)
	2000	0.12 (0.18)	0.10 (0.16)	0.06 (0.06)	0.05 (0.06)	0.03 (0.03)	0	0.05 (0.05)	0	0.07 (0.05)	0.05 (0.04)
	2001	0	0	0	0	0.07 (0.08)	0.04 (0.05)	0	0	0.01 (0.01)	0.006 (0.008)
	2002	0.02 (0.02)	0.01 (0.02)	0.10 (0.004)	0.03 (0.004)	0.18 (0.06)	0.008 (0.01)	0.12 (0.08)	0	0.11 (0.03)	0.01 (0.006)
	2003	0.16 (0.18)	0.14 (0.17)	0.33 (0.19)	0.07 (0.06)	0.12 (0.06)	0.01 (0.01)	0.09 (0.04)	0.009 (0.01)	0.19 (0.08)	0.07 (0.06)
	2004	0.05 (0.02)	0.01 (0.02)	0.11 (0.05)	0.02 (0.01)	0.22 (--)	0.02 (0.02)	0.02 (0.003)	0	0.09 (0.03)	0.01 (0.008)
	2005	0.003 (0.004)	0	0.05 (0.03)	0.001 (0.001)	0.04 (0.01)	0	0.34 (0.37)	0	0.06 (0.03)	0.0006 (0.0008)
	2006	0.02 (0.01)	0.005 (0.007)	0.08 (0.04)	0.02 (0.03)	0.05 (0.04)	0.009 (--)	0.27 (--)	0	0.08 (0.02)	0.01 (0.01)
	2007	0.09 (--)	0.07 (--)	0.04 (0.04)	0.04 (0.04)	0	0	0	0	0.03 (0.01)	0.03 (0.01)
	2008	0.001 (0.002)	0	0.07 (0.10)	0.06 (0.08)	0.005 (0.004)	0	0.009 (0.008)	0	0.03 (0.03)	0.02 (0.03)
	Mean	0.05	0.04	0.08	0.03	0.08	0.01	0.09	0.001	0.07	0.02

Appendix 4. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
Channel Catfish	1998	0	0	0.007 (0.01)	0.007 (0.01)	0.004 (0.006)	0.004 (0.006)	0	0	0.003 (0.003)	0.003 (0.003)
	1999	0	0	0	0	0	0	0	0	0	0
	2000	0.003 (0.004)	0.003 (0.004)	0.002 (0.004)	0.002 (0.004)	0	0	0	0	0.002 (0.002)	0.002 (0.002)
	2001	0	0	0	0	0	0	0	0	0	0
	2002	0	0	0	0	0	0	0	0	0	0
	2003	0.006 (0.01)	0	0	0	0	0	0	0	0.002 (0.003)	0
	2004	0.0006 (0.0008)	0	0.004 (0.005)	0.004 (0.005)	0.03 (0.02)	0.008 (0.01)	0	0	0.005 (0.003)	0.003 (0.002)
	2005	0	0	0	0	0	0	0.004 (0.005)	0	0.0002 (0.0003)	0
	2006	0	0	0	0	0.003 (0.003)	0.002 (0.003)	0	0	`0.001 (0.0009)	0.0007 (0.0008)
	2007	0	0	0	0	0	0	0	0	0	0
	2008	0	0	0	0	0.002 (0.004)	0	0	0	0.0002 (0.0004)	0
	Mean	0.0009	0.0003	0.001	0.001	0.004	0.001	0.0004	0	0.001	0.0008

Appendix 4. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
Bluegill	1998	0	0	0	0	0	0	0	0	0	0
	1999	0	0	0	0	0	0	0	0	0	0
	2000	0	0	0	0	0.002 (0.003)	0.002 (0.003)	0	0	0.0006 (0.0009)	0.0006 (0.0009)
	2001	0	0	0	0	0	0	0	0	0	0
	2002	0.004 (0.01)	0.004 (0.01)	0.02 (0.01)	0.01 (0.008)	0.02 (0.01)	0.005 (0.004)	0.11 (0.06)	0.06 (0.05)	0.04 (0.02)	0.02 (0.01)
	2003	0.008 (0.01)	0	0.001 (0.002)	0.001 (0.002)	0.006 (0.005)	0.002 (0.003)	0.04 (0.07)	0	0.01 (0.01)	0.0008 (0.0008)
	2004	0.004 (0.002)	0.003 (0.002)	0.02 (0.008)	0.02 (0.008)	0.005 (0.005)	0.002 (0.002)	0.002 (--)	0	0.01 (0.003)	0.01 (0.004)
	2005	0	0	0.01 (0.008)	0.006 (0.005)	0.01 (0.01)	0.001 (0.002)	0.10 (0.07)	0.02 (0.02)	0.01 (0.007)	0.005 (0.003)
	2006	0	0	0.05 (0.05)	0.04 (0.05)	0.02 (0.02)	0.005 (0.005)	0.26 (0.30)	0.07 (0.10)	0.05 (0.03)	0.03 (0.02)
	2007	0	0	0	0	0.006 (0.008)	0.006 (0.008)	0.01 (0.02)	0.01 (0.02)	0.003 (0.003)	0.003 (0.003)
	2008	0	0	0.02 (0.02)	0.02 (0.02)	0.005 (0.01)	0.003 (0.01)	0.003 (0.004)	0.003 (0.004)	0.009 (0.003)	0.008 (0.004)
	Mean	0.002	0.0006	0.01	0.009	0.007	0.002	0.05	0.01	0.01	0.007

Appendix 4. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
Green Sunfish	1998	0	0	0	0	0	0	0	0	0	0
	1999	0	0	0	0	0	0	0	0	0	0
	2000	0	0	0	0	0	0	0	0	0	0
	2001	0	0	0	0	0	0	0	0	0	0
	2002	0	0	0	0	0	0	0	0	0	0
	2003	0.006 (0.005)	0.006 (0.005)	0.01 (--)	0.004 (0.002)	0.008 (0.02)	0.008 (0.02)	0.006 (0.008)	0.006 (0.008)	0.008 (0.004)	0.006 (0.004)
	2004	0	0	0	0	0	0	0	0	0	0
	2005	0	0	0	0	0	0	0.004 (0.005)	0.004 (0.005)	0.0002 (0.0003)	0.0002 (0.0003)
	2006	0	0	0	0	0	0	0	0	0	0
	2007	0	0	0	0	0	0	0	0	0	0
	2008	0	0	0	0	0	0	0	0	0	0
	Mean	0.0005	0.0005	0.0009	0.0004	0.0007	0.0007	0.0009	0.0008	0.0007	0.0006

Appendix 4. Continued

Species	*Year*	*May*		*June*		*July*		*August*		*Total*	
		C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h	C/h	H/h
Other	1998	0.002 (0.002)	0.002 (0.002)	0	0	0.004 (0.005)	0.004 (0.005)	0	0	0.001 (0.002)	0.001 (0.002)
	1999	0.01 (0.01)	0	0	0	0	0	0.005 (0.004)	0	0.005 (0.004)	0
	2000	0.003 (0.004)	0	0	0	0.004 (0.004)	0	0	0	0.002 (0.002)	0
	2001	0.002 (0.002)	0.002 (0.002)	0	0	0	0	0	0	0.0007 (0.0008)	0.0007 (0.0008)
	2002	0.008 (0.01)	0.002 (0.003)	0.008 (0.009)	0	0.006 (0.004)	0.003 (0.003)	0.005 (0.005)	0.0008 (0.001)	0.006 (0.004)	0.002 (0.001)
	2003	0.008 (0.01)	0.005 (0.006)	0.005 (0.004)	0.002 (0.003)	0.006 (0.007)	0	0	0	0.005 (0.004)	0.002 (0.002)
	2004	0.0006 (0.0008)	0	0.004 (0.004)	0	0	0	0.0008 (0.0009)	0	0.002 (0.002)	0
	2005	0.003 (0.003)	0	0	0	0.003 (0.004)	0	0.007 (0.01)	0	0.001 (0.001)	0
	2006	0	0	0.006 (0.006)	0	0	0	0	0	0.002 (0.002)	0
	2007	0.006 (0.009)	0	0	0	0	0	0	0	0.001 (0.002)	0
	2008	0.005 (0.005)	0	0.003 (0.004)	0.003 (0.0040	0	0	0	0	0.003 (0.002)	0.001 (0.002)
	Mean	0.004	0.001	0.002	0.0005	0.002	0.0006	0.002	0.0001	0.003	0.0006

Appendix 5. Winter angler target species frequency total by month and over the winter for parties interviewed by the creel clerk during winter creel surveys on Brant Lake, 2002-2008.

		Percent of anglers targeting					
Year	*Month*	*Walleye*	*Yellow perch*	*Black crappie*	*Northern pike*	*Smallmouth bass*	*Any species*
2002-03	December	70	20	0	0	0	10
	January	78	11	0	0	0	11
	February	78	9	0	0	0	13
	March	83	7	0	0	0	10
	Total	79	10	0	0	0	11
2003-04	December	93	7	0	0	0	0
	January	85	3	0	0	0	12
	February	86	6	0	0	0	8
	March	94	0	0	0	0	6
	Total	88	4	0	0	0	8
2004-05	December	47	33	0	0	0	20
	January	46	19	12	0	0	23
	February	27	45	0	0	0	28
	March	100	0	0	0	0	0
	Total	48	26	10	0	0	16
2005-06	December	0	75	0	0	0	25
	January	27	42	3	0	0	28
	February	29	57	0	14	0	0
	March	50	50	0	0	0	0
	Total	26	48	2	2	0	22
2006-07	December	85	4	4	0	0	7
	January	95	0	0	0	3	2
	February	91	0	0	0	0	9
	March	29	71	0	0	0	0
	Total	88	4	1	0	1	6
2007-08	December	52	12	0	0	0	36
	January	77	19	4	0	0	0
	February	36	10	19	2	0	33
	March	12	4	60	0	0	24
	Total	50	13	17	1	0	19

Appendix 6. Monthly and total (December through March) number of angler interviews (# Int), estimated fishing pressure (angler hours), estimated angler days, estimated economic value, estimated trip length (hours), average party size, percent of interviewed parties that were South Dakota (SD) residents, percent of angling activity done by shack and percent of angling activity that occurred during weekends/holidays at Brant Lake, South Dakota (80% confidence interval).

Year	*Month*	*# Int*	*Angler hours*	*Angler days*	*Economic value*	*Trip length (h)*	*Party size*	*% SD residents*	*% shack anglers*	*% weekends or holidays*
2002	December	10	811 (544)	--		--	1.72 (--)	100	51	58
2003	January	45	2,426 (834)	433	$26,426	5.60 (--)	1.75 (0.61)	100	98	53
2003	February	55	2,095 (1,178)	180	$11,017	11.60 (--)	1.81 (0.80)	96	93	75
2003	March	41	2,766 (1,535)	1,441	$87,878	1.92 (--)	2.10 (0.43)	98	48	44
	Total	151	8,098 (1,697)	1,064	$64,912	7.61 (--)	1.82 (0.28)	98	75	56
2003	December	15	1,145 (555)	204	$12,444	5.61 (--)	1.60 (0.55)	100	66	61
2004	January	60	3,268 (1,453)	360	$21,955	9.08 (0.78)	2.20 (1.38)	87	84	49
2004	February	49	2,421 (1,127)	518	$31,623	4.67 (2.99)	1.94 (1.52)	94	75	46
2004	March	31	816 (440)	355	$21,642	2.30 (--)	1.69 (0.77)	100	17	41
	Total	155	7,651 (1,970)	1,409	$85,950	5.43 (0.74)	1.86 (0.56)	93	71	52
2004	December	26	276 (246)	55	$3,355	0.99 (--)	1.85 (0.59)	100	41	20
2005	January	11	805 (204)	161	$9,821	1.00 (--)	1.59 (0.87)	100	80	79
2005	February	6	182 (105)	36	$2,196	1.28 (--)	1.67 (1.04)	91	38	42
2005	March	15	299 (354)	60	$3,660	1.01 (--)	1.63 (--)	100	26	8
	Total	58	1,561 (488)	312[a]	$19,032	1.03 (--)	1.69 (0.36)	98	59	50
2005	December	4	151 (75)	48	$2,906	3.17 (--)	1.19 (--)	75	76	25
2006	January	33	1,067 (397)	430	$26,242	2.55 (0.32)	1.89 (1.11)	100	82	55
2006	February	7	211 (154)			--	1.14 (0.18)	100	85	81
2006	March	2	177 (227)			--	1.50 (--)	100	0	0
	Total	46	1,606 (408)	597	$36,419	2.69 (0.25)	1.43 (0.31)	98	73	49
2006	December	26	954 (541)	245	$14,960	3.89 (1.22)	1.73 (1.09)	92	91	46
2007	January	59	3,156 (1,394)	992	$60,359	3.18 (0.57)	1.68 (1.17)	98	94	59
2007	February	44	1,989 (866)	347	$21,137	5.74 (--)	1.76 (0.21)	98	98	45
2007	March	7	544 (392)	124	$7,559	4.39 (--)	1.14 (--)	100	23	40
	Total	136	6,642 (1,772)	1,562	$95,332	4.25 (0.37)	1.61 (0.44)	97	89	52
2007	December	25	937 (453)	180	$10,970	5.21 (--)	1.70 (0.47)	100	91	58
2008	January	57	1,534 (706)	89	$5,459	17.14 (9.84)	1.69 (0.89)	98	84	77
2008	February	43	1,455 (742)	400	$24,383	3.64 (1.54)	1.77 (1.57)	100	66	60
2008	March	26	873 (266)	112	$6,819	7.81 (0.69)	1.52 (0.80)	100	94	59
	Total	151	4,799 (1,151)	562	$34,319	8.53 (2.53)	1.67 (0.50)	99	82	65

[a] A trip length of 5 hours was used to calculate angler days in 2004-05 because of the small sample size and unreasonable estimated trip lengths.

Appendix 7. Estimated number of walleye, northern pike, yellow perch and black crappie caught and harvested by month and year during the winter fishery at Brant Lake, South Dakota. (80% confidence interval).

Species	*Year*	*December*		*January*		*February*		*March*		*Total*	
		catch	harvest	catch	harvest	catch	harvest	catch	harvest	catch	harvest
Walleye	2002-03	60 (0)	22 (0)	517 (316)	132 (69)	1,747 (1,025)	84 (69)	1,578 (788)	300 (172)	3,902 (1,331)	539 (198)
	2003-04	140 (54)	74 (32)	469 (519)	177 (157)	188 (207)	117 (136)	293 (148)	200 (117)	1,091 (581)	568 (241)
	2004-05	0	0	0	0	0	0	0	0	0	0
	2005-06	0	0	0	0	0	0	0	0	0	0
	2006-07	497 (333)	78 (51)	1,374 (718)	152 (92)	162 (91)	72 (71)	356 (--)	158 (--)	2,389 (797)	459 (127)
	2007-08	113 (69)	60 (31)	209 (205)	56 (42)	68 (176)	38 (103)	49 (22)	0	439 (279)	153 (115)
	Total	810	234	2,569	517	2,165	311	2,276	658	7,820	1,720
Northern Pike	2002-03	0	0	28 (17)	0	0	0	14 (--)	0	42 (17)	0
	2003-04	21 (--)	21 (--)	6 (10)	6 (10)	0	0	6 (8)	3 (2)	33 (13)	30 (10)
	2004-05	0	0	5 (3)	5 (3)	0	0	0	0	5 (3)	5 (3)
	2005-06	0	0	0	0	0	0	0	0	0	0
	2006-07	7 (8)	0	0	0	0	0	0	0	7 (8)	0
	2007-08	7 (10)	0	3 (4)	0	0	0	0	0	10 (10)	0
	Total	35	21	42	11	0	0	20	3	97	35

Appendix 7. Continued

Species	*Year*	*December*		*January*		*February*		*March*		*Total*	
		catch	harvest	catch	harvest	catch	harvest	catch	harvest	catch	harvest
Yellow Perch	2002-03	0	0	27 (41)	27 (41)	29 (21)	25 (20)	329 (43)	329 (43)	385 (63)	381 (62)
	2003-04	0	0	0	0	0	0	0	0	0	0
	2004-05	0	0	0	0	0	0	0	0	0	0
	2005-06	0	0	9 (15)	9 (15)	0	0	0	0	9 (15)	9 (15)
	2006-07	0	0	10 (16)	0	0	0	8 (--)	8 (--)	18 (16)	8 (0)
	2007-08	7 (8)	7 (8)	3 (4)	3 (4)	45 (40)	45 (40)	13 (11)	10 (10)	68 (42)	65 (42)
	Total	7	7	49	39	74	70	350	347	480	463
Black Crappie	2002-03	0	0	0	0	13 (14)	8 (12)	87 (43)	87 (43)	99 (45)	95 (45)
	2003-04	0	0	25 (46)	17 (30)	18 (27)	0	10 (--)	10 (--)	52 (53)	26 (30)
	2004-05	0	0	0	0	0	0	0	0	0	0
	2005-06	0	0	0	0	6 (6)	0	0	0	6 (6)	0
	2006-07	0	0	0	0	0	0	0	0	0	0
	2007-08	0	0	11 (12)	11 (12)	249 (236)	200 (181)	47 (40)	23 (21)	307 (240)	234 (182)
	Total	0	0	36	28	286	208	144	120	466	356

Appendix 8. Estimated angler catch rate (C/h) and harvest rate (H/h) of walleye, northern pike, yellow perch and black crappie by month and year during the winter fishery at Brant Lake, South Dakota. (80% confidence interval).

Species	*Year*	*December*		*January*		*February*		*March*		*Total*	
		catch	harvest	catch	harvest	catch	harvest	catch	harvest	catch	harvest
Walleye	2002-03	0.17 (0)	0	0.21 (0.16)	0.05 (0.05)	0.83 (1.03)	0.04 (0.06)	0.57 (1.12)	0.11 (0.23)	0.48 (0.42)	0.07 (0.07)
	2003-04	0.12 (0.15)	0.06 (0.08)	0.14 (0.12)	0.05 (0.04)	0.08 (0.12)	0.05 (0.08)	0.36 (0.22)	0.25 (0.15)	0.14 (0.08)	0.07 (0.04)
	2004-05	0	0	0	0	0	0	0	0	0	0
	2005-06	0	0	0	0	0	0	0	0	0	0
	2006-07	0.52 (0.86)	0.08 (0.17)	0.44 (0.49)	0.05 (0.05)	0.08 (0.09)	0.04 (0.06)	0.65 (--)	0.29 (--)	0.36 (0.25)	0.07 (0.04)
	2007-08	0.12 (0.10)	0.06 (0.05)	0.14 (0.18)	0.04 (0.04)	0.05 (0.15)	0.03 (0.09)	0.06 (--)	0	0.09 (0.08)	0.03 (0.03)
	Mean	0.16	0.03	0.16	0.03	0.17	0.03	0.27	0.11	0.18	0.04
Northern Pike	2002-03	0	0	0.01 (0.009)	0	0	0	0.005 (--)	0	0.005 (0.003)	0
	2003-04	0.02 (--)	0.02 (--)	0.002 (0.008)	0.002 (0.008)	0	0	0.008 (0.01)	0.003 (0.005)	0.004 (0.008)	0.004 (0.005)
	2004-05	0	0	0.006 (0.004)	0.006 (0.004)	0	0	0	0	0.003 (0.002)	0.003 (0.002)
	2005-06	0	0	0	0	0	0	0	0	0	0
	2006-07	0.007 (0.01)	0	0	0	0	0	0	0	0.001 (0.001)	0
	2007-08	0.007 (0.01)	0	0.002 (0.003)	0	0	0	0	0	0.002 (0.002)	0
	Mean	0.006	0.003	0.003	0.001	0	0	0.002	0.0005	0.003	0.001

Appendix 8. Continued

Species	*Year*	*December*		*January*		*February*		*March*		*Total*	
		catch	harvest	catch	harvest	catch	harvest	catch	harvest	catch	harvest
Yellow Perch	2002-03	0	0	0.01 (0.02)	0.01 (0.02)	0.01 (0.01)	0.01 (0.01)	0.12 (0.07)	0.12 (0.07)	0.05 (0.02)	0.05 (0.02)
	2003-04	0	0	0	0	0	0	0	0	0	0
	2004-05	0	0	0	0	0	0	0	0	0	0
	2005-06	0	0	0.009 (0.01)	0.009 (0.01)	0	0	0	0	0.006 (0.009)	0.006 (0.009)
	2006-07	0	0	0.003 (0.005)	0	0	0	0.01 ((--)	0.01 (--)	0.003 (0.003)	0.001 (0.0003)
	2007-08	0.007 (0.009)	0.007 (0.009)	0.002 (--)	0.002 (--)	0.03 (0.04)	0.03 (0.04)	0.02 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
	Mean	0.001	0.001	0.004	0.004	0.007	0.007	0.03	0.02	0.01	0.01
Black Crappie	2002-03	0	0	0	0	0.006 (0.01)	0.004 (0.01)	0.03 (0.02)	0.03 (0.02)	0.01 (0.008)	0.01 (0.007)
	2003-04	0	0	0.008 (0.01)	0.005 (0.01)	0.007 (0.01)	0	0.01 (--)	0.01 (--)	0.007 (0.007)	0.003 (0.004)
	2004-05	0	0	0	0	0	0	0	0	0	0
	2005-06	0	0	0	0	0.03 (0.01)	0	0	0	0.004 (0.004)	0
	2006-07	0	0	0	0	0	0	0	0	0	0
	2007-08	0	0	0.007 (0.01)	0.007 (0.01)	0.17 (0.33)	0.14 (0.28)	0.05 (0.06)	0.03 (0.03)	0.06 (0.07)	0.05 (0.06)
	Mean	0	0	0.003	0.002	0.04	0.02	0.02	0.01	0.01	0.01

Appendix 9. Questions asked during interviews to obtain angler opinions on regulations and trip satisfaction.

Question 1. Response of Brant Lake, South Dakota angling parties interviewed during the summer 1999 creel survey to the question: "Are you in favor of removing the 14-inch minimum size limit on walleyes on lakes Brant, Madison and Herman?" (n is the number of responses)

Response	*Percent (%) (n = 185)*
Yes	53
No	27
Undecided	20

Question 2. Response of Brant Lake, South Dakota angling parties interviewed during the summer 1999 creel survey to the question: "Given the numbers and size of fish caught, how satisfied are you with your fishing trip today?" (n is the number of responses)

Response	*Percent (%) (n = 185)*
Satisfied	62
Somewhat satisfied	4
Neutral	5
Somewhat dissatisfied	2
Dissatisfied	2
No opinion	25

Question 3. Response of Brant Lake, South Dakota angling parties interviewed during the summer 2002 creel survey to the question: "How satisfied are you with your fishing trip today considering all factors?" (n is the number of responses)

Response	*Percent (%) (n = 447)*
Very satisfied	22
Satisfied	40
Neutral	25
Dissatisfied	7
Very dissatisfied	3
Not answered	3

Question 4. Response of Brant Lake, South Dakota angling parties interviewed during the summer 2003 creel survey to the question: "How satisfied are you with your fishing trip today?" (n is the number of responses)

Response	*Percent (%) (n = 285)*
Satisfied	58
Somewhat satisfied	19
Neutral	10
Somewhat dissatisfied	5
Dissatisfied	7
No opinion	1

Question 5. Response of Brant Lake, South Dakota angling parties interviewed during the summer 2003 creel survey to the question: "In your opinion, would you say that the current South Dakota fishing regulations are…" (n is the number of responses)

Response	*Percent (%) (n = 285)*
Very easy to understand	58
Somewhat easy to understand	17
Somewhat difficult to understand	17
Very difficult to understand	7
No opinion	1

Question 6. Response of Brant Lake, South Dakota angling parties interviewed during the winter 2003-04 and summer 2004 creel surveys to the question: "On a typical fishing trip, would you rather catch and keep four 13-inch; three 14-inch or 1 17-inch walleye?" (n is the number of responses)

Response	*Percent (%)*	
	Winter 2003-04 (n = 155)	*Summer 2004 (n = 462)*
Four 13-inch walleyes	26	16
Three 14-inch walleyes	55	66
One 17-inch walleye	19	18

Question 7. Response of Brant Lake, South Dakota angling parties interviewed during the winter 2003-04, summer 2004 and winter 2004-05 creel surveys to the question: "Why did you choose this lake over other lakes?" (n is the number of responses)

Response	*Percent (%)*		
	Winter 2003-04 (n = 155)	*Summer 2004 (n = 462)*	*Winter 2004-05 (n = 58)*
Closeness to home	65	34	55
Heard targeted fish were biting	15	31	4
Chance to catch bigger fish	1	1	0
Chance to catch a lot of fish	5	4	0
Familiarity with the lake	7	14	17
Other	7	16	24

Question 8. Response of Brant Lake, South Dakota angling parties interviewed during the winter 2004-05 creel survey to the question: "How many walleyes over 20 inches were released?"

Number released	*Number*	*Percent (%)*
0	58	100
1	0	0
2	0	0

Question 9. Response of Brant Lake, South Dakota angling parties interviewed during the summer 2005 creel survey to four questions concerning potential regulation changes (n is the number of responses)

Question	*n*	*Percent (%)*		
		Favor	*Neutral*	*Oppose*
What is your opinion on making the one walleye over 20 inches restriction statewide regulation?	114	85	5	10
What is your opinion on reducing the statewide daily walleye limit from four to three?	114	26	10	64
What is your opinion on reducing the daily panfish limit from 25 to 10?	136	46	18	36
What is your opinion on reducing the statewide daily northern pike limit from six to three?	136	24	34	42

Question 10. Response of Brant Lake, South Dakota angling parties interviewed during the winter 2005-06 creel survey to three questions concerning potential regulation changes (n is the number of responses)

Question	*n*	*Percent (%)* *Favor*	*Neutral*	*Oppose*
What is your opinion on reducing the statewide daily walleye limit from four to three?	0			
What is your opinion on reducing the daily panfish limit from 25 to 10?	37	37	14	49
What is your opinion on reducing the statewide daily northern pike limit from six to three?	9	12	44	44

Question 11. Response of Brant Lake, South Dakota angling parties interviewed during the winter 2007-08 and summer 2008 creel surveys to the question, "What would you consider to be the best daily limit for panfish (perch, crappies and bluegills)." The number of responses is in parentheses.

Response	*Percent (%)* *Winter 2007-08 (n = 149)*	*Summer 2008 (n = 268)*
5	3	4
10	31	29
15	23	21
20	7	9
25	36	35
25+	0	2

Appendix 10. Yearly fishing pressure (h and h/ha) and catch and harvest statistics for walleyes, yellow perch and northern pike on primary walleye waters in eastern South Dakota creel surveyed between 1996 and 2008. Creel data for the Brant, Herman, Madison and Sinai fisheries were rerun using a corrected version of the CAS program, and therefore, values for catch and harvest rates will be lower than those reported in Lucchesi (2009).

				Surface			*Walleye*			*Yellow perch*			*Northern pike*		
				area	*Fishing pressure*		*Catch*	*Harvest*		*Catch*	*Harvest*		*Catch*	*Harvest*	
Lake	*County*	*Season*	*Year*	*(ha)*	*(h)*	*(h/ha)*	*rate*	*rate*	*per ha*	*rate*	*rate*	*per ha*	*rate*	*rate*	*per ha*
Bitter	Day	Summer	2000	4,010	48,062	12.0	1.2	0.32	3.84	0.01	0.01	0.12	0.44	0.09	1.08
Bitter	Day	Summer	2001	4,010	42,775	10.7	1.1	0.27	2.88	0.01	0.01	0.11	0.38	0.05	0.53
Bitter	Day	Summer	2002	4,010	56,655	14.1	0.94	0.25	3.53	0.01	0.01	0.14	0.36	0.05	0.71
Bitter	Day	Summer	2003	4,010	50,510	12.6	0.95	0.23	2.90	0.01	0.01	0.13	0.22	0.04	0.50
Bitter	Day	Summer	2004	4,010	41,665	10.4	0.79	0.31	3.22	0.01	0.01	0.10	0.24	0.05	0.52
Bitter	Day	Summer	2005	4,010	65,927	16.4	0.58	0.27	4.44	0.001	0.001	0.02	0.07	0.02	0.33
Bitter	Day	Summer	2006	4,010	31,115	7.8	0.32	0.2	1.55	0.001	0.001	0.01	0.15	0.06	0.47
Bitter	Day	Summer	2007	4,010	33,369	8.3	0.94	0.19	1.58	0.001	0.001	0.01	0.03	0.01	0.08
Bitter	Day	Summer	2008	4,010	52,469	13.1	0.66	0.4	5.23	0.001	0.001	0.01	0.03	0.01	0.13
Brant	Lake	Summer	1998	420	14,257	33.9	0.48	0.03	1.02	0.02	0.02	0.68	0.05	0.01	0.34
Brant	Lake	Summer	1999	420	13,634	32.5	0.56	0.06	1.95	0.05	0.02	0.65	0.03	0.008	0.26
Brant	Lake	Summer	2000	420	17,966	42.8	0.42	0.13	5.56	0.14	0.12	5.13	0.004	0.001	0.04
Brant	Lake	Summer	2001	420	29,843	71.1	0.20	0.11	7.82	0.01	0.004	0.28	0.0004	0.002	0.14
Brant	Lake	Summer	2002	420	44,346	105.6	0.24	0.07	7.39	0.59	0.46	48.57	0.02	0.003	0.32
Brant	Lake	Summer	2003	420	28,220	67.2	0.79	0.10	6.72	0.34	0.25	16.80	0.004	0.002	0.13
Brant	Lake	Summer	2004	420	30,658	73.0	0.22	0.12	8.76	0.08	0.08	5.84	0.003	0.001	0.07
Brant	Lake	Summer	2005	420	31,760	75.6	0.15	0.12	9.07	0.06	0.05	3.78	0.001	0	0
Brant	Lake	Summer	2006	420	22,053	52.5	0.27	0.07	3.68	0.05	0.02	1.05	0.009	0.003	0.16
Brant	Lake	Summer	2007	420	14,857	35.4	0.18	0.12	4.24	0.03	0.03	1.06	0.008	0.004	0.14
Brant	Lake	Summer	2008	420	30,627	72.9	0.31	0.09	6.56	0.01	0.01	0.73	0.02	0.002	0.15
Enemy Swim	Day	Summer	1997	870	16,518	19.0	0.99	0.06	1.14	0.44	0.02	0.38	0.26	0.03	0.57
Enemy Swim	Day	Summer	1998	870	21,232	24.4	0.36	0.11	2.68	0.19	0.06	1.46	0.07	0.01	0.24
Enemy Swim	Day	Summer	1999	870	53,004	60.9	0.41	0.1	6.09	0.29	0.09	5.48	0.05	0.01	0.61
Enemy Swim	Day	Summer	2000	870	56,553	65.0	0.17	0.05	3.25	0.22	0.07	4.55	0.03	0.01	0.65
Enemy Swim	Day	Summer	2001	870	36,350	41.8	0.13	0.04	1.67	0.2	0.01	0.42	0.03	0.01	0.42
Enemy Swim	Day	Summer	2002	870	41,369	47.6	0.37	0.09	4.28	0.13	0.04	1.90	0.03	0.01	0.48
Enemy Swim	Day	Summer	2003	870	45,705	52.5	0.22	0.06	3.15	0.16	0.02	1.05	0.03	0	0.00
Enemy Swim	Day	Summer	2004	870	38,274	44.0	0.14	0.02	0.88	0.1	0.02	0.88	0.02	0.001	0.04
Enemy Swim	Day	Summer	2005	870	38,253	44.0	0.17	0.09	3.96	0.09	0.01	0.44	0.01	0.001	0.04
Enemy Swim	Day	Summer	2006	870	26,757	30.8	0.17	0.06	1.85	0.18	0.007	0.22	0.02	0.004	0.12
Enemy Swim	Day	Summer	2007	870	20,993	24.1	0.05	0.04	0.97	0.05	0.001	0.02	0.01	0.001	0.02
Enemy Swim	Day	Summer	2008	870	16,518	19.0	0.99	0.06	1.14	0.44	0.02	0.38	0.26	0.03	0.57
Herman	Lake	Summer	1998	521	17,128	32.9	0.48	0.03	0.99	0.05	0.03	0.99	0.01	0.01	0.33
Herman	Lake	Summer	1999	521	5,038	9.7	0.57	0.03	0.29	0.08	0.05	0.48	0	0	0
Herman	Lake	Summer	2000	521	11,483	22.0	0.16	0.07	1.54	0.08	0.07	1.54	0.002	0	0

Appendix 10 Continued.

				Surface			*Walleye*			*Yellow perch*			*Northern pike*		
				area	*Fishing pressure*		*Catch*	*Harvest*		*Catch*	*Harvest*		*Catch*	*Harvest*	
Lake	*County*	*Season*	*Year*	*(ha)*	*(h)*	*(h/ha)*	*rate*	*rate*	*per ha*	*rate*	*rate*	*per ha*	*rate*	*rate*	*per ha*
Herman	Lake	Summer	2001	521	14,265	27.38	0.12	0.05	1.37	0.01	0.006	0.16	0.007	0.001	0.03
Herman	Lake	Summer	2002	521	11,837	22.72	0.18	0.08	1.82	0.06	0.04	0.91	0.01	0.001	0.01
Herman	Lake	Summer	2003	521	11,189	21.48	0.32	0.23	4.94	0.02	0.02	0.43	0.02	0.007	0.15
Herman	Lake	Summer	2004	521	8,259	15.85	0.29	0.09	1.43	0.10	0.10	1.59	0.01	0.003	0.05
Herman	Lake	Summer	2005	521	6,074	11.66	0.29	0.02	0.23	0.006	0.006	0.07	0.002	0	0
Herman	Lake	Summer	2006	521	5,114	9.82	0.09	0.04	0.39	0.008	0.008	0.08	0.004	0	0
Herman	Lake	Summer	2007	521	4,229	8.12	0.34	0.14	1.14	0.08	0.07	0.57	0.05	0.01	0.08
Herman	Lake	Summer	2008	521	9,009	17.29	0.28	0.16	2.77	0.009	0.002	0.03	0.03	0.002	0.03
Madison	Lake	Summer	1998	1,070	18,374	17.2	0.33	0.05	0.86	0.22	0.17	2.92	0.001	0	0
Madison	Lake	Summer	1999	1,070	12,141	11.3	0.60	0.03	0.34	0.19	0.13	1.48	0.001	0.001	0.01
Madison	Lake	Summer	2000	1,070	18,660	17.4	0.47	0.11	1.92	0.04	0.03	.052	0	0	0
Madison	Lake	Summer	2001	1,070	11,477	10.7	0.04	0.01	0.11	0.54	0.30	3.22	0	0	0
Madison	Lake	Summer	2002	1,070	14,632	13.7	0.04	0.01	0.14	1.43	0.63	8.62	0.01	0.01	0.14
Madison	Lake	Summer	2003	1,070	32,116	30.0	0.13	0.09	2.70	0.83	0.48	14.41	0.01	0.002	0.06
Madison	Lake	Summer	2004	1,070	36,903	34.5	0.19	0.07	2.41	0.24	0.16	5.52	0.02	0.008	0.28
Madison	Lake	Summer	2005	1,070	28,694	26.8	0.25	0.04	1.07	0.15	0.13	3.49	0.0003	0	0
Madison	Lake	Summer	2006	1,070	21,792	20.4	0.14	0.10	2.04	0.03	0.02	0.41	0.0006	0	0
Madison	Lake	Summer	2007	1,070	13,231	12.4	0.41	0.19	2.35	0.51	0.2	2.47	0.008	0.002	0.02
Madison	Lake	Summer	2008	1,070	18,521	17.3	0.28	0.04	0.69	0.55	0.18	3.12	0.008	0.002	0.03
Pickerel	Day	Summer	1997	377	11,733	31.1	0.5	0.05	1.56	0.15	0.12	3.73	0.49	0.13	4.05
Pickerel	Day	Summer	1998	377	17,076	45.3	0.34	0.15	6.79	0.12	0.01	0.45	0.36	0.08	3.62
Pickerel	Day	Summer	2000	377	22,461	59.6	0.73	0.14	8.34	0.14	0.05	2.98	0.27	0.02	1.19
Pickerel	Day	Summer	2001	377	10,315	27.4	0.15	0.03	0.82	0.18	0.07	1.92	0.09	0.003	0.08
Pickerel	Day	Summer	2006	377	31,409	83.3	0.23	0.08	6.67	0.21	0.06	5.00	0.05	0.01	0.83
Pickerel	Day	Summer	2007	377	31,713	84.1	0.24	0.11	9.25	0.16	0.02	1.68	0.08	0.02	1.68
Pickerel	Day	Summer	2008	377	24,285	64.4	0.28	0.04	2.58	0.04	0.003	0.19	0.11	0.01	0.64
Poinsett	Hamlin	Summer	1997	3,200	62,987	19.7	0.68	0.14	2.76	0.06	0.04	0.79	0.08	0.02	0.39
Poinsett	Hamlin	Summer	1998	3,200	69,844	21.8	0.67	0.08	1.75	0.03	0.03	0.65	0.07	0.01	0.22
Poinsett	Hamlin	Summer	1999	3,200	47,733	14.9	0.46	0.12	1.79	0.02	0.005	0.07	0.05	0.006	0.09
Poinsett	Hamlin	Summer	2000	3,200	98,907	30.9	0.49	0.25	7.73	0.07	0.05	1.55	0.02	0.001	0.02
Poinsett	Hamlin	Summer	2001	3,200	47,583	14.9	0.15	0.04	0.59	0.01	0.005	0.07	0.04	0.01	0.15
Poinsett	Hamlin	Summer	2002	3,200	48,398	15.1	0.2	0.08	1.21	0.02	0.01	0.15	0.15	0.02	0.30
Poinsett	Hamlin	Summer	2003	3,200	56,888	17.8	0.17	0.1	1.78	0.01	0.004	0.07	0.09	0.02	0.36
Poinsett	Hamlin	Summer	2004	3,200	29,951	9.4	0.09	0.06	0.56	0.004	0.002	0.02	0.06	0.01	0.09
Sinai	Brookings	Summer	2005	696	20,541	29.5	0.24	0.05	1.48	0.52	0.42	12.40	0.004	0.001	0.02
Sinai	Brookings	Summer	2006	696	20,947	30.1	0.74	0.09	2.71	0.40	0.28	8.43	0.0009	0	0
Sinai	Brookings	Summer	2007	696	18,031	25.9	0.46	0.15	3.89	0.06	0.04	1.04	0.004	0.002	0.05

Appendix 10 Continued.

				Surface			Walleye			Yellow perch			Northern pike		
				area	Fishing pressure		Catch	Harvest		Catch	Harvest		Catch	Harvest	
Lake	*County*	*Season*	*Year*	*(ha)*	*(h)*	*(h/ha)*	*rate*	*rate*	*per ha*	*rate*	*rate*	*per ha*	*rate*	*rate*	*per ha*
Sinai	Brookings	Summer	2008	696	20,090	28.9	0.50	0.15	4.33	0.26	0.07	2.02	0.001	0.001	0.009
Thompson	Kingsbury	Summer	1997	6,576	178,061	27.1	1.01	0.31	8.39	0.06	0.05	1.35	0.23	0.04	1.08
Thompson	Kingsbury	Summer	1998	6,576	162,913	24.8	0.91	0.32	7.93	0.07	0.06	1.49	0.14	0.02	0.50
Thompson	Kingsbury	Summer	1999	6,576	182,813	27.8	0.75	0.37	10.29	0.06	0.05	1.39	0.1	0.03	0.83
Thompson	Kingsbury	Summer	2000	6,576	130,175	19.8	0.73	0.26	5.15	0.15	0.11	2.18	0.1	0.01	0.20
Thompson	Kingsbury	Summer	2001	6,576	124,233	18.9	0.44	0.13	2.46	0.03	0.02	0.38	0.05	0.01	0.19
Thompson	Kingsbury	Summer	2002	5,731	117,502	20.5	0.65	0.26	5.33	0.11	0.06	1.23	0.06	0.01	0.21
Thompson	Kingsbury	Summer	2003	4,886	135,476	27.7	0.62	0.26	7.21	0.04	0.03	0.83	0.08	0.01	0.28
Thompson	Kingsbury	Summer	2004	4,886	114,142	23.4	0.56	0.23	5.37	0.008	0.006	0.14	0.07	0.01	0.23
Thompson	Kingsbury	Summer	2005	4,886	79,613	16.3	0.28	0.17	2.77	0.03	0.03	0.49	0.02	0.007	0.11
Thompson	Kingsbury	Summer	2006	4,886	71,517	14.6	0.62	0.24	3.51	0.009	0.006	0.09	0.007	0.001	0.01
Thompson	Kingsbury	Summer	2007	4,886	78,520	16.1	0.43	0.25	4.02	0.01	0.008	0.13	0.01	0.003	0.05
Thompson	Kingsbury	Summer	2008	4,559	69,634	15.3	0.87	0.28	4.28	0.004	0.003	0.05	0.01	0.001	0.02
Waubay	Day	Summer	1997	6,289	26,959	4.3	0.31	0.14	0.60	0	0	0.00	0.44	0.12	0.51
Waubay	Day	Summer	1998	6,289	117,764	18.7	0.52	0.35	6.55	0.44	0.17	3.18	0.24	0.04	0.75
Waubay	Day	Summer	1999	6,289	260,228	41.4	0.48	0.31	12.83	1.25	0.28	11.59	0.29	0.05	2.07
Waubay	Day	Summer	2000	6,289	174,526	27.8	0.43	0.11	3.05	0.86	0.39	10.82	0.22	0.04	1.11
Waubay	Day	Summer	2001	6,289	111,723	17.8	0.62	0.07	1.24	0.69	0.43	7.64	0.1	0.03	0.53
Waubay	Day	Summer	2002	6,289	139,769	22.2	1.22	0.06	1.33	0.34	0.25	5.56	0.05	0.01	0.22
Waubay	Day	Summer	2003	6,289	143,826	22.9	2.18	0.05	1.14	0.13	0.1	2.29	0.02	0.01	0.23
Waubay	Day	Summer	2004	6,289	121,922	19.4	2.3	0.38	7.37	0.07	0.06	1.16	0.01	0.01	0.19
Waubay	Day	Summer	2005	6,289	70,398	11.2	0.9	0.4	4.48	0.003	0.002	0.02	0.01	0.008	0.09
Waubay	Day	Summer	2006	6,289	65,029	10.3	0.84	0.24	2.48	0.01	0.01	0.10	0.003	0.002	0.02
Waubay	Day	Summer	2007	6,289	28,047	4.5	0.82	0.16	0.71	0.04	0.003	0.01	0.007	0.001	0.00
Waubay	Day	Summer	2008	6,289	45,909	7.3	0.8	0.2	1.46	0.002	0.001	0.01	0.003	0.001	0.00
Madison	Lake	Fall	2005	1,070	21,231	19.8	0.24	0.04	0.79	0.61	0.52	10.32	0.002	0.001	0.02
Madison	Lake	Fall	2006	1,070	11,041	10.3	0.04	0.02	0.21	0.16	0.14	1.44	0.001	0	0
Madison	Lake	Fall	2007	1,070	8,194	7.7	1.17	0.005	0.04	2.54	1.67	12.8	0	0	0
Madison	Lake	Fall	2008	1,070	10,402	9.7	0.23	0.02	0.19	0.90	0.76	7.39	0.004	0.002	0.02
Bitter	Day	Winter	1999-00	4,010	14,719	3.7	0.43	0.11	0.40	0.39	0.33	1.21	0.58	0.27	0.99
Bitter	Day	Winter	2000-01	4,010	2,355	0.6	0.12	0.02	0.01	0.07	0.03	0.02	0.35	0.26	0.15
Bitter	Day	Winter	2001-02	4,010	26,684	6.7	0.34	0.1	0.67	0.17	0.15	1.00	0.19	0.08	0.53
Bitter	Day	Winter	2002-03	4,010	23,241	5.8	0.34	0.1	0.58	0.15	0.08	0.46	0.26	0.14	0.81
Bitter	Day	Winter	2003-04	4,010	31,386	7.8	0.46	0.17	1.33	0.19	0.17	1.33	0.18	0.12	0.94
Bitter	Day	Winter	2004-05	4,010	25,146	6.3	0.21	0.11	0.69	0.1	0.09	0.56	0.06	0.05	0.31

Appendix 10 Continued.

				Surface			Walleye			Yellow perch			Northern pike		
				area	Fishing pressure		Catch	Harvest		Catch	Harvest		Catch	Harvest	
Lake	*County*	*Season*	*Year*	*(ha)*	*(h)*	*(h/ha)*	*rate*	*rate*	*per ha*	*rate*	*rate*	*per ha*	*rate*	*rate*	*per ha*
Bitter	Day	Winter	2005-06	4,010	14,238	3.6	0.07	0.03	0.11	0.19	0.17	0.60	0.19	0.19	0.67
Bitter	Day	Winter	2006-07	4,010	8,932	2.2	0.04	0.01	0.02	0.23	0.18	0.40	0.09	0.09	0.20
Bitter	Day	Winter	2007-08	4,010	12,212	3.0	0.11	0.07	0.21	0.06	0.05	0.15	0.03	0.03	0.09
Brant	Lake	Winter	2002-03	420	8,098	19.3	0.48	0.07	1.35	0.05	0.05	0.96	0.005	0	0
Brant	Lake	Winter	2003-04	420	7,651	18.2	0.14	0.07	1.28	0	0	0	0.004	0.004	0.07
Brant	Lake	Winter	2004-05	420	1,561	3.7	0	0	0	0	0	0	0.003	0.003	0.01
Brant	Lake	Winter	2005-06	420	1,606	3.8	0	0	0	0.006	0.006	0.02	0	0	0
Brant	Lake	Winter	2006-07	420	6,642	15.8	0.36	0.07	1.10	0.003	0.001	0.02	0.001	0	0
Brant	Lake	Winter	2007-08	420	4,799	11.4	0.09	0.03	0.34	0.01	0.01	0.11	0.002	0	0
Enemy Swim	Day	Winter	1997-98	870	5,251	6.0	0.22	0.07	0.42	0.5	0.15	0.91	0.05	0.04	0.24
Enemy Swim	Day	Winter	2000-01	870	18,904	21.7	0.2	0.06	1.30	0.9	0.32	6.95	0.04	0.02	0.43
Enemy Swim	Day	Winter	2001-02	870	9,519	10.9	0.09	0.05	0.55	0.66	0.3	3.28	0.05	0.01	0.11
Enemy Swim	Day	Winter	2002-03	870	13,453	15.5	0.15	0.05	0.77	0.36	0.16	2.47	0.11	0.05	0.77
Enemy Swim	Day	Winter	2003-04	870	21,974	25.3	0.17	0.06	1.52	0.19	0.05	1.26	0.13	0.06	1.52
Enemy Swim	Day	Winter	2004-05	870	25,361	29.2	0.04	0.01	0.29	0.11	0.03	0.87	0.07	0.06	1.75
Enemy Swim	Day	Winter	2005-06	870	8,737	10.0	0.08	0.05	0.50	0.21	0.01	0.10	0.08	0.06	0.60
Enemy Swim	Day	Winter	2006-07	870	12,035	13.8	0.05	0.03	0.42	0.73	0.03	0.42	0.03	0.03	0.42
Enemy Swim	Day	Winter	2007-08	870	8,792	10.1	0.08	0.006	0.06	0.18	0.008	0.08	0.02	0.01	0.10
Madison	Lake	Winter	2002-03	1,070	28,759	26.9	0.009	0.003	0.81	5.46	1.84	49.50	0.01	0.01	0.27
Madison	Lake	Winter	2003-04	1,070	4,614	4.3	0.05	0.05	0.22	0.44	0.39	1.68	0	0	0
Madison	Lake	Winter	2004-05	1,070	14,923	13.9	0.13	0.02	0.28	0.02	0.02	0.28	0.01	0.01	0.14
Madison	Lake	Winter	2005-06	1,070	8,307	7.8	0.07	0.02	0.16	0.008	0.008	0.062	0.001	0.001	0.005
Madison	Lake	Winter	2006-07	1,070	2,810	2.6	0.07	0.05	0.13	0.003	0	0	0.004	0	0
Madison	Lake	Winter	2007-08	1,070	1,962	1.8	0.02	0	0	0.007	0	0	0	0	0
Pickerel	Day	Winter	1997-98	377	2,610	6.9	0.39	0.1	0.69	0.19	0.12	0.83	0.07	0.04	0.28
Pickerel	Day	Winter	2000-01	377	1,400	3.7	0.71	0.02	0.07	0.18	0.15	0.56	0.16	0.02	0.07
Pickerel	Day	Winter	2005-06	377	22,137	58.7	0.02	0.01	0.59	0.86	0.37	21.73	0.01	0.001	0.06
Pickerel	Day	Winter	2006-07	377	12,024	31.9	0.05	0.03	0.96	0.62	0.27	8.61	0.02	0.004	0.13
Pickerel	Day	Winter	2007-08	377	12,472	33.1	0.01	0.02	0.66	0.71	0.36	11.91	0.02	0.01	0.33
Poinsett	Hamlin	Winter	1997-98	3,200	24,747	7.7	1.22	0.11	0.85	0.2	0.19	1.47	0.02	0.008	0.06
Poinsett	Hamlin	Winter	1998-99	3,200	28,664	9.0	0.71	0.12	1.07	0.48	0.43	3.85	0.08	0.04	0.36
Poinsett	Hamlin	Winter	1999-00	3,200	40,218	12.6	0.26	0.15	1.89	0.16	0.15	1.89	0.01	0.007	0.09
Poinsett	Hamlin	Winter	2000-01	3,200	18,802	5.9	0.33	0.07	0.41	0.05	0.04	0.24	0.02	0.01	0.06
Poinsett	Hamlin	Winter	2001-02	3,200	12,192	3.8	0.14	0.06	0.23	0.22	0.18	0.69	0.02	0.01	0.04
Thompson	Kingsbury	Winter	1997-98	6,576	44,477	6.8	0.35	0.12	0.81	0.04	0.02	0.14	0.11	0.11	0.74
Thompson	Kingsbury	Winter	1998-99	6,576	20,801	3.2	0.21	0.07	0.22	0.03	0.01	0.03	0.23	0.18	0.57
Thompson	Kingsbury	Winter	1999-00	6,576	15,066	2.3	0.27	0.09	0.21	0.05	0.02	0.05	0.06	0.03	0.07

Appendix 10 Continued.

				Surface			*Walleye*			*Yellow perch*			*Northern pike*		
				area	*Fishing pressure*		*Catch*	*Harvest*		*Catch*	*Harvest*		*Catch*	*Harvest*	
Lake	*County*	*Season*	*Year*	*(ha)*	*(h)*	*(h/ha)*	*rate*	*rate*	*per ha*	*rate*	*rate*	*per ha*	*rate*	*rate*	*per ha*
Thompson	Kingsbury	Winter	2000-01	4,010	14,238	3.6	0.07	0.03	0.11	0.19	0.17	0.60	0.19	0.19	0.67
Thompson	Kingsbury	Winter	2001-02	4,010	8,932	2.2	0.04	0.01	0.02	0.23	0.18	0.40	0.09	0.09	0.20
Thompson	Kingsbury	Winter	2002-03	4,010	12,212	3.0	0.11	0.07	0.21	0.06	0.05	0.15	0.03	0.03	0.09
Thompson	Kingsbury	Winter	2003-04	4,010	17,690	2.7	0.38	0.12	0.32	0.06	0.04	0.11	0.04	0.03	0.08
Thompson	Kingsbury	Winter	2004-05	4,010	12,011	1.8	0.13	0.04	0.07	0.005	0.002	0.00	0.07	0.07	0.13
Thompson	Kingsbury	Winter	2005-06	4,010	29,021	5.1	0.28	0.12	0.61	0.03	0.02	0.10	0.03	0.02	0.10
Thompson	Kingsbury	Winter	2006-07	4,010	27,401	5.6	0.25	0.09	0.50	0.04	0.02	0.11	0.01	0.01	0.06
Thompson	Kingsbury	Winter	2007-08	4,010	28,202	5.8	0.09	0.07	0.40	0.03	0.02	0.12	0.06	0.05	0.29
Waubay	Day	Winter	1996-97	6,289	5,890	0.9	0.02	0.01	0.01	0	0	0.00	0.33	0.33	0.31
Waubay	Day	Winter	1997-98	6,289	19,935	3.2	0.17	0.11	0.35	0.42	0.39	1.24	0.17	0.15	0.48
Waubay	Day	Winter	1998-99	6,289	91,058	14.5	0.09	0.06	0.87	2.44	0.94	13.61	0.11	0.07	1.01
Waubay	Day	Winter	1999-00	6,289	82,172	13.1	0.12	0.04	0.52	2.43	1.47	19.21	0.26	0.15	1.96
Waubay	Day	Winter	2000-01	6,289	81,169	12.9	0.33	0.01	0.13	1.35	1.06	13.68	0.2	0.12	1.55
Waubay	Day	Winter	2001-02	6,289	115,486	18.4	0.42	0.02	0.37	1.76	1.28	23.50	0.06	0.05	0.92
Waubay	Day	Winter	2002-03	6,289	158,167	25.1	0.32	0.02	0.50	1.86	1.36	34.20	0.04	0.02	0.50
Waubay	Day	Winter	2003-04	6,289	245,088	39.0	0.7	0.2	7.79	1.18	0.91	35.46	0.01	0.01	0.39
Waubay	Day	Winter	2004-05	6,289	184,594	29.4	0.17	0.05	1.47	0.47	0.41	12.03	0.003	0.002	0.06
Waubay	Day	Winter	2005-06	6,289	144,061	22.9	0.25	0.05	1.15	0.6	0.52	11.91	0.002	0.002	0.05
Waubay	Day	Winter	2006-07	6,289	88,321	14.0	0.27	0.02	0.28	0.54	0.43	6.04	0.002	0.001	0.01
Waubay	Day	Winter	2007-08	6,289	49,731	7.9	0.29	0.03	0.24	0.48	0.39	3.08	0.0009	0.001	0.00