Analysis of Fish Harvested During the 2017 Chisago Lakes Lions Club Carp Festival



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Project Background

Common carp *Cyprinus carpio* are a wide-spread invasive species that negatively affect aquatic vegetation, water clarity, and native fish abundance (Bajer and Sorenson 2010; 2012). Common carp have been introduced into many aquatic ecosystems throughout the Midwest and recent research at the University of Minnesota has focused on reducing and controlling populations through various management techniques (Bajer et al. 2011; Bajer et al. 2009). Reducing carp abundance through commercial harvest is one of the most promising management strategies (Weber et al. 2011); however, the effects of tournament harvest on common carp population dynamics remain largely unknown.

Trophy and tournament fishing for carp, while extremely popular in Europe, has only recently become popular in the United States (Phillips 2005). Tournament harvest of common game species like walleye and bass has shown that tournaments can significantly impact the population size and structure of these species (Willis and Hartman 1986; Hayes et al. 1995). Similar population effects might also occur as a result of recreational harvest of common carp.

Collection of data from fishing tournaments can provide useful information for fisheries management, but tournament data is not commonly collected by fisheries managers. The low cost to collect large amounts of data from tournaments is often in contrast to the unknown biases of data collected by anglers. Although fish collected in tournaments show a bias toward larger fish, catch rates typically reflect size structures of fish captured with other sampling gears (Willis and Hartman 1986). We also observed similar patterns in size structure of common carp harvest during the 2016 Chisago Lakes Lion Club Carp Tournament (Lallaman 2016). Tournament data can also be useful for analyzing regional or long-term trends if multiple events are recorded. Tournament data alone cannot provide sufficient information for fisheries management; but it can provide useful information and important socio-political benefits (Willis and Hartman 1986).

Data Collection

A team of six Saint Mary's University of Minnesota students collected data on all fish brought to the tournament weigh-in at Frankie's Live Bait & Marine the morning of June 3rd, 2017. All fish were measured for total length in cm, weighed to the nearest tenth of a kg, and scales were collected from a random sample of common carp for age analysis. In the laboratory, carp scales were aged under a dissecting microscope by two independent readers. If the ages disagreed, the average age was calculated.

Tournament Results

A total of 29 teams participated in the 2017 tournament, with 25 boats submitting fish for the weigh-in. Since no individual angler effort was recorded (i.e. the number of hours fished or number of misses), the 739 fish measured at the weigh-in were compared across anglers equally and not corrected for angler effort. Additionally, a change in tournament rules this year allowed for anglers to select their own lakes rather than be assigned a specific lake. We collected information on the lakes fished for each boat during their weigh-in. Nine teams reported fishing more than one lake. We labeled fish from these boats as "mixed" as the specific lake source was undetermined for individual fish and prevented us from comparing this catch directly to other lakes.

Rush Lake was the most popular lake fished by 48% of teams, followed by North or South Center (24%), Goose Lake (24%), Green Lake (12%), Comfort Lake (12%), and Horseshoe, Mandall, and Sunrise Lakes (4%) (Table 1). Common carp were the most abundant species harvested, followed by bullhead *Ameiurus sp.*, freshwater drum *Aplodinotus grunniens*, bowfin *Amia calva*, white sucker *Catostomus commersonii*, buffalo *Ictiobus sp.*, and redhorse *Moxostoma sp.* (Table 2).

Average lengths of common carp were similar among lakes, except for a significantly smaller average in North & South Center Lakes (One-Way Analysis of Variance; $P < 0.05$) (Figure 1). Similarly, the size distribution of carp in North and South Center Lakes had higher numbers of smaller fish, especially compared to Rush Lake (Figure 2). Despite differences in the overall size structure, similar peaks correlating to strong year classes were observed among lakes: occurring at the 60-65 cm and 75-80 cm length classes, and 85-90 cm length classes (Figure 2). Similar to previous data in 2016, these peaks correspond with approximately the 6, 8, and 10/11-year-old age classes, suggesting strong recruitment events in these years.

Ages were estimated from 55 common carp from Comfort, Rush, and North & South Center Lakes, all other lakes had fewer than 3 individuals with reliable age estimates. Growth rates in Rush Lake appear to be fastest, with North & South Center being the slowest (Figure 4). This supports the difference in size structures between the two lakes with Rush Lake having the largest carp harvested and suggesting favorable growth conditions for carp within the lake. Examination of lake specific habitat in relation to carp may help to understand specific growth rate differences. For example, other studies have shown significant differences in carp growth caused by temperature, dissolved oxygen, carp density, or density of aquatic macrophytes (Pietsch and Hirsch 2015). However, the presence of larger carp in Rush Lake may also be a result of low angler pressure prior to this tournament. As observed in other fish species (Faust and Hansen 2016), continued tournament harvest of larger carp in Rush Lake may show a size structure shift to smaller/younger fish similar to North and South Center Lakes.

Conclusions

Results of the 2017 Chisago Lakes Carp Festival expands the current understanding of fish populations and harvest in Chisago area lakes. Tournament harvest rates were 279% higher

in 2017 compared to 2016, likely attributable to heavy rain reducing visibility prior to the tournament in 2016. This suggests that inter-annual harvest rates are strongly dependent upon weather and continued data collection from the annual tournament would be useful for understanding harvest variability. Secondly, the changing of the tournament rules in 2017 allowed for new lakes (i.e. Rush, Mandall, Horshoe) to be fished and provide additional data for area lakes. However, this rule change also allowed teams to fish more than one lake, making comparison of individual lake harvest difficult. Our recommendation for 2018 is that teams keep harvest separated for different lakes (e.g. keeping a different bin for each lake visited).

Despite differences in the total number of fish harvest, some harvest trends were comparable between 2016 and 2017. Common carp were again the most common species, along with bullhead and bowfin making up a total of 78% of species harvested. Common carp have similar peaks in length/age frequency suggesting the same strong year classes detected previously as a result of favorable reproductive events in 2011, 2009, and 2007. We did not observe any additional peaks after 2011, suggesting that large reproductive events are absent in recent years or these fish are not old enough to be harvested in significant numbers. Continued monitoring of subsequent tournament years can help identify additional strong year classes and corresponding reproductive conditions within the Chisago Lakes Region.

Some differences between harvest in 2016 and 2017 are notable. Bowfin were not harvested in four of the six primary lakes (Table 2) and the overall bowfin biomass harvested was much lower in 2017 (Figure 3). Weather or angler effort may play a critical role in the type and number of species harvested from year to year, emphasizing the need for analyzing long-term trends in tournament harvest. The addition of harvest from Rush and Goose Lakes was also associated with harvest of several additional species not seen in 2016: redhorse, buffalo, and freshwater drum. In particular, 130 freshwater drum were harvested in Rush Lake, which was

nearly 30% of the total number of fish harvested in that lake. Freshwater drum abundance is not believed to impact more valuable game species like walleye or yellow perch and likely won't have a significant impact on fish in Rush Lake (Pereira et al. 1992).

Specific effects of tournament harvest on the carp populations within each lake requires additional study. Both Weber et al. (2016) and Lechelt and Bajer (2016) suggest that mortality rates less than 30% have little effect on reducing overall carp abundance in Minnesota Lakes. Electrofishing estimates of 44.58 carp/ha in South Center Lake were calculated by Lallaman (2016). A conservative total lake estimate of 37,224 carp means that a single tournament harvest of 71 individuals represents less than 0.1% of the carp population. Greater information about population specific exploitation rates (i.e. a tagging study or long-term tournament analysis) could help determine if tournament harvest is having a significant impact on populations.

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Table 1. Number of fish harvested, largest fish, and lakes fished for each team that weighed-in during the tournament. Boats that fished more than one lake are highlighted.

Boat #	Fish Count	Largest Fish (lbs)	Lakes Fished
1	14	-	Sunrise River
3	10	32.15	Rush
4	52	15.35	South Center
5	29	16.15	Goose, North Center
6	49	29.95	Rush
9	21	33.77	Rush
10	26	17.55	South Center
11	21	25.84	Goose, Mandall, Chisago
12	8	21.98	Comfort
13	5	14.00	Comfort Green, North and South Center
14	33	33.33	Goose, Rush
17	47	26.16	Horshoe and Goose
18	7	10.26	Green and North Pool
19	114	38.25	Rush
20	45	27.44	Rush
21	38	35.08	Rush
22	47	25.94	Rush
23	44	31.64	Rush
24	11	26.35	Rush
25	14	-	Comfort, Green, North Center
26	13	17.33	Goose and Rush
27	10	31.77	Green
28	31	18.89	North and South Center
29	45	-	West Rush
30	5	25.25	Goose

Table 2. Number of individual species harvested from each lake reported.

	N. & S. Center	Comfort	Goose	Green	Rush	Sunrise	Mixed (Unknown)	Total
Bowfin	6				10		24	40
Buffalo					3		3	6
Bullhead			1	1	174		36	212
Carp	71	8	3	9	97	12	130	330
Drum			1		126		5	132
Redhorse			1		2		0	3
W. Sucker					9	2	5	16
Total	77	8	6	10	421	14	203	739

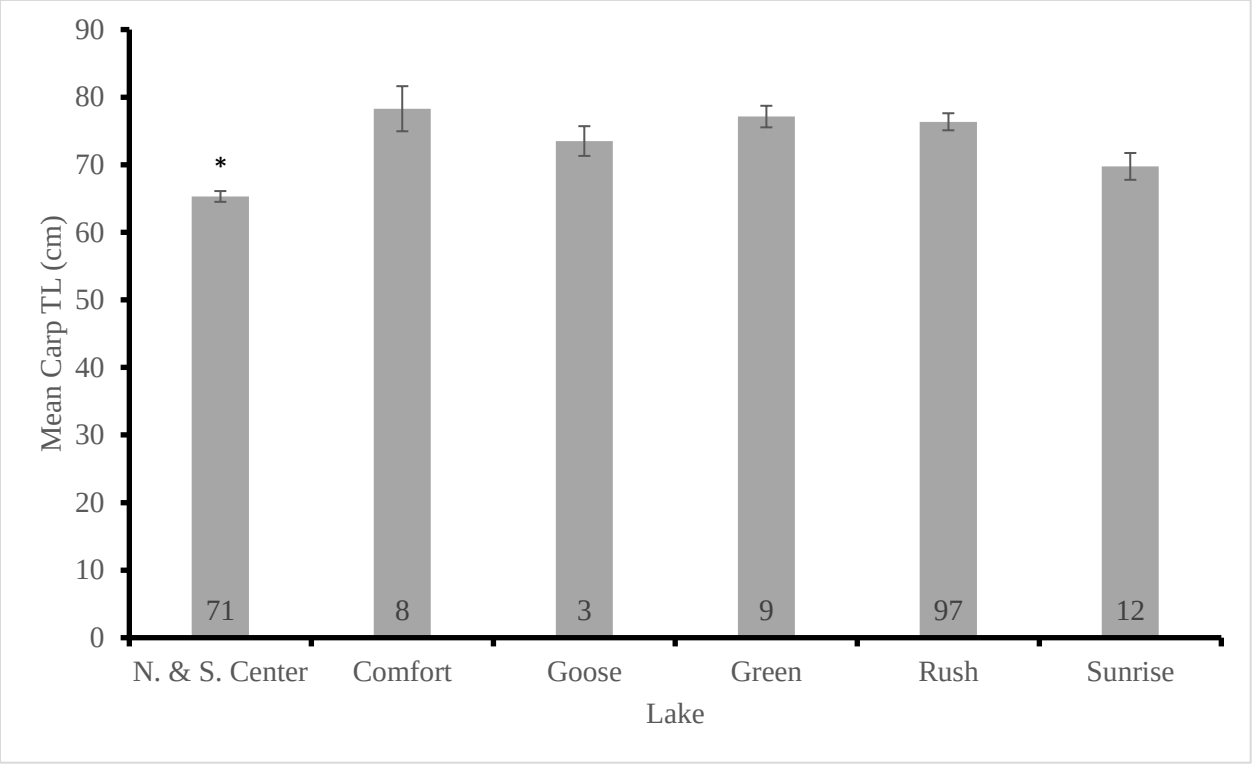


Figure 1. Mean total length of carp harvested from each lake (+/- 1 standard error). Sample size of individual carp from each lake is represented by the data labels within each bar. Significant differences are denoted with an '*' ($P < 0.05$).

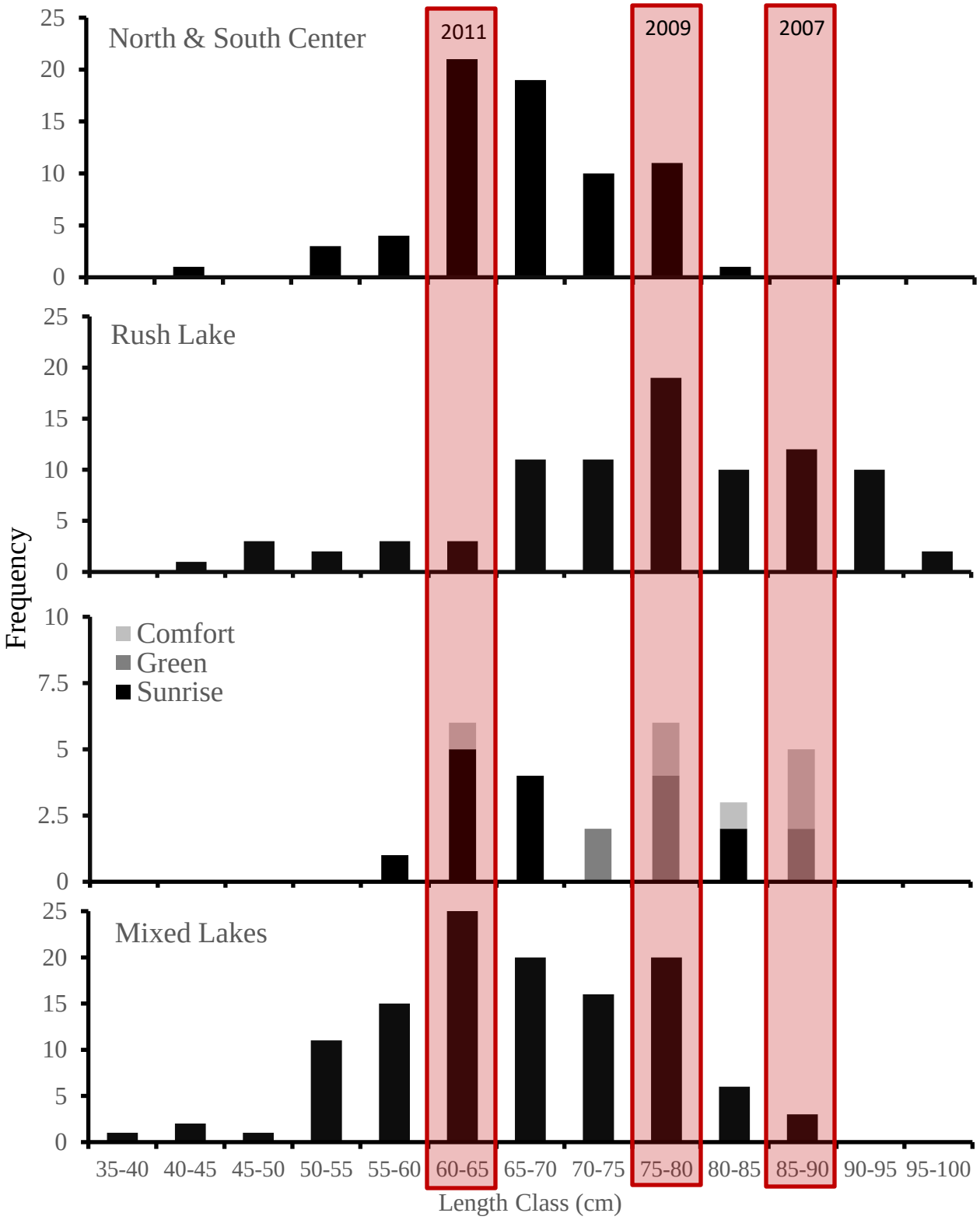


Figure 2. Length frequency of common carp harvested during the 2017 Chisago Lakes carp festival. Note commonly shared peaks occurring near 60-65, 75-80, and 85-90 cm (highlighted in red), suggesting common recruitment events in 2011, 2009, and 2007.

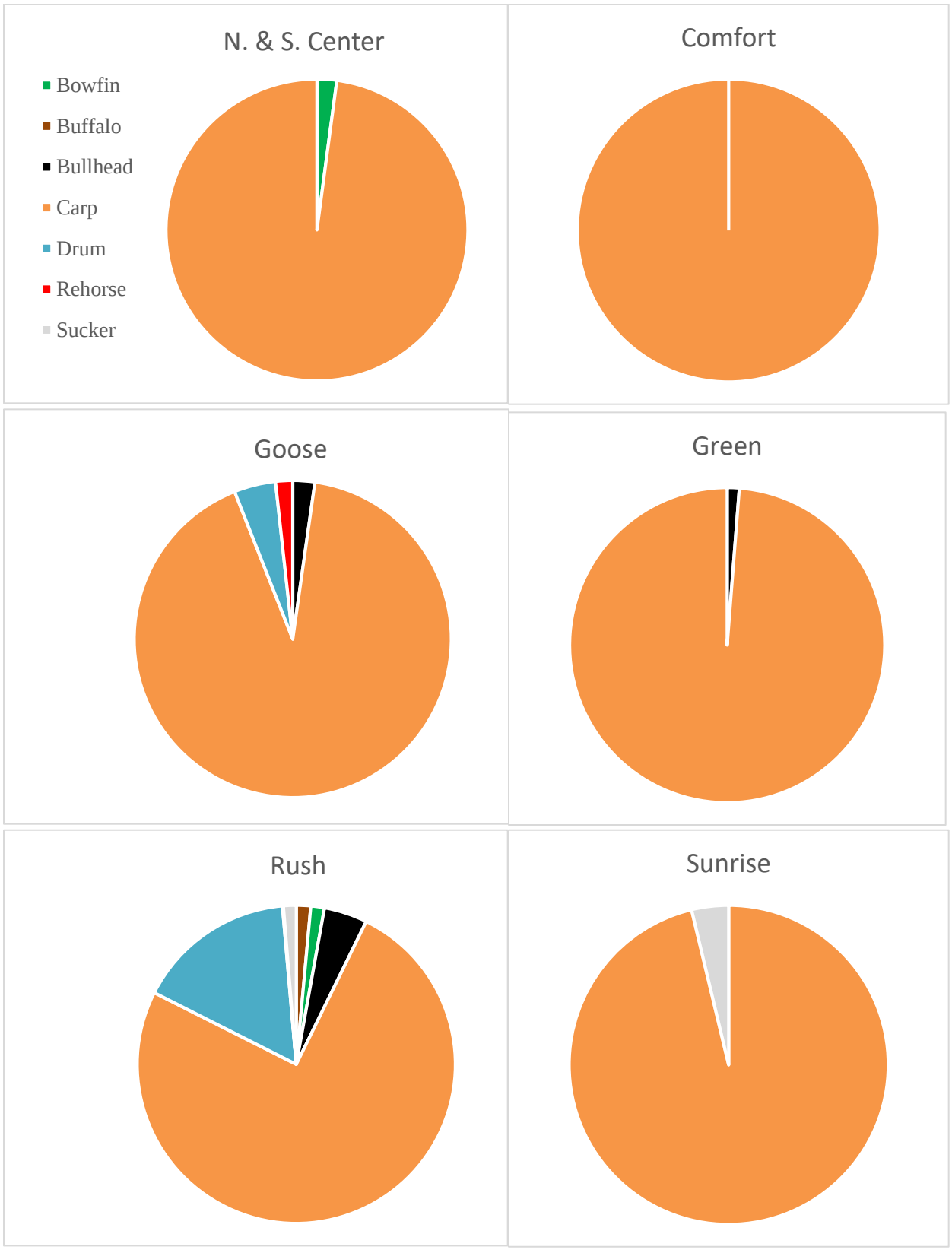
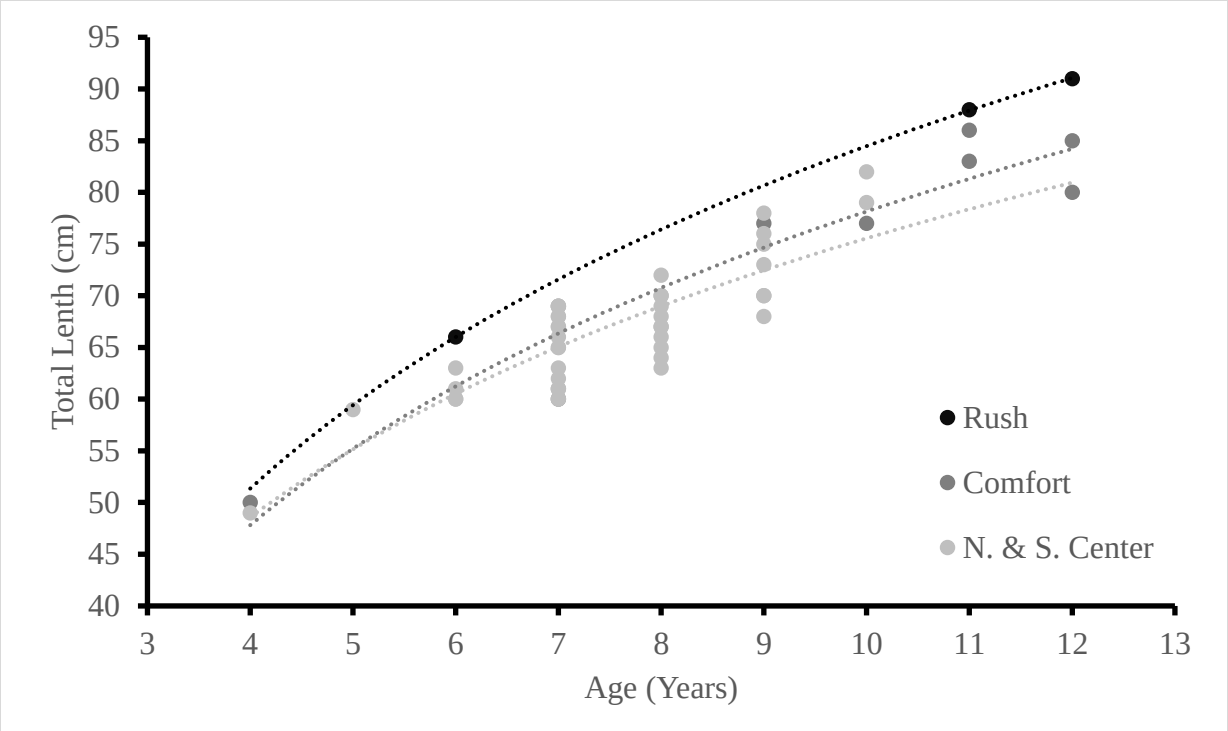


Figure 3. Proportion of species biomass harvested within each lake.



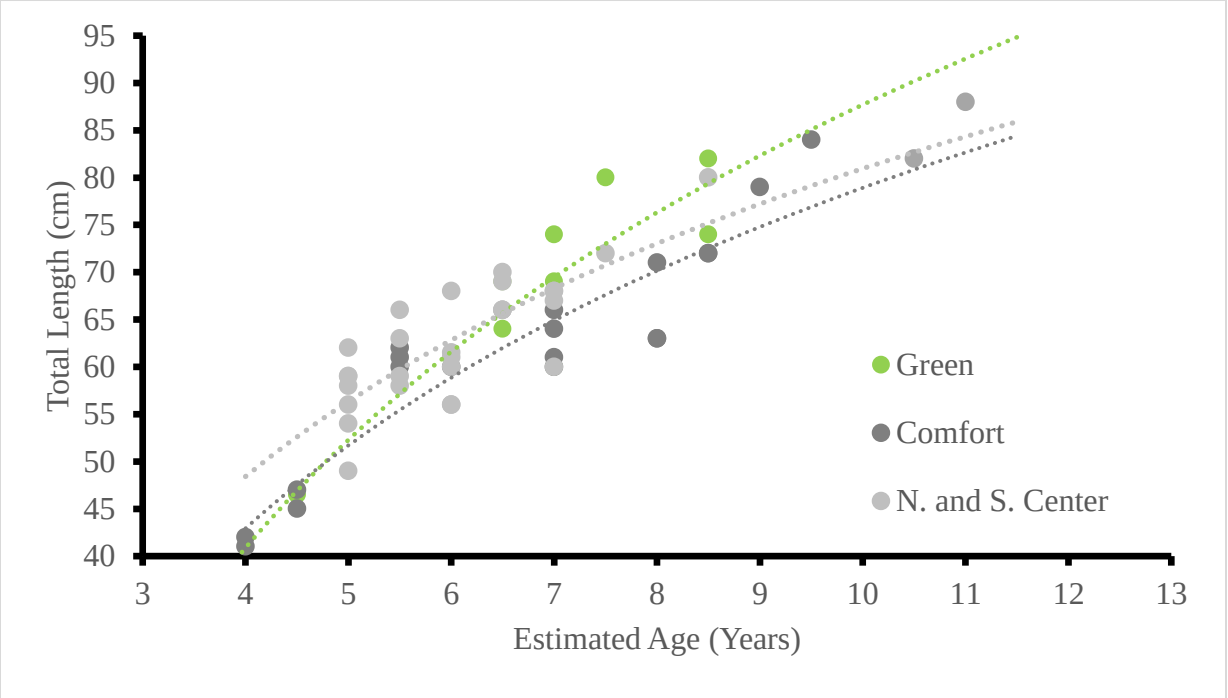


Figure 4. Top: Estimated ages of carp harvested in 2017 plotted against their total length (cm). Note the higher growth curve for Rush Lake compared to North and South Center Lakes. Bottom: Estimated ages of carp harvested in 2016. Note similar growth data for Comfort, North and South Center Lakes.