Analysis of Fish Harvested During the 2016 Chisago Lakes Lions Club Carp Festival

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Project Background

Common carp *Cyprinus carpio* are a wide-spread invasive species that cause significant changes to 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). Tournament data can also be useful for analyzing regional or long-term trends if multiple events are recorded. Although tournament data alone cannot provide sufficient information for successful fisheries management, it can provide useful information and important socio-political benefits (Willis and Hartman 1986).

Data Collection

A team of four 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 4th, 2016. All fish were measured for total length in cm, weighed to the nearest tenth of a kg, and scales were collected from all 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 271 fish were collected and measured from the tournament. Common carp were the most abundant species collected, followed by white sucker *Catostomus commersonii*, bowfin *Amia calva*, and bullhead *Ameiurus sp.* (Table 1). Catch rates were highest from South Center Lake due to the number of white suckers collected, and lowest in Sunrise Lake. Additional comparisons to Sunrise Lake are noted, but no conclusions can be safely drawn due to the extremely small sample size collected. Catch rates from Chisago, Comfort, Green, and North Center Lakes were similar between 24-45 fish.

Average lengths of each species were not significantly different among lakes (2-Way Analysis of Variance; $P > 0.05$) (Figure 1). The only notable difference in total lengths were a slightly larger average length of common carp in Green Lake and a high average length of common carp in Sunrise Lake due to the small sample size ($n = 2$). Similarly, size distribution of common carp was similar among lakes, with small peaks occurring at both the 45-50 cm and 80-85 cm length classes, with a large peak occurring at the 65-70 cm length class (Figure 2). These

peaks correspond with approximately the 5, 7, and 9-year-old age classes, suggesting strong recruitment events in these years.

Relative weight percentages in each lake were similar as well, except for the small sample from Sunrise Lake (Figure 3). Common carp represented the majority of the biomass harvested, except in Chisago Lake, where a larger number of bowfin were harvested. Total amount of common carp harvested was between 16.69 and 81.92 kg from each lake.

Ages were estimated from 70 common carp, the additional 18 scale samples were unreadable due to regrown or incomplete annular growth rings. Analysis of common carp scales showed similar age distributions among lakes ranging from 4 to 11 years. Growth rates calculated by examining fish length-at-age show nearly identical growth rates for Chisago, Comfort, North and South Center Lakes (Figure 4). However, Green Lake showed a faster growth rate that the other lakes. When compared to global growth rates, these populations are at or slightly above the typical growth for common carp in North America (Figure 4).

Conclusions

Results of the 2016 Chisago Lakes Carp Festival provide useful data for understanding fish populations of Chisago area lakes. The similarity in catch numbers, sizes, and ages between lakes suggest similar common carp (and other rough fish) populations within each water body. These results are not surprising given that these lakes are in the same geographical area, experience similar weather patterns, and have similar habitat conditions. However, the slightly larger size and faster growth rate of common carp in Green Lake merit further study of why this population may have more favorable conditions for common carp growth.

Without knowledge of angler effort or long-term trend analysis, determining lake specific population characteristics and exploitation is not possible. Harvest of 271 fish in 2016 was reported to be lower than previous years due to poor weather and water clarity. If 2016 represents minimum harvest rates of 20-80 kg per lake, this likely only represents harvesting a small percentage of total carp populations within each lake. Weber et al. (2016) found that common carp exhibited a compensatory response to low-moderate harvest levels; carp populations experiencing between 1-43% harvest rates showed stable abundance, recruitment, and growth. However, Lechelt and Bajer (2016) found that carp populations were controlled with as little as 30% annual biomass removal in variable recruitment lakes, like those in Minnesota. Greater information about population specific exploitation rates (i.e. a tagging study or long-term tournament collection data) could help determine if tournament harvest is having a significant impact on populations.

Phelps et al. (2007) found that common carp scales provided a reliable estimate of carp ages, although errors of 1-2 years were common especially in older individuals. The strong peaks in length/age frequency suggest favorable reproductive events in 2011, 2009, and 2007. In Lake Susan and Lake Riley, MN up to 90-95% of carp populations were comprised of strong year classes occurring during periods of optimal reproduction conditions: often access to marshy backwaters with low egg and larval predators due to recent winter kill events (Bajer and Sorenson 2010). Further analysis into weather and lake conditions in these years may help identify conditions for strong reproduction and recruitment of common carp in these systems.

Acknowledgments

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Table 1. Number of species harvested and recorded during the weigh-in on June 4th.

Species	Chisago	Comfort	Green	North Center	South Center	Sunrise	Total
Bowfin	23	17	13	10	5	0	68
Bullhead	7	2	8	4	14	1	36
Common Carp	14	26	14	8	24	2	88
White Sucker	1	4	0	2	72	0	79
Totals	45	49	35	24	115	3	271

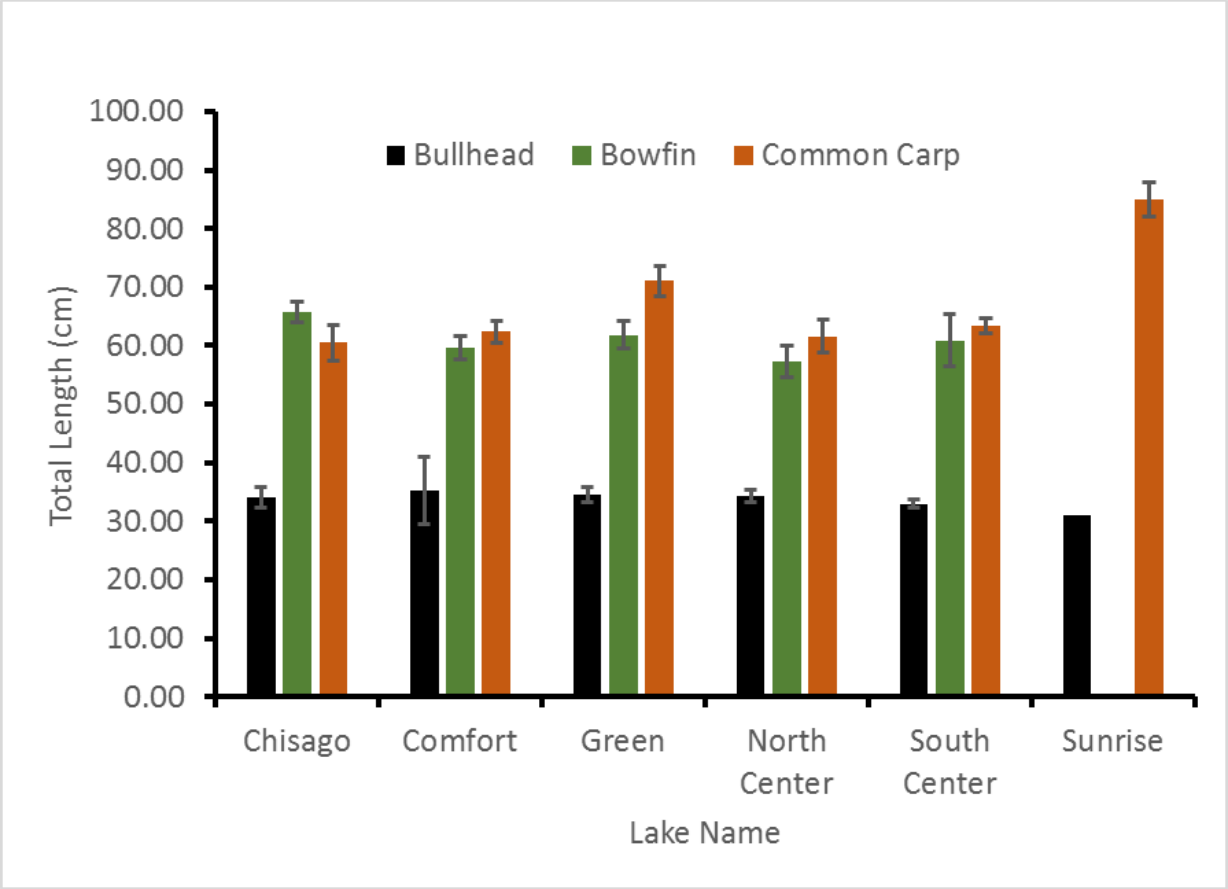


Figure 1. Average total length of species harvested from each lake. No significant differences were detected for species between each lake ($P > 0.05$).

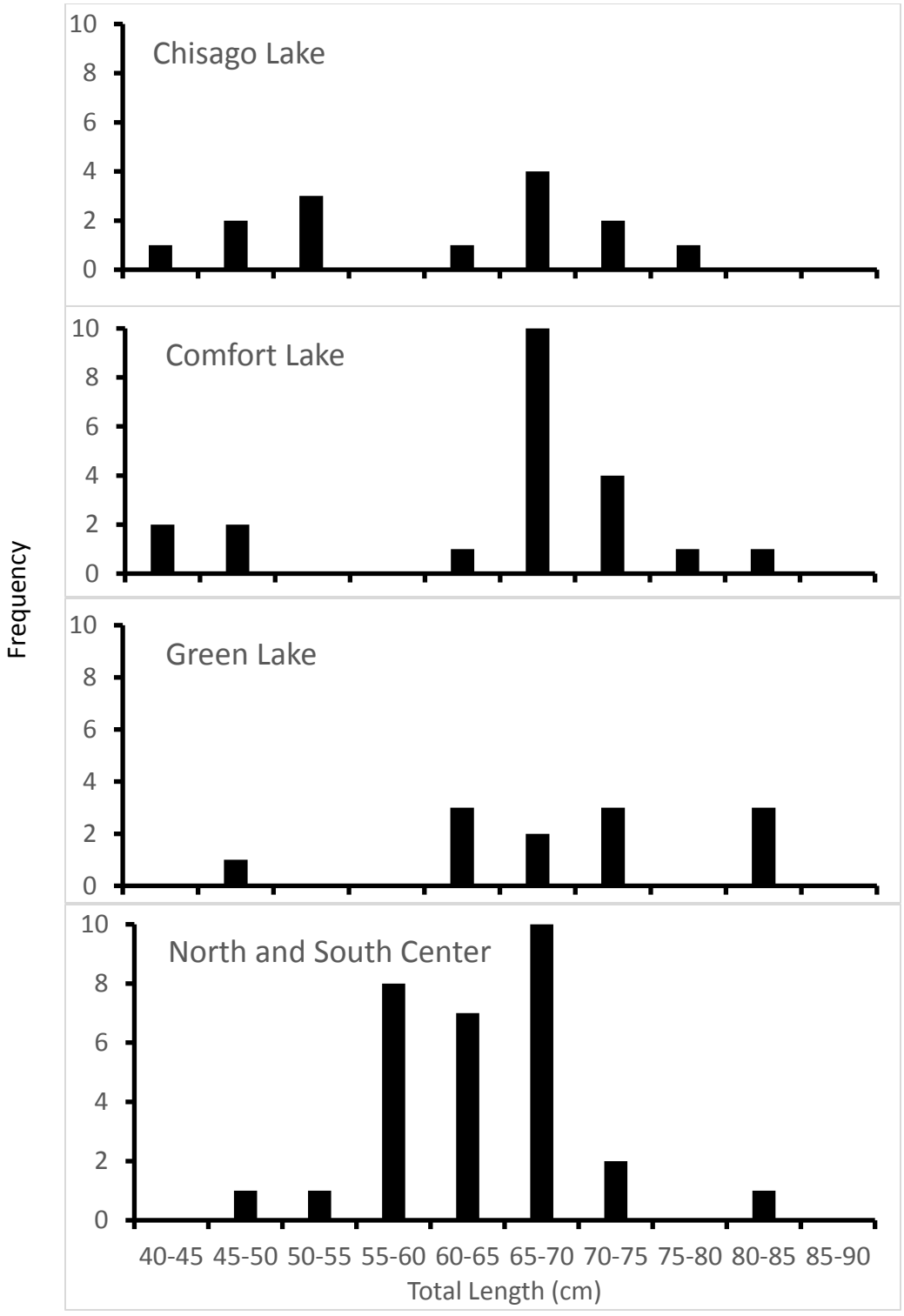


Figure 2. Length frequency of common carp harvested during the 2016 Chisago Lakes carp festival. Note the similar peaks occurring near 45-50, 65-70, and 80-85 cm.

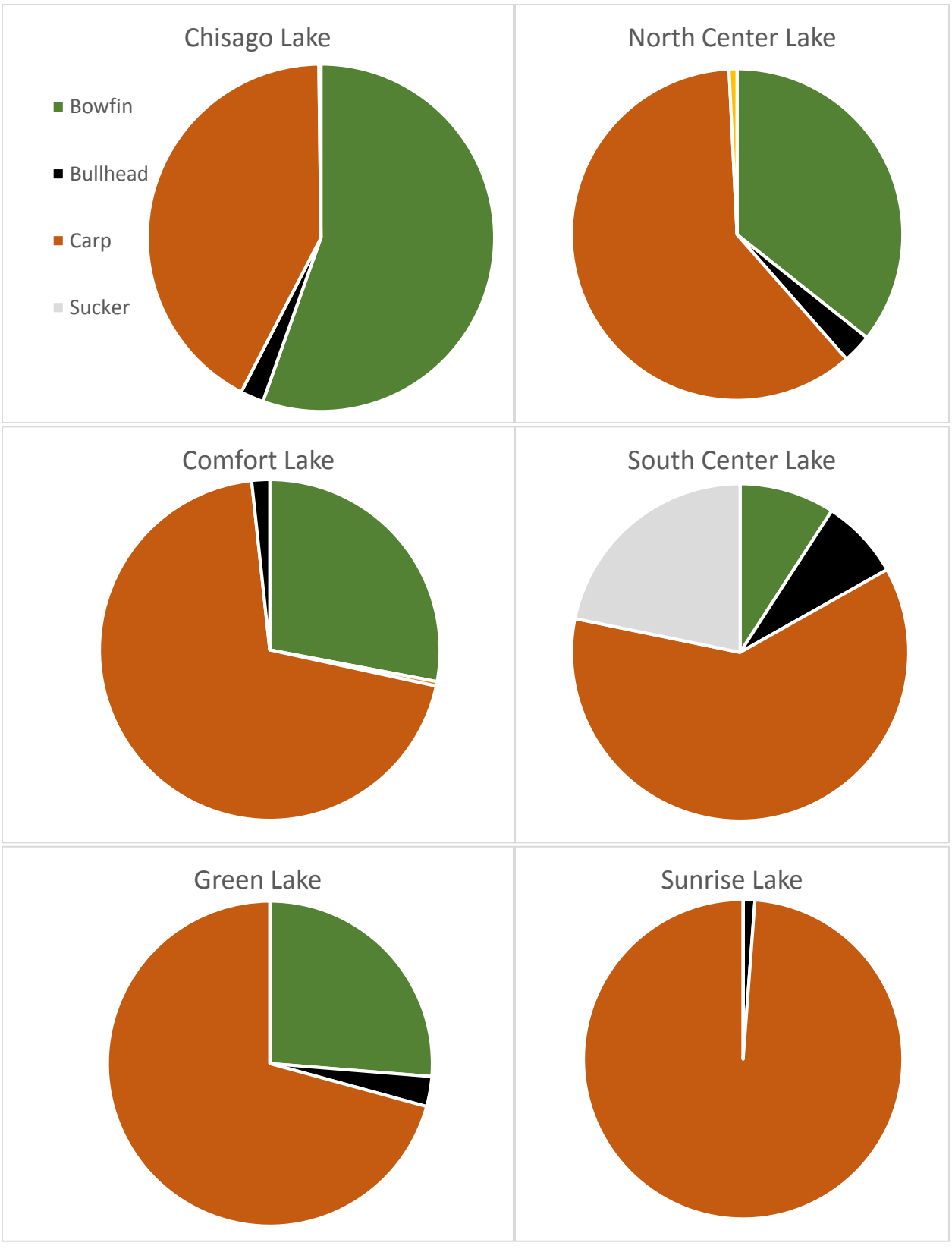
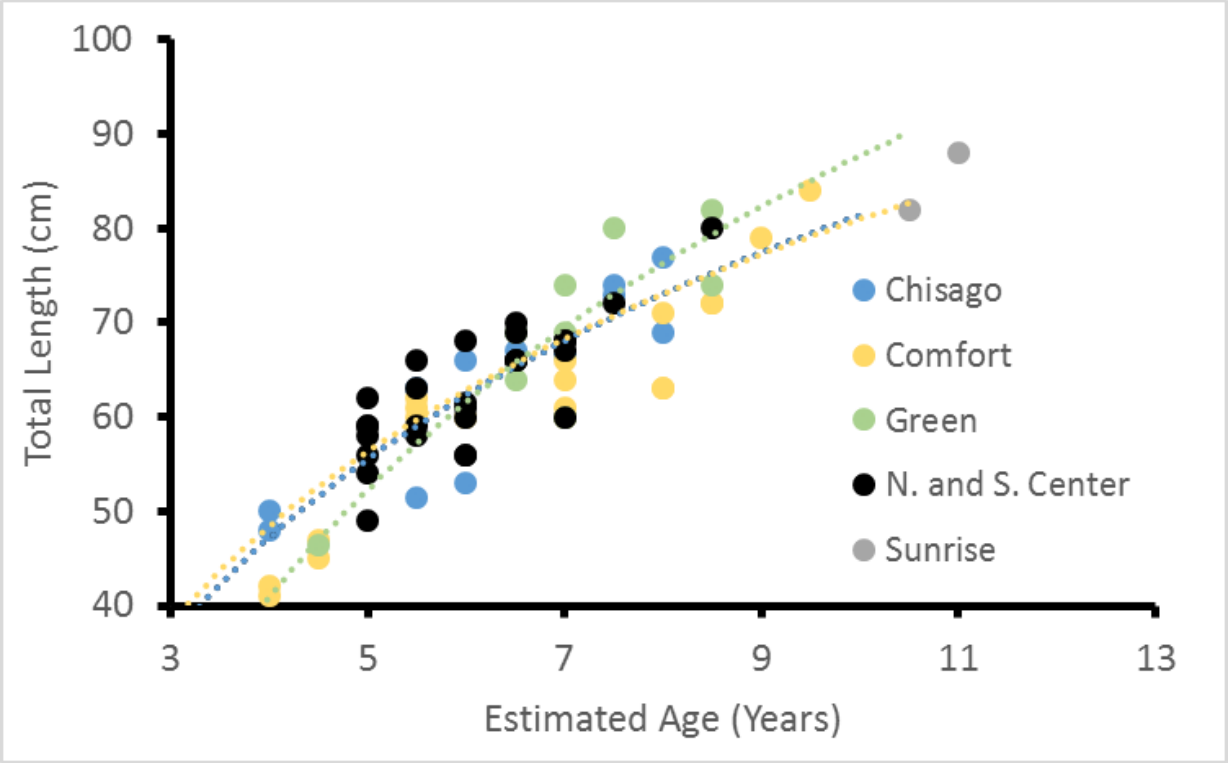


Figure 3. Proportion of species weights harvested within each lake.



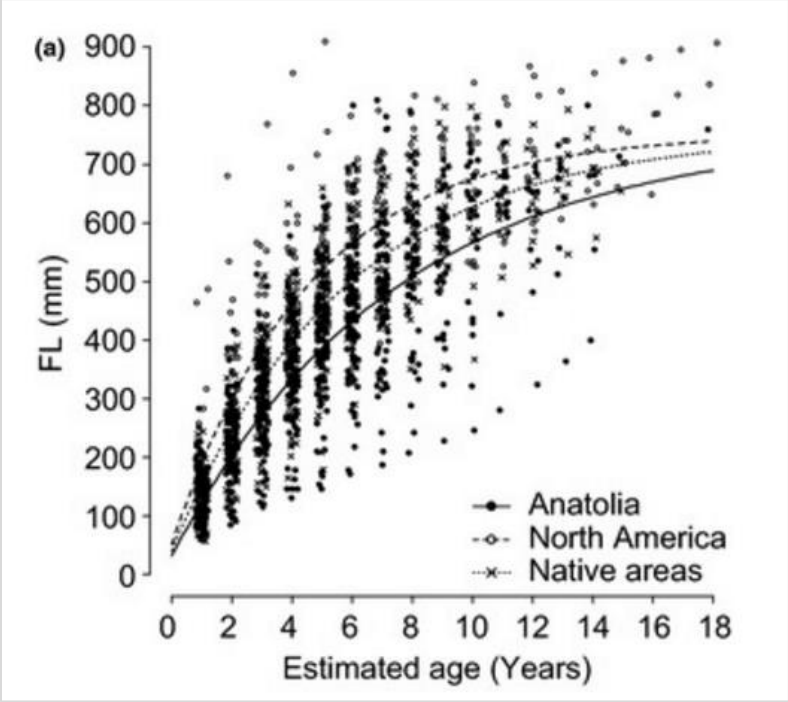


Figure 4. Top: Estimated ages of carp plotted against their total length (cm). Note the similar growth curves for Chisago, Comfort, North and South Center Lakes, but higher growth rate in Green Lake. Bottom: Comparison of global carp growth taken from Vilizzi et al. (2014).