

Wisconsin DNR Lake Superior Summer Index Assessment Report–2018

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Introduction

The fish community of Lake Superior has gone through a series of dramatic changes over the last 100 years. Agencies responsible for the management of Lake Superiors' fishery resources have established a series of fish-community objectives (Horns et al., 2003), with the overarching goal to “rehabilitate and maintain a diverse, healthy, and self-regulating fish community, dominated by native species and supporting sustainable fisheries.” Information from this survey is used to monitor population dynamics and also to assess progress towards fish community objectives in Wisconsin waters of Lake Superior. This dataset also serves as one of the primary inputs for a statistical catch-at-age model, which is used by state, tribal, and federal biologists to determine recommended lake trout harvest quotas.

Methods

The summer index rotates between sampling the western arm during odd-numbered years and the Apostle Islands region during even-numbered years. Prior to 1980, all stations were sampled annually. In 2018, 39 stations were sampled in the Apostle Islands region (Figure 1) with 1,097 m monofilament gillnet gangs. Each gang is composed of a series of 91 m nets constructed with 38 to 178 mm mesh (stretch measure), by 13 mm increments. All nets were set on the bottom for one night (24 hr) using the R/V Hack Noyes. Biological information was collected from fish using standardized protocols.

The time-series of geometric mean catch-per-unit-effort (CPE) was calculated using only catch data from the stations that were sampled in 2018 because these stations have the longest data sets and allow for a balanced examination of trends. Geometric mean CPE was calculated using stations as replicates. The minimum CPE estimate that was > 0 was added to all estimates. Analyses were conducted using the program R.

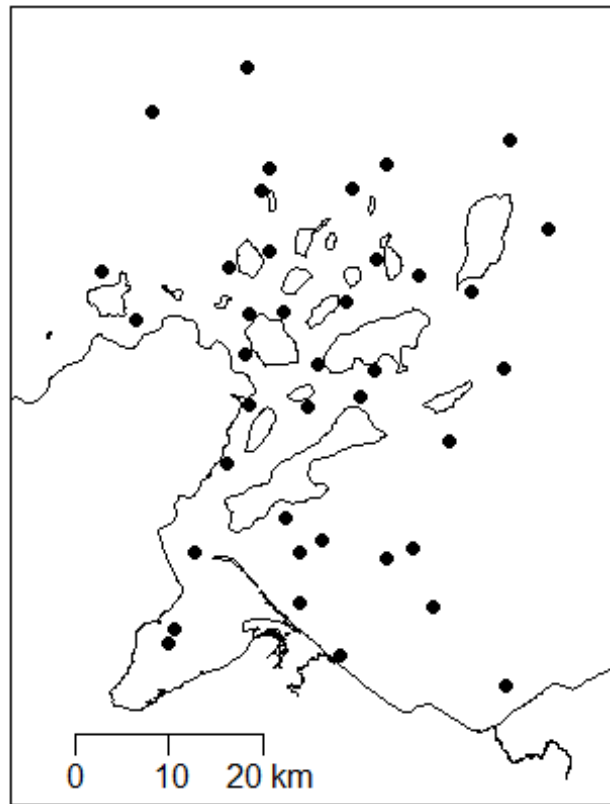


Figure 1. Map of the Apostle Islands region of Lake Superior and the sampling stations for the Wisconsin DNR summer fish-community index, 2018.

Results

Lake Trout

During the 2018 summer index a total of 406 Lean Lake Trout were caught, and approximately 96.6% were native (Figure 2). The 2018 geometric mean CPE slightly increased from the recent low in 2014 (Figure 3), which is consistent with observations from other stock assessment efforts. The size distribution of Lake Trout is skewed towards smaller fish (Figures 4 and 5), which is likely the result of a couple strong year classes of Lake Trout entering the fishery and the considerable fishing pressure that occurs in the Apostle Islands. While the median length of Lake Trout captured has increased since 2014 (Figure 5), the geometric CPE of native Lake Trout <432 mm from 51 and 64 mm meshes has decreased slightly (Figure 6). This indicates that recent large year class have increased in size and should be recruiting to the fishery. Recently, reduced numbers of Lake Trout in Apostle Islands region has prompted managers to reduce quotas for both recreational and commercial fishers. Juvenile Lake Trout should be monitored closely to make sure increased harvest still allows for recruitment to the population.

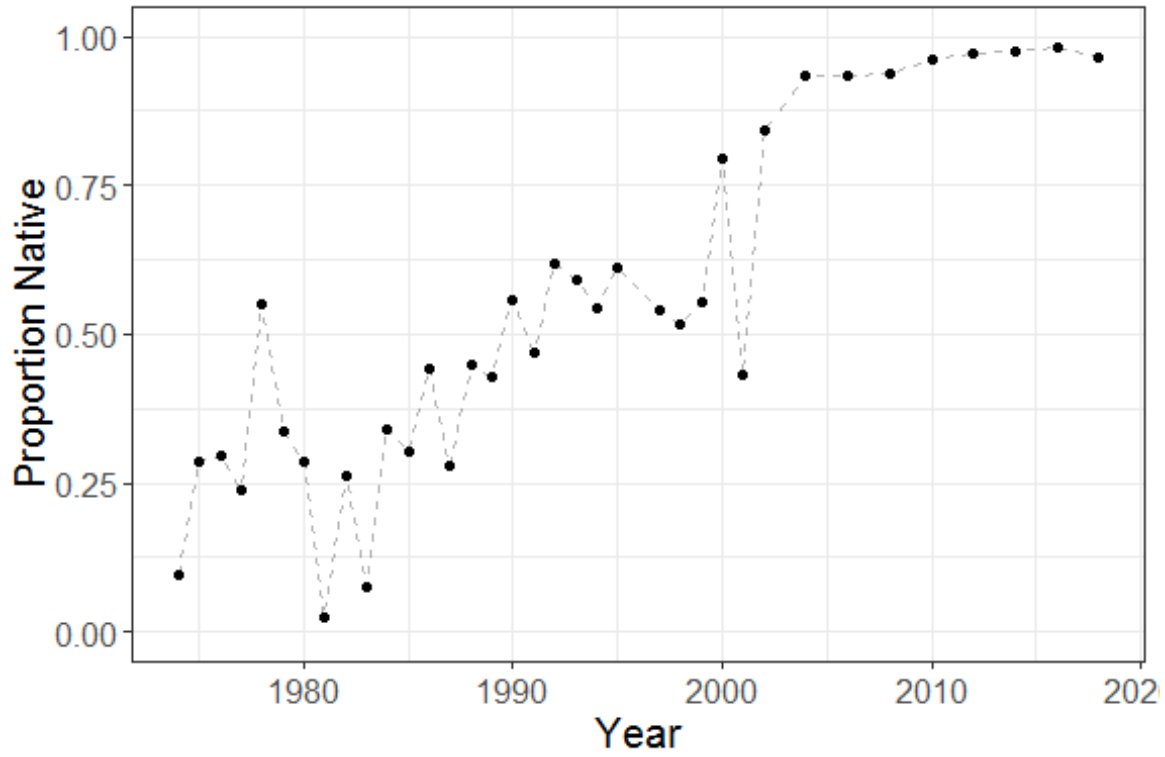


Figure 2. Proportion of Lake Trout that are native in the Apostle Islands region of Lake Superior, 1974-2018.

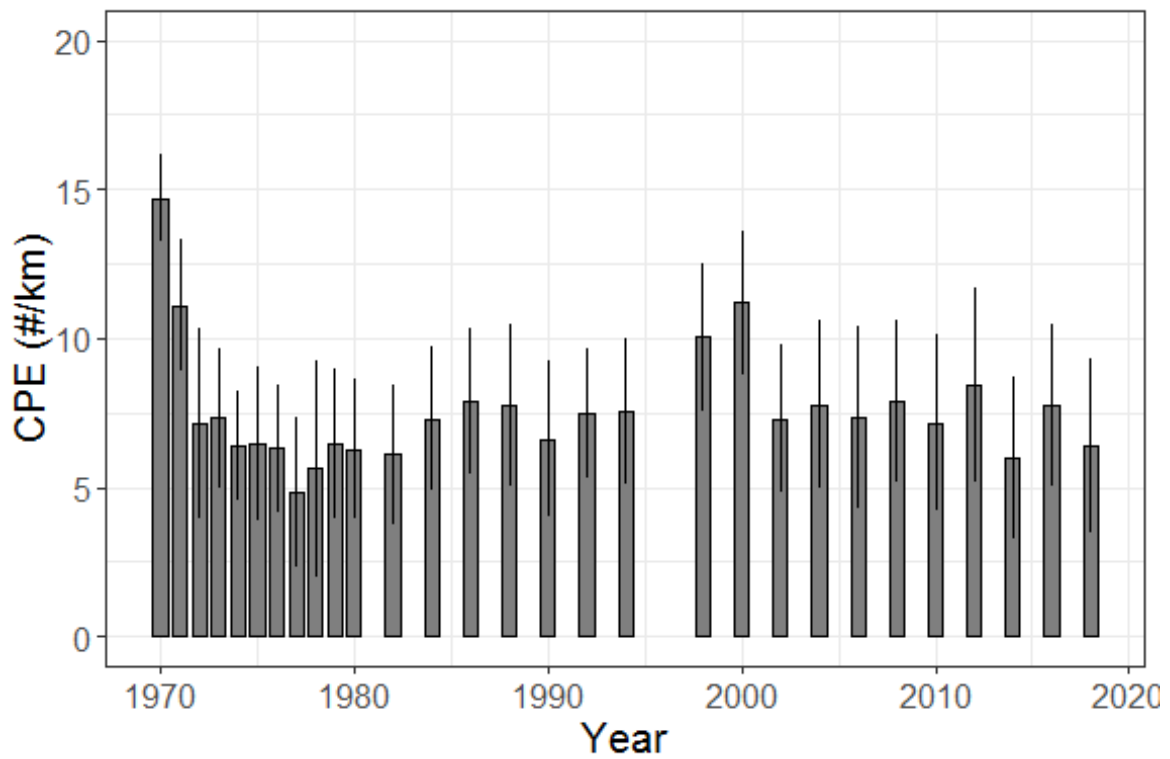


Figure 3. Time series of geometric mean CPE for Lake Trout in the Apostle Islands region of Lake Superior, 1970-2018. Summer index sampling did not occur in 1996. Error bars are one standard deviation.

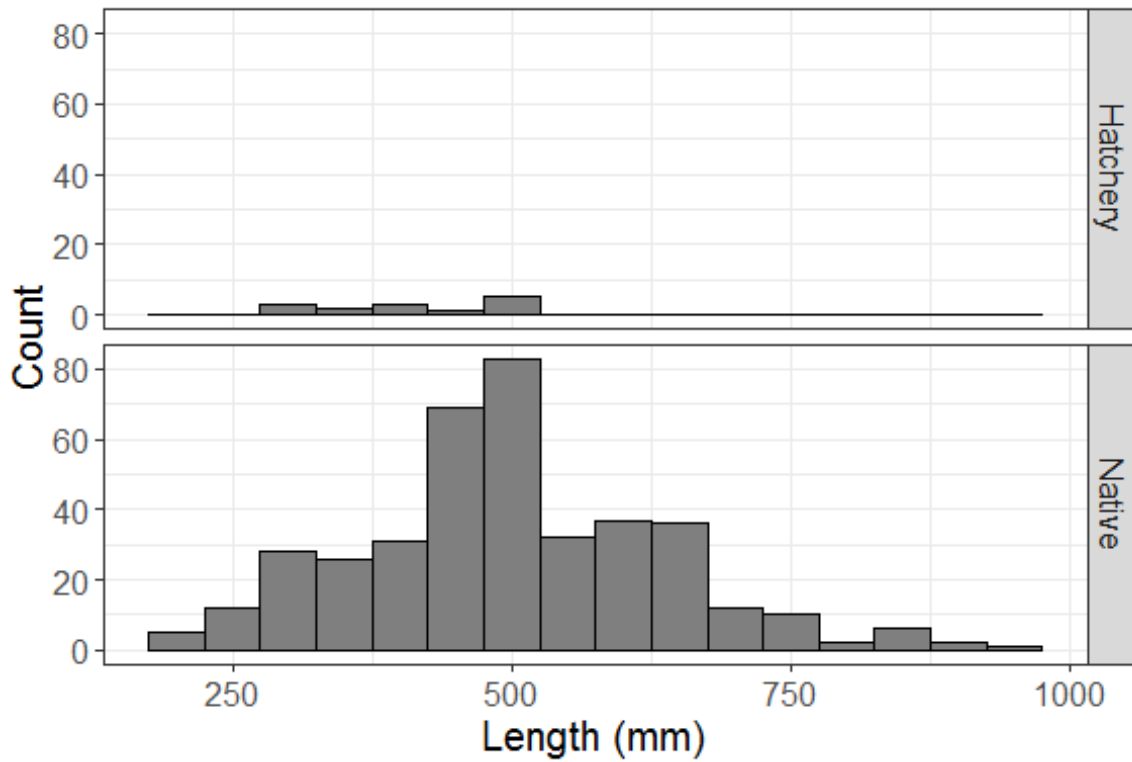


Figure 4. Length distribution of native and hatchery Lake Trout caught in the Apostle Islands region of Lake Superior during the 2018 summer index.

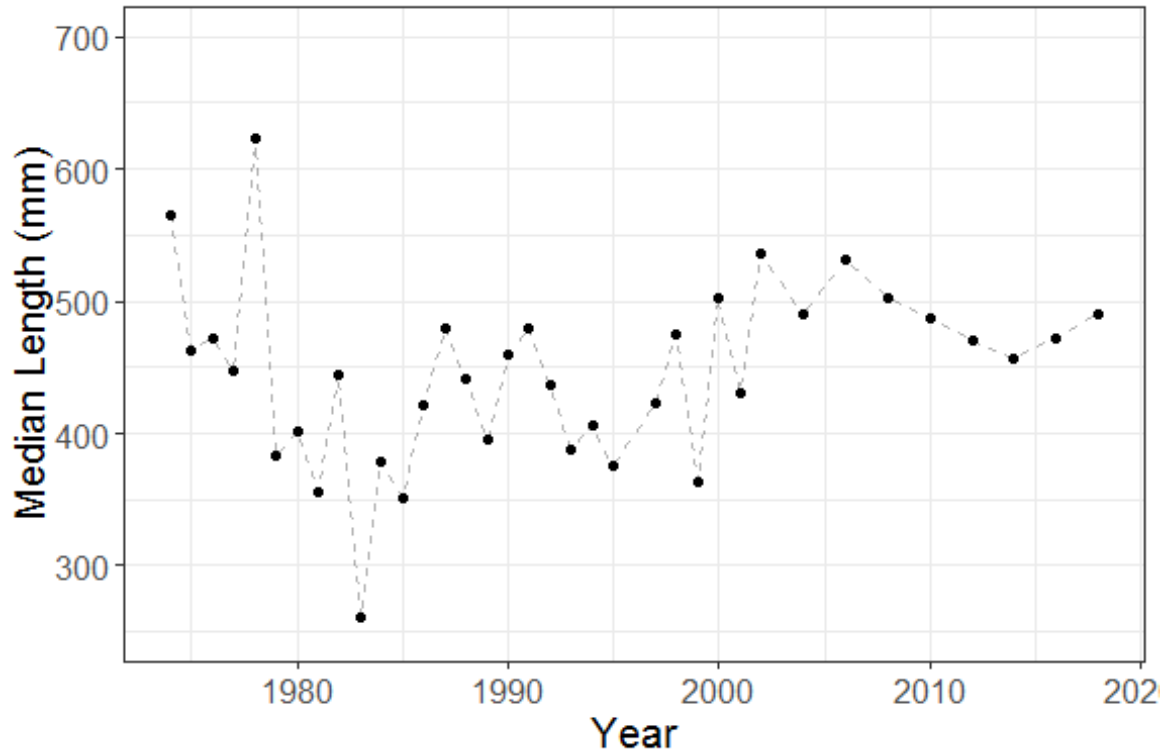


Figure 5. Time-series of Lake Trout median length, 1974-2018. Summer index sampling did not occur in 1996.

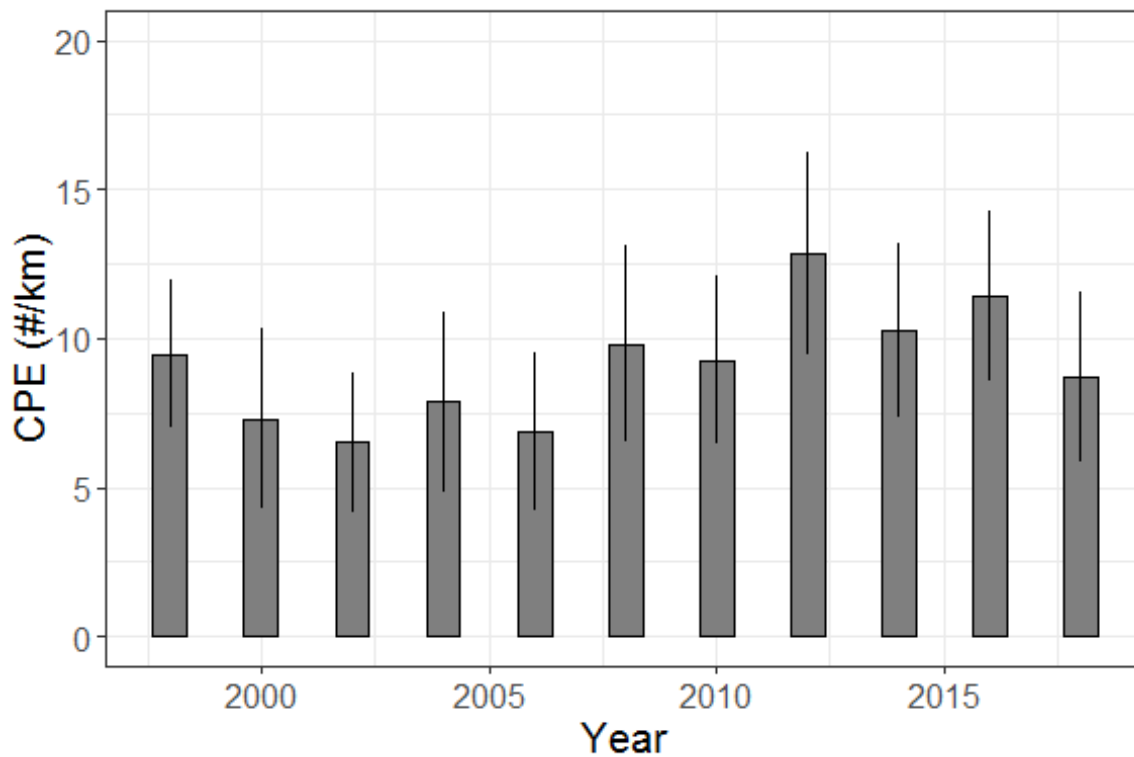


Figure 6. Time series of geometric mean CPE for native Lake Trout < 432 mm from 51 and

64 mm meshes in the Apostle Islands region of Lake Superior, 1998-2018. Summer index sampling did not occur in 1996. Error bars are one standard deviation.

Lake Whitefish

A total of 1402 Lake Whitefish were caught during the 2018 summer index. Lake Whitefish geometric mean CPE has decreased considerably over the last 10-15 years (Figure 7), but appears to be increasing since 2012. The length distribution of Lake Whitefish is skewed towards fish below 450 mm (Figure 8), which is consistent with what would be expected for a population that is exposed to considerable fishing pressure with a minimum size of 432 mm.

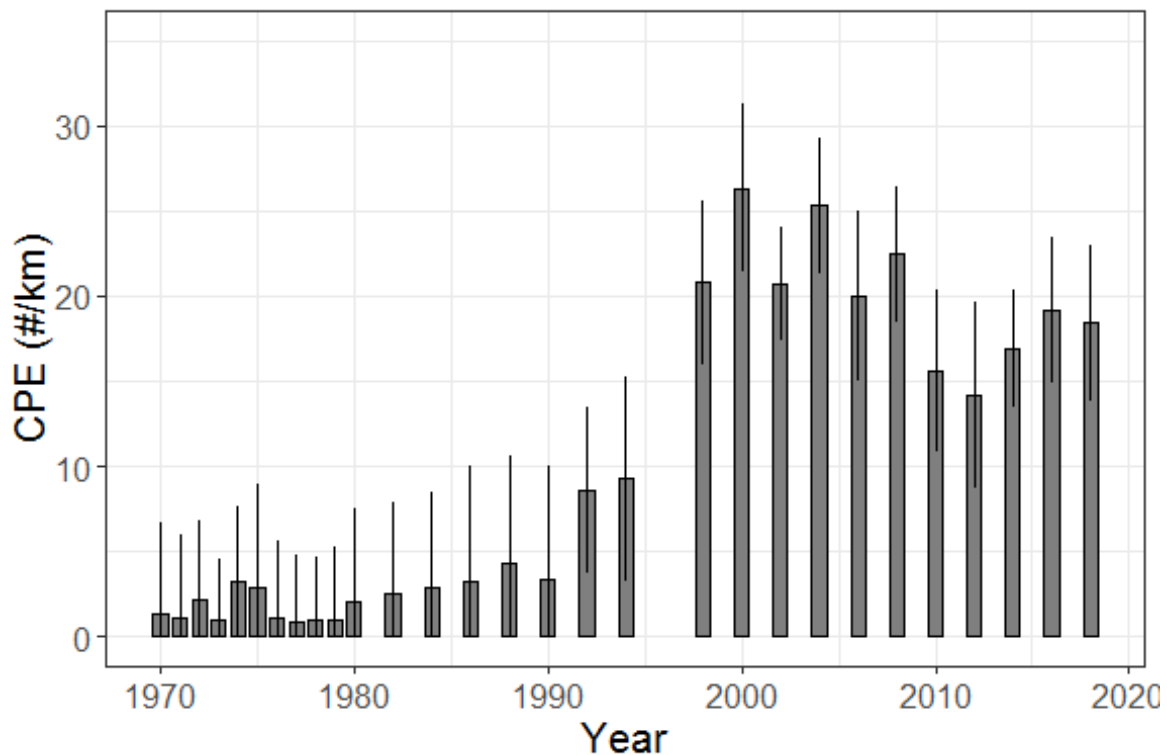


Figure 7. Time series of geometric mean CPE for Lake Whitefish in the Apostle Islands region of Lake Superior, 1970-2018. Summer index sampling did not occur in 1996. Error bars are one standard deviation.

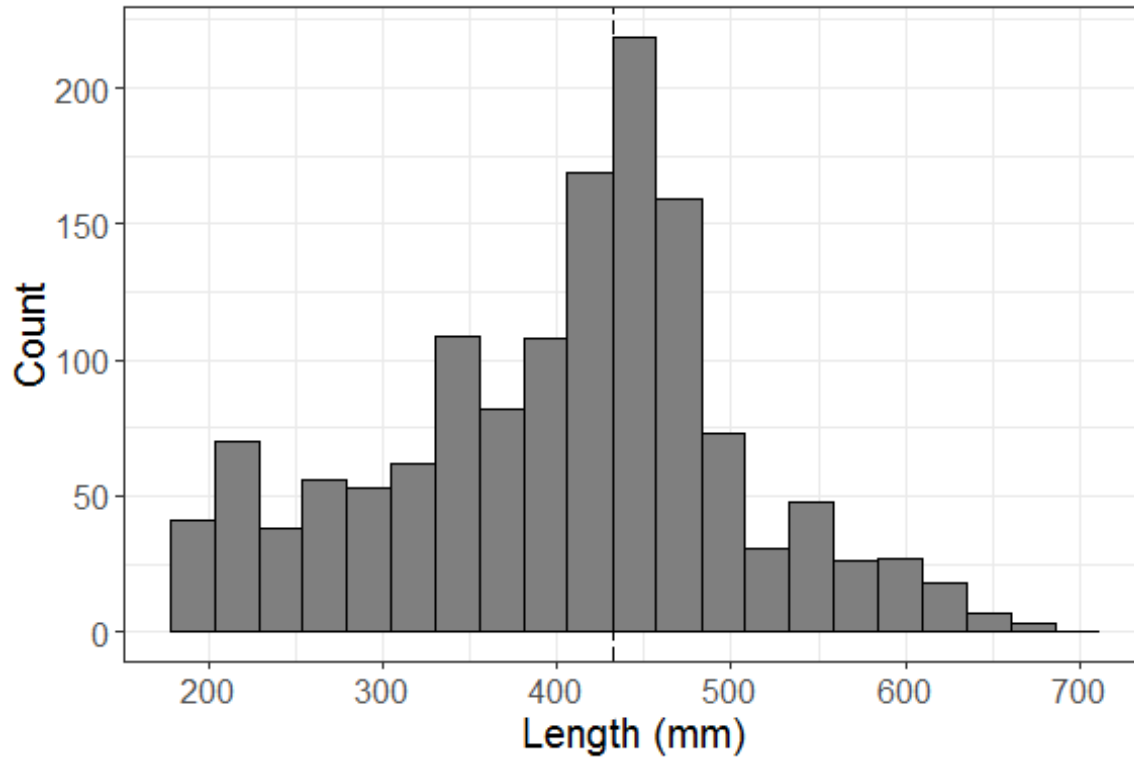


Figure 8. Length distribution of Lake Whitefish caught in the Apostle Islands region of Lake Superior during the 2018 summer index.

Siscowet

A total of 172 Siscowet Lake Trout were sampled during the 2018 summer index. The geometric mean CPE has remained fairly stable during recent years (Figure 9). However, it is important to note that the summer index does not specifically target Siscowet and thus the variability in estimates is likely a product of sample design. The Siscowet that were sampled represented a wide range of sizes (Figure 10).

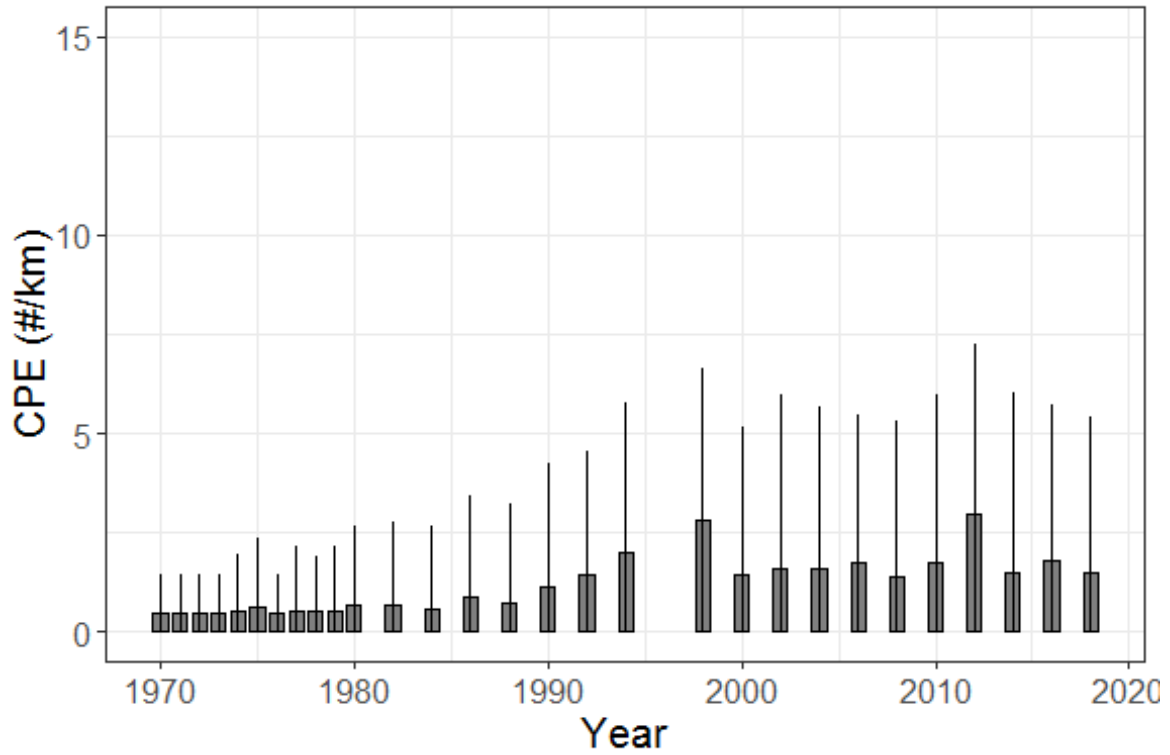


Figure 9. Time series of geometric mean CPE for Siscowet Lake Trout in the Apostle Islands region of Lake Superior, 1970-2018. Summer index sampling did not occur in 1996. Error bars are one standard deviation.

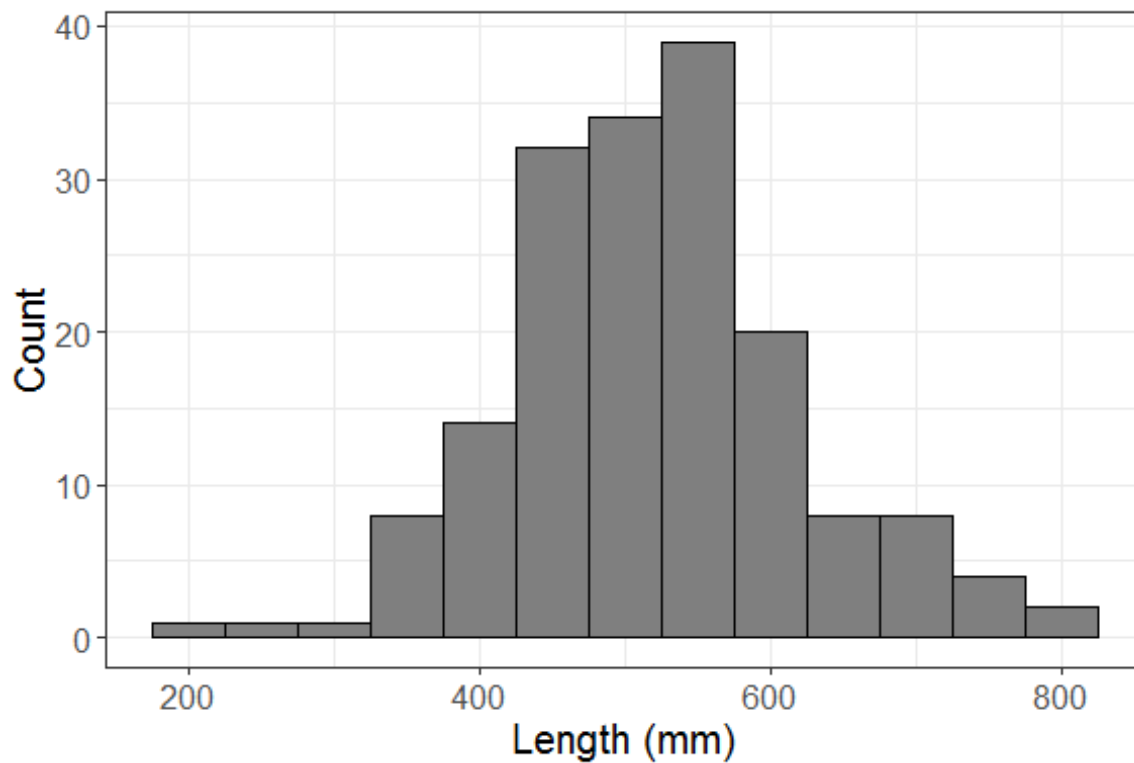


Figure 10. Length distribution of Siscowet Lake Trout caught in the Apostle Islands region of Lake Superior during the 2018 summer index.

Ciscos

The geometric mean CPE of all Cisco species (*C. artedi*, *C. hoyi*, *C. kiyi*, *C. zenithicus*, and respective crosses) from 51 and 64 mm meshes has generally increased since 2000 (Figure 11). Since 2012, the relative abundance has remained fairly consistent. These levels have been likely maintained due to the 2009 and 2014 year classes. However, recent increases in fishing pressure could shorten the longevity of these year classes and lead to depressed populations if recruitment remains low and variable. The geometric mean CPE in 38 mm mesh has remained low since the large year class of 1998 (Figure 12). A total of 1150 Cisco species (711 were *C. artedi*) were caught in 2018 summer index. The size distribution is heavily skewed towards smaller fish (Figure 13), which is expected with the heavy fishing pressure directed towards spawning cisco. This should be monitored closely as another fishery independent metric to track Cisco abundance.

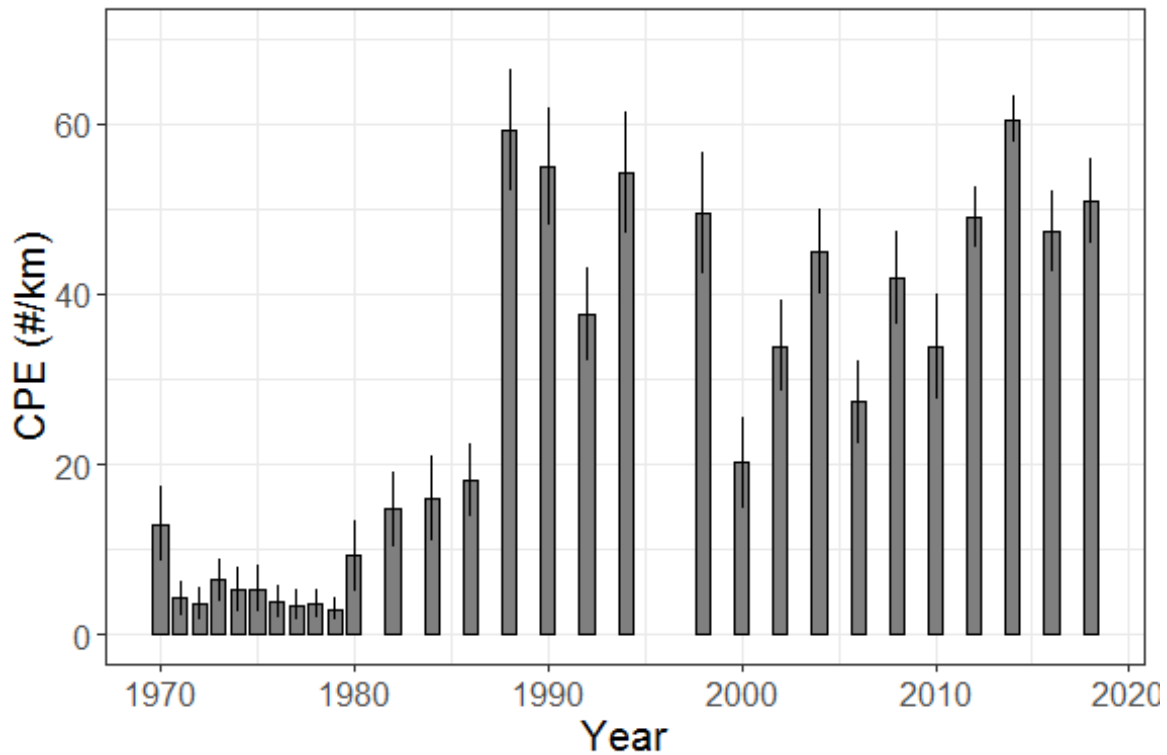


Figure 11. Time series of geometric mean CPE for Cisco species from 51 and 64 mm meshes in the Apostle Islands region of Lake Superior, 1970-2018. Summer index sampling did not occur in 1996. Error bars are one standard deviation.

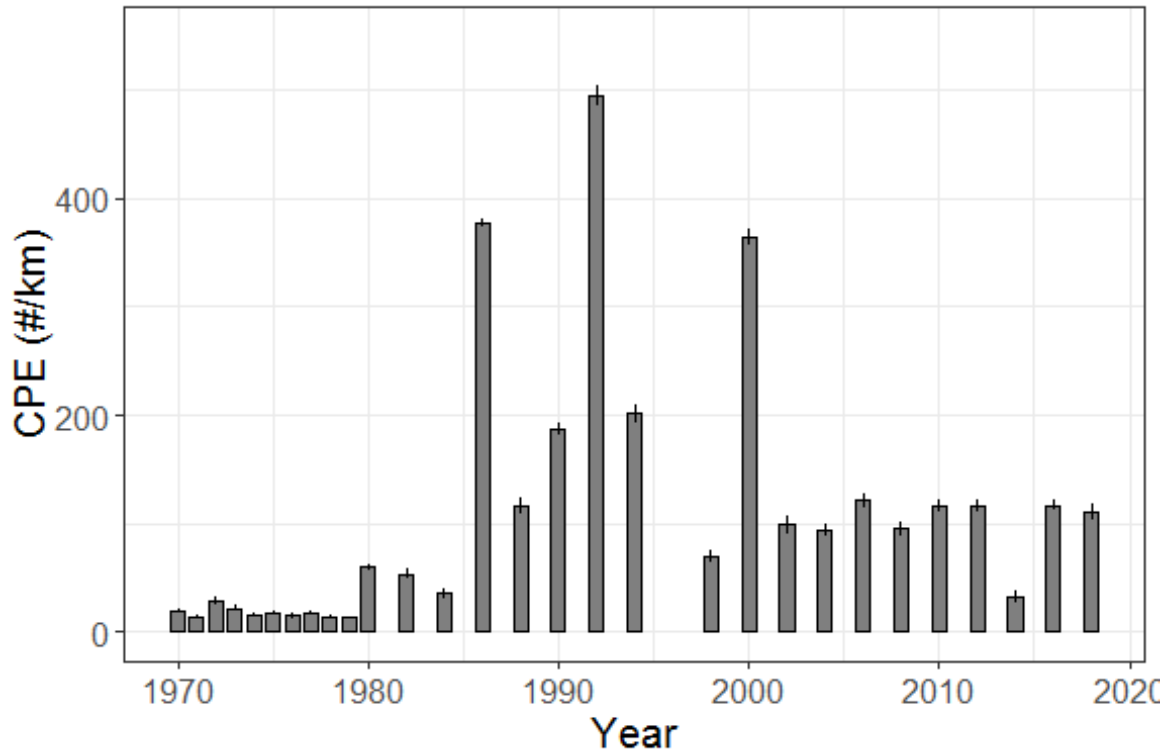


Figure 12. Time series of geometric mean CPE for Cisco species from 38 mm meshes in the Apostle Islands region of Lake Superior, 1970-2018. Summer index sampling did not occur in 1996. Error bars are one standard deviation.

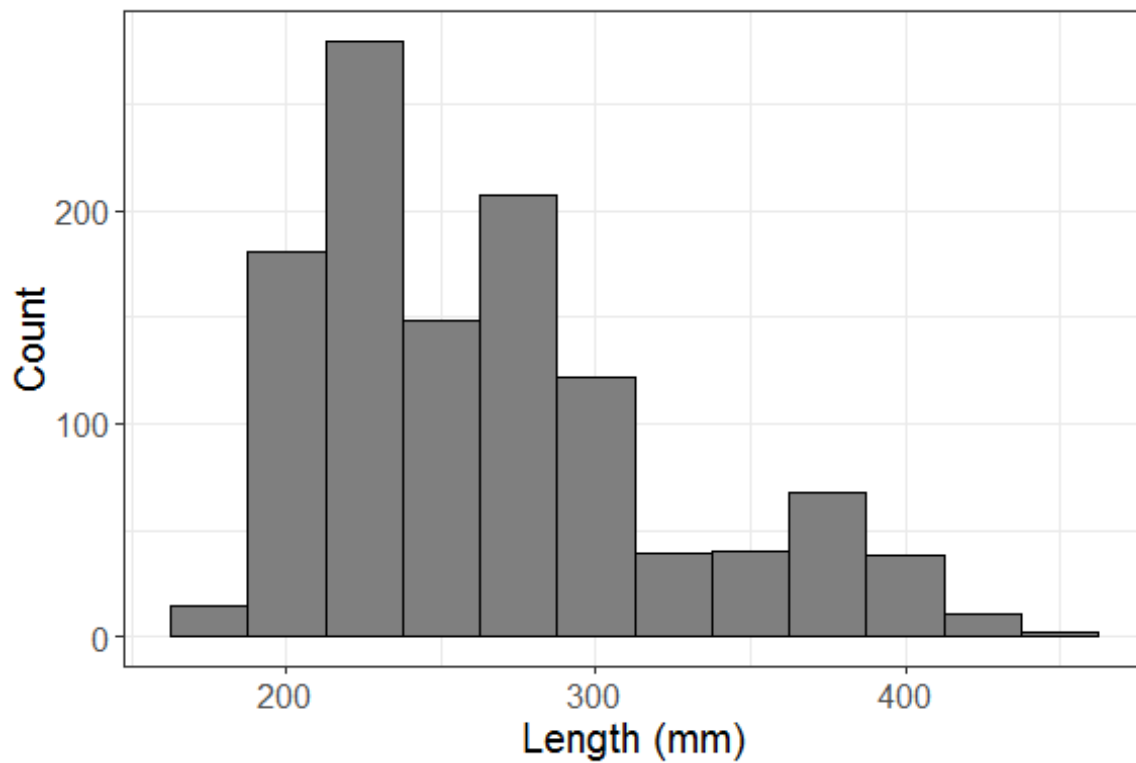


Figure 13. Length distribution of Cisco species caught in the Apostle Islands region of Lake Superior during the 2018 summer index.

Burbot

The geometric mean CPE for Burbot appears to have remained low since the 1980's (Figure 14). A total of 30 Burbot were sampled in 2018 and their median length was 504.2 mm (Figure 15).

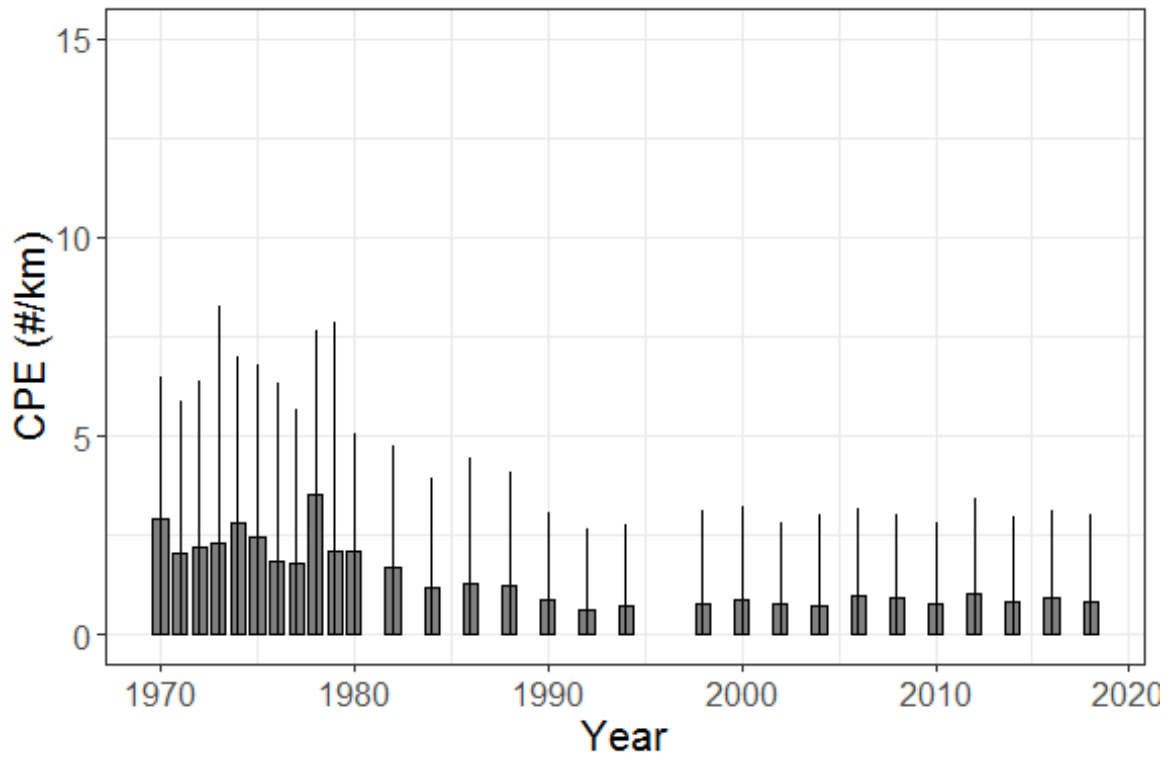


Figure 14. Time series of geometric mean CPE for Burbot in the Apostle Islands region of Lake Superior, 1970-2018. Summer index sampling did not occur in 1996. Error bars are one standard deviation.

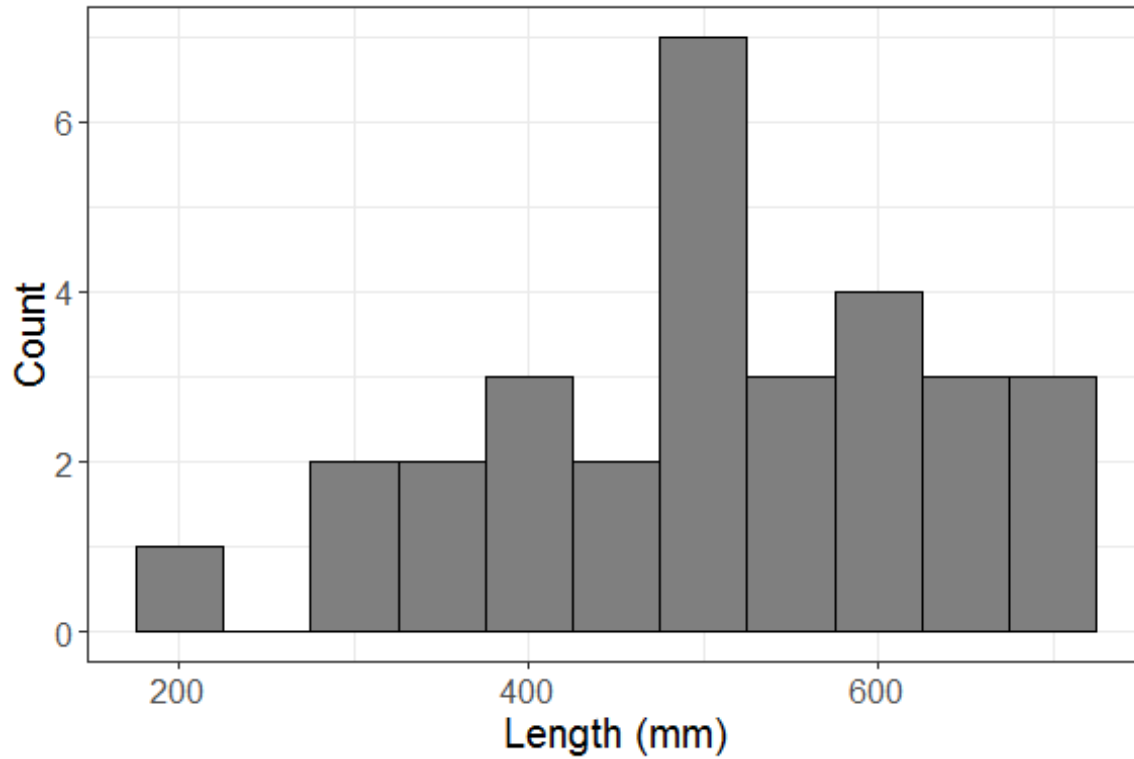


Figure 15. Length distribution of Burbot caught in the Apostle Islands region of Lake Superior during the 2018 summer index.

Round Whitefish

The time-series of Round Whitefish geometric mean CPE suggests a potential decrease in abundance from the 1970's (Figure 16). The average size of Round Whitefish during 2018 was 337.8 mm (Figure 17).

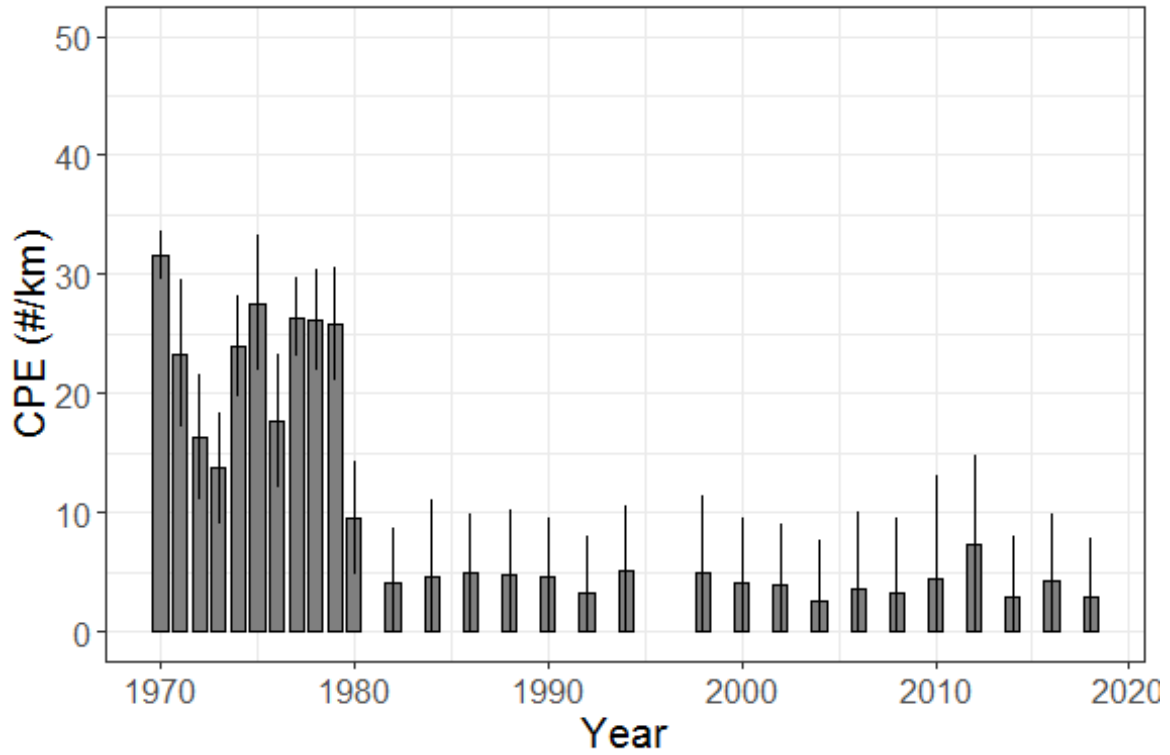


Figure 16. Time series of geometric mean CPE for Round Whitefish in the Apostle Islands region of Lake Superior, 1970-2018. Summer index sampling did not occur in 1996. Error bars are one standard deviation.

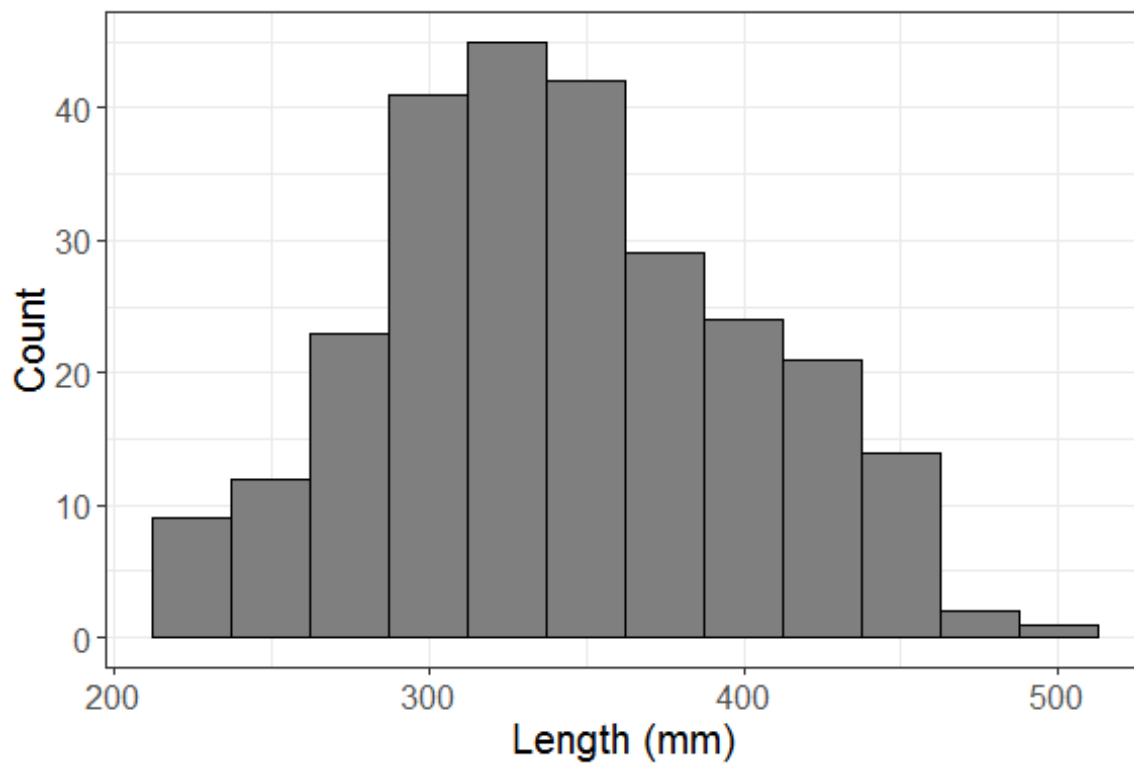


Figure 17. Length distribution of Round Whitefish caught in the Apostle Islands region of Lake Superior during the 2018 summer index.

References

Horns, W.H., Bronte, C.R., Busiahn, T.R., Ebener, M.P., Eshenroder, R.L., Gorenflo, T., Kmiecik, N., Mattes, W., Peck, J.W., Petzold, M., Schreiner, D.R. 2003. Fish-community objectives for Lake Superior [online]. Available at: http://www.glf.org/pubs/SpecialPubs/Sp03_1.pdf .