

# Lake Pend Oreille Predator Management Program 2023 Annual Project Update

Dissolved Gas Supersaturation Control, Mitigation, and Monitoring,  
Appendix F5

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## ABSTRACT

Kokanee have been the primary driver of the Lake Pend Oreille (LPO) salmonid fishery since becoming established in the 1930s. However, a combination of changing lake conditions and increased predation greatly reduced their abundance prompting closures to the kokanee fishery in 2000. Beginning in 2006, predator suppression programs were implemented with the goal of reducing predatory fish abundance in LPO. An Angler Incentive Program (AIP) was introduced to incentivize sport harvest of Rainbow Trout *Oncorhynchus mykiss* (ended in 2013) and Lake Trout *Salvelinus namaycush* (ongoing). In addition, commercial trap net and gill net operations targeting Lake Trout were implemented to further reduce the predator population and subsequently increase kokanee *O. nerka* survival (ongoing). The success of these efforts was illustrated by increased kokanee abundance and the reopening of the kokanee harvest fishery in 2013. Much like Lake Trout in the early 2000s, an expanding Walleye *Sander vitreus* population has the potential to put several fish populations in LPO at risk through direct predation and competition, spurring the implementation of a Walleye suppression feasibility project (started in 2018), a Walleye AIP (started in 2019), and periodic monitoring. This report provides preliminary results of the 2023 predator suppression programs on LPO. In 2023, 9,310 Lake Trout were captured and all but nine were removed from LPO via the Lake Trout Netting Program. A total of 1,327 Bull Trout *S. confluentus* were also caught, with 307 being direct mortalities (23%). Anglers turned in 2,677 Lake Trout heads through the AIP, with 16 incidental Bull Trout mortalities due to angler misidentification. In addition, 453 Walleyes were removed through the Walleye netting program, with five incidental Bull Trout mortalities. In 2023, 3,194 Walleye heads were turned in as part of the Walleye AIP, with 13 reward tags (\$1,000 each) being returned. These programs continue to successfully reduce the populations of predator fish in LPO and it is recommended they continue to be implemented in future years.

## INTRODUCTION

Lake Pend Oreille (LPO) represents a stronghold for adfluvial Bull Trout *Salvelinus confluentus* within their native range. Rainbow Trout *Oncorhynchus mykiss* in LPO provide a popular, world-class trophy fishery that largely depends on abundant kokanee *O. nerka* for forage. Kokanee also provide a popular harvest fishery and are the main forage base for adfluvial Bull Trout, which are listed as threatened under the Endangered Species Act. Westslope Cutthroat Trout *O. lewisi* are also native to LPO and historically provided an important sport fishery in the lake.

Kokanee have been the primary driver of the LPO salmonid fishery since becoming established in the 1930s. They serve a dual role by providing both a high-yield sport fishery and the primary prey source for pelagic predators that support trophy fisheries (i.e., Rainbow Trout, Bull Trout). From the 1950s through the mid-1970s, LPO anglers targeted mainly kokanee, with commensurately high harvests. The lake also supported an active commercial kokanee fishery at times. However, kokanee abundance began declining in the mid-1960s and reached a depressed state by the 1970s. The commercial fishery was closed in 1973. Lake Trout *S. namaycush* were introduced in the early part of the 20<sup>th</sup> century and became increasingly abundant by the early 2000s. Increased predation threatened to collapse the already diminished kokanee population (Hansen et al. 2010; Rust et al. 2020) which prompted the implementation of fishing regulation changes intended to balance high predator abundance, specifically Lake Trout and Rainbow Trout, with the declining kokanee prey base. In 2000, the kokanee fishery was closed, Rainbow Trout limits were liberalized, and the bag limit on Lake Trout was removed (Fredericks et al. 2003). Despite these efforts, the Lake Trout population continued to expand, and the kokanee fishery did not show signs of recovery. Lake level manipulation, zooplankton dynamics, and floods may have also contributed to the decline of kokanee (Corsi et al. 2019).

Research determined that reduced kokanee productivity in LPO, in concert with an over-abundance of upper trophic level predators, had created a predator pit that would have likely led to a complete collapse of kokanee in the system (Hansen et al. 2010). Beginning in 2006, with support from Avista and the Bonneville Power Administration, predator suppression programs were implemented with the goal of reducing predator abundance in LPO. An Angler Incentive Program (AIP) was introduced to incentivize sport harvest of Rainbow Trout and Lake Trout. In addition, commercial trap net and gill net operations targeting Lake Trout were implemented to further reduce the predator population and increase kokanee survival. The AIP was also intended to reduce Rainbow Trout abundance, but this component of the program was discontinued in 2013 because of limited success and increased resiliency of the kokanee population by that time. The predator suppression program has been a major success, and the kokanee population has responded positively (Dux et al. 2019; Rust et al. 2022).

Walleye *Sander vitreus*, were illegally introduced into Noxon Reservoir in the early 1990s and have become well-established throughout Noxon and Cabinet Gorge reservoirs (Horn et al. 2009). These reservoirs provide suitable spawning and rearing habitat for Walleyes and downstream drift was the likely source of subsequent invasions into the Idaho portion of the Clark Fork River, LPO, and the Pend Oreille River, where they now present a threat to downstream fisheries. Walleyes

were originally documented in LPO in the early 2000s (Schoby et al. 2007), and the population remained stable at a low density until 2011, although increasing numbers of Walleyes were caught in Lake Trout netting efforts throughout LPO during this period (Rust et al. 2022). Since then, catch per unit effort in index netting surveys has approximately doubled every three years from 2011 to 2017, but was reduced to near 2014 levels in 2020 (Ryan et al. 2021; Camacho et al. *in prep*; Bouwens et al. 2021).

Much like with Lake Trout, an expanding Walleye population has the potential to put several fish populations in LPO at risk through direct predation and competition (Frawley 2023). Walleyes are prolific piscivores and their establishment in other western lentic systems has led to significant fishery management challenges, particularly where they overlap with salmonid fisheries (McMahon and Bennett 1998; MFWP 2016). Lake Trout existed at low abundances in LPO for many years before they became a predation concern, and it is likely a similar situation existed with Walleyes. Should Walleye abundance continue to increase, and the scope of their niche expand to include ecologically significant predation on kokanee, Westslope Cutthroat Trout, and juvenile Bull Trout and Rainbow Trout, it would undermine the conservation successes and recreational fishery enhancements made through previous suppression programs. These similar patterns led to the establishment of an experimental Walleye netting program in 2018 and a Walleye AIP in 2019. Unlike the incentivized angling system established for Lake Trout, the Walleye AIP instead focuses on a small number of fish tagged with coded wire tags (CWT's) for a high reward (\$1,000 per fish) along with each head submitted providing an entry into a monthly drawing for ten \$100 rewards.

This report provides a summary of preliminary results from the 2023 predator suppression programs on LPO.

## **METHODS**

### ***LAKE TROUT***

#### **Netting**

Lake Trout netting methods closely followed those described in Rust et al. (2022). Hickey Brothers Research, LLC was contracted to remove Lake Trout from LPO using gill nets during three weeks of assessment netting (January 3–January 21), 11 weeks in the spring netting season (January 23–April 7), eight weeks in the fall spawner netting season (September 5–October 26), and six weeks in the fall juvenile netting season (October 30–December 15).

Prior to 2018, trap net catch rates were utilized as an index of Lake Trout and Bull Trout abundance. Trap netting was discontinued in 2018 and replaced with a random assessment netting protocol based on analysis by Hansen et al. (2019). Data from this program are utilized to conduct a cohort analysis for Lake Trout, which provides an annual age-specific abundance estimate. This random assessment netting was conducted during the late fall 2018–2020 but was complicated with periodic catches of spawning and recently spawned kokanee that quickly fouled the nets. To avoid this, assessment netting was not conducted in December of 2021 but instead moved to early January 2022 after most of the kokanee had spawned. Assessment netting will be conducted in January moving forward.

Bottom-set gill nets with stretch mesh sizes ranging from 3.8 to 14 cm were used. Each net was 91.4 m long. Three nets were connected to form a 274 m “box”. Several boxes were then tied together to form a “gang”. Gangs were generally set in serpentine patterns parallel to shore at various locations around LPO (Figure 1). Suppression and spawner netting locations were chosen based on past catch history and available telemetry information indicating target fish in the area. Assessment netting locations were based on a stratified random design. Nets were set near dawn and retrieved in the late-morning (typically 4- to 6-hour sets). See Rust et al. (2022) for a more detailed explanation of netting methods.

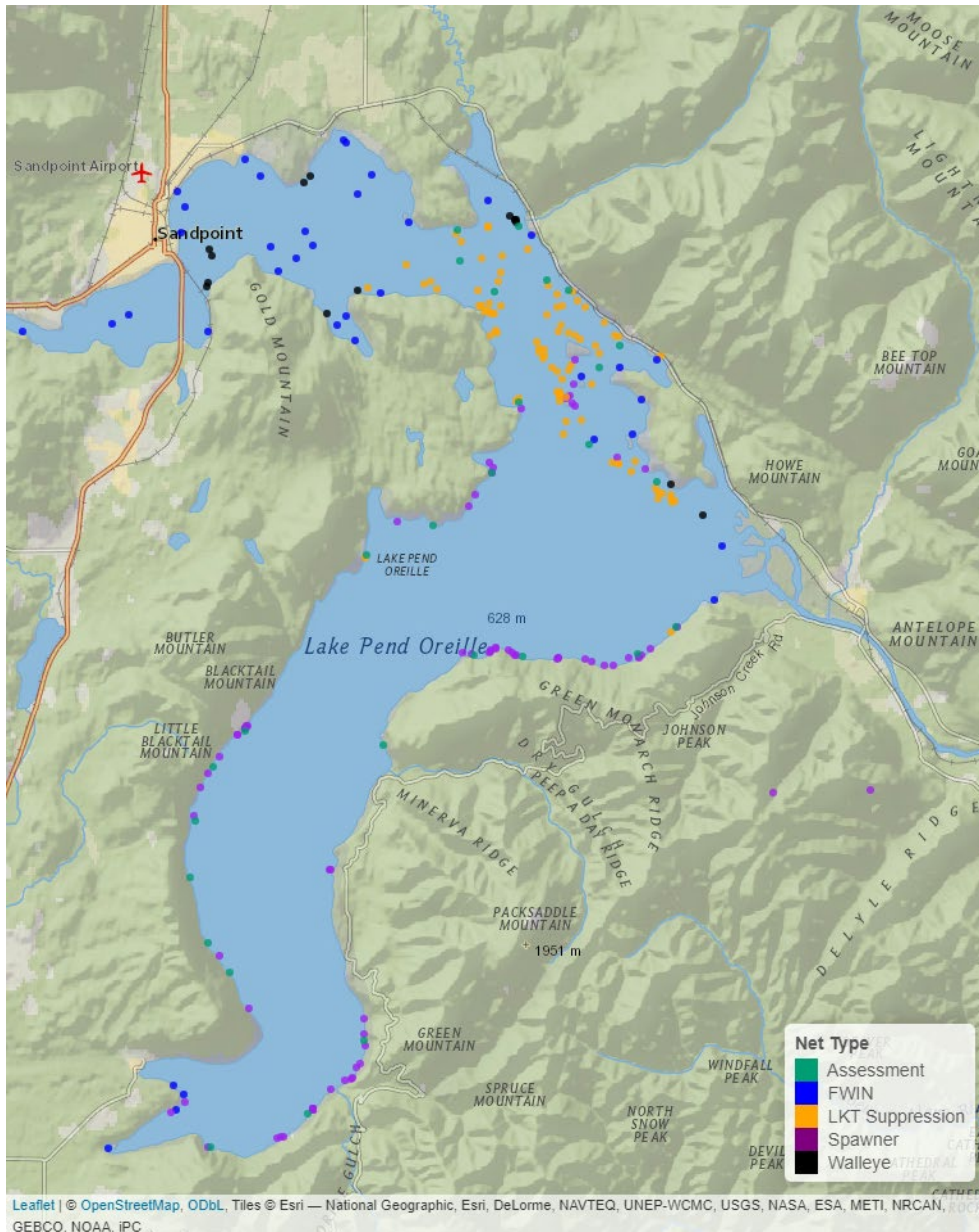


Figure 1. Netting locations in 2023 as part of the predator suppression program.

Except for spawning or recently spawned kokanee and Lake Whitefish *Coregonus clupeaformis*, all gamefish captured in gill nets were enumerated. Because of high catch rates, Lake Whitefish were enumerated from a stratified random subset of standardized assessment netting locations. Catch rates were calculated as the number of fish of a particular species captured per 274 m box.

All captured individuals of each target species (i.e., Lake Trout, Northern Pike *Esox lucius*, and Walleyes) were measured for total length and, with few exceptions (i.e., those tagged for research purposes), removed from the population and donated to local food banks or raptor rehabilitation facilities. Sex and maturity were determined for most of the Lake Trout captured throughout the spawning period (September–November). Otoliths were removed from a subset of Lake Trout during the standardized assessment netting for ageing purposes. All Bull Trout captured during Lake Trout netting were measured for total length, scanned for PIT tags, and a genetic sample was taken. All live Bull Trout were implanted with a 12-mm FDX PIT tag if they didn't already have one, assigned a condition score, revived in an oxygenated tank if necessary, and released. In addition, when incidental mortalities occurred, total length, head length, and body depth were measured; sex and maturity level were determined; genetic samples, otoliths, scales, and fin rays were collected; pathogen samples were taken; fecundity was estimated from a subset of mature females; and stomach contents were described.

### **Angler Incentive Program**

Anglers that caught Lake Trout from LPO had the option to turn the heads in to freezers placed around the lake at angler access points for a payment of \$15 per head. Heads were collected from freezers weekly, identified to species, and measured from the tip of the snout to the posterior edge of the operculum. Previously developed head-length to total-length relationships for Lake Trout in LPO (Wahl et al. 2013) were used to extrapolate total length. In addition to the freezer collections, angler clubs had the ability to apply for AIP sponsorship at fishing derbies. Clark Fork Settlement Agreement funds were used to increase the total dollar amount of prize winnings for each derby, with the intent of increasing the participation and resulting number of Lake Trout removed from the system.

## ***WALLEYE***

### **Telemetry**

During 2023, Walleyes greater than 515 mm ( $n = 4$ ) in LPO were tagged using Innovasea (formerly Vemco) acoustic telemetry tags for tracking purposes. Tags were implanted into fish via a 4.5 cm incision in the anterior of the abdomen and closed with non-absorbable sutures. A total of 81 Walleyes have been implanted with acoustic tags since telemetry research began in 2018. Due to angler harvest and subsequent removal of tagged fish by both anglers and contracted netting, a total of 32 Walleyes with acoustic tags are currently present in LPO. An acoustic telemetry array was installed in 2019 and expanded annually thereafter to passively track fish movements within the system throughout the year. The array currently consists of 48 acoustic receivers positioned strategically throughout the LPO system at main lake points and islands, and throughout the adjoining Pend Oreille and Clark Fork rivers to maximize observations and capture fish movement data. There are 42 receivers permanently deployed in the LPO system, and six receivers that are



deployed seasonally in LPO when full summer water level is achieved, and the littoral zone is navigable by boat. The main lake contains 28 receivers, the Pend Oreille River has ten receivers, and the Clark Fork River contains nine receivers (Figure 2). To supplement this array, fish were also tracked using active methods from a research boat. Active tracking was conducted weekly throughout the entire system on a rotating basis in areas of seasonal interest to fish movement (i.e., spawning seasons). Walleye locations are periodically provided to the public to facilitate angler harvest.

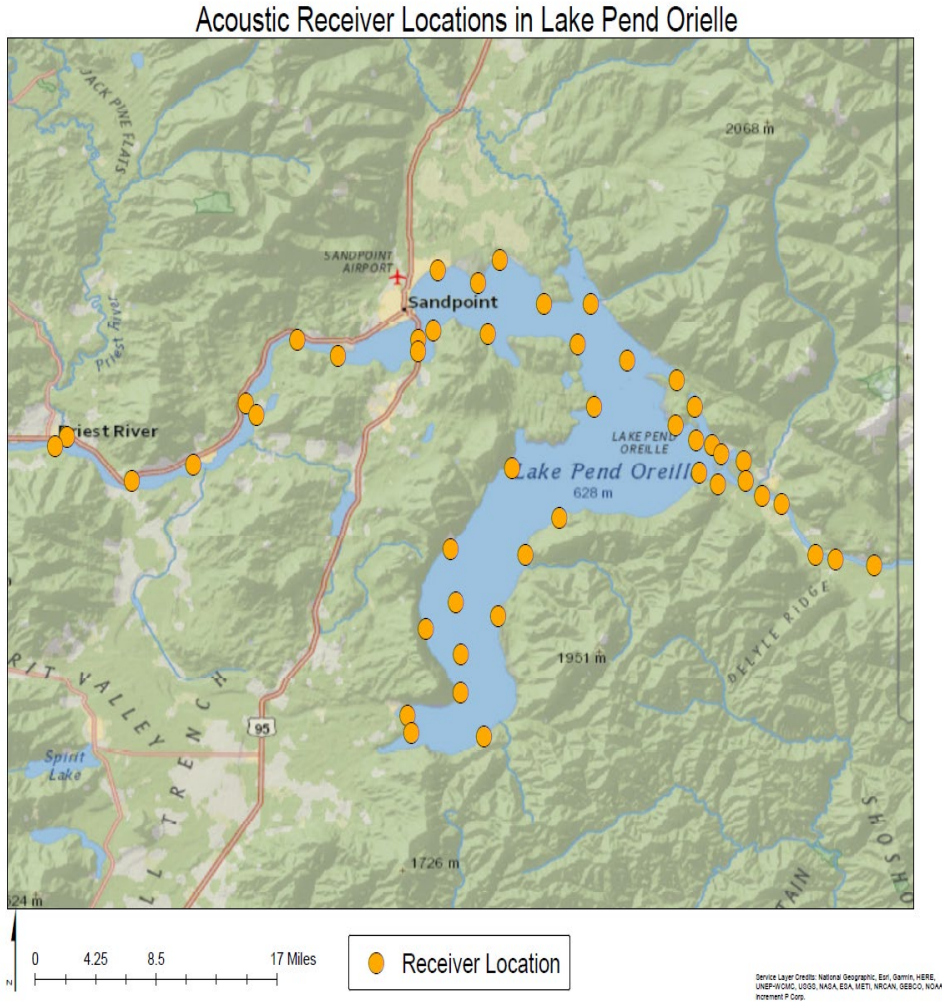


Figure 2. Acoustic receiver locations in Lake Pend Oreille, 2023.

**Netting**

Hickey Brothers Research, LLC was contracted to operate gill nets during three weeks in the spring of 2023 (April 10–28) to target Walleyes. This was done to evaluate their use as a tool to reduce Walleye abundance in LPO. Aided by telemetry data, gill net effort was primarily focused on the following areas: Pack River delta, Fisherman’s Island area, Shepherd Point, immediately north of the Burlington Northern Railroad bridge in Sandpoint, Kootenai Point, and adjacent to the mouth of the Clark Fork River delta (Figure 1).

Bottom-set gill nets with stretch mesh sizes of 7.6, 8.9, 10.2, and 11.4 cm were used. Each net was 91 m long. Three nets were connected to form a 274 m “box”. Several boxes were then tied together to form a “gang”. Gang-specific mesh size and set locations may have varied based upon recent catch data to maximize catch rates of target species while minimizing bycatch. Gill nets were set just before dawn and retrieved mid-morning, typically after 4–6 hours fishing time. Except for Lake Whitefish (because of high abundances in the catch), all gamefish captured in gill nets were enumerated. Catch rates were calculated as the number of Walleyes captured per 274 m box.

Captured Walleyes were measured for total length and checked for existing tags or marks. Fifty-three Walleyes were implanted in the snout with CWTs during 2023 to maintain an adequate group of tagged fish for the AIP. As of December 31, 241 Walleyes have been implanted with CWTs, although we estimate about 41 are still at large due to known or estimated natural mortality. The remaining Walleyes captured during netting were taken to local food banks. All Bull Trout captured were measured for total length, scanned for PIT tags, and a genetic sample was taken. All live Bull Trout were implanted with a 12-mm FDX PIT tag if they did not already have one, assigned a condition score, revived in an oxygenated tank if necessary, and released. In addition, when incidental mortalities occurred, total length, head length, and body depth were measured; sex and maturity level were determined; genetic samples, otoliths, scales, and fin rays were collected; pathogen samples were taken; fecundity was estimated from a subset of mature females; and stomach contents were described.

### **Angler Incentive Program**

Anglers that caught Walleyes from LPO had the option to turn in the heads to freezers already in place for the Lake Trout AIP. Heads were collected from freezers weekly and measured from the tip of the snout to the posterior edge of the operculum. Previously developed head-length to total-length relationships for Walleyes in Lake Pend Oreille were used to extrapolate total length (Idaho Department of Fish and Game, unpublished data). Anglers received one entry for each head submitted in a monthly drawing for 10 rewards (\$100 each). Walleye heads were also scanned for a coded wire tag and, when present, the angler received a \$1,000 reward.

## **RESULTS AND DISCUSSION**

### ***LAKE TROUT***

#### **Netting**

A total of 9,310 Lake Trout were captured during 2023; all but 9 were removed from the lake. A total of 1,327 Bull Trout were also caught, with 307 of them being mortalities (23%). The number of Lake Trout removed by the netting program annually since suppression began in 2006 is shown in Figure 3.

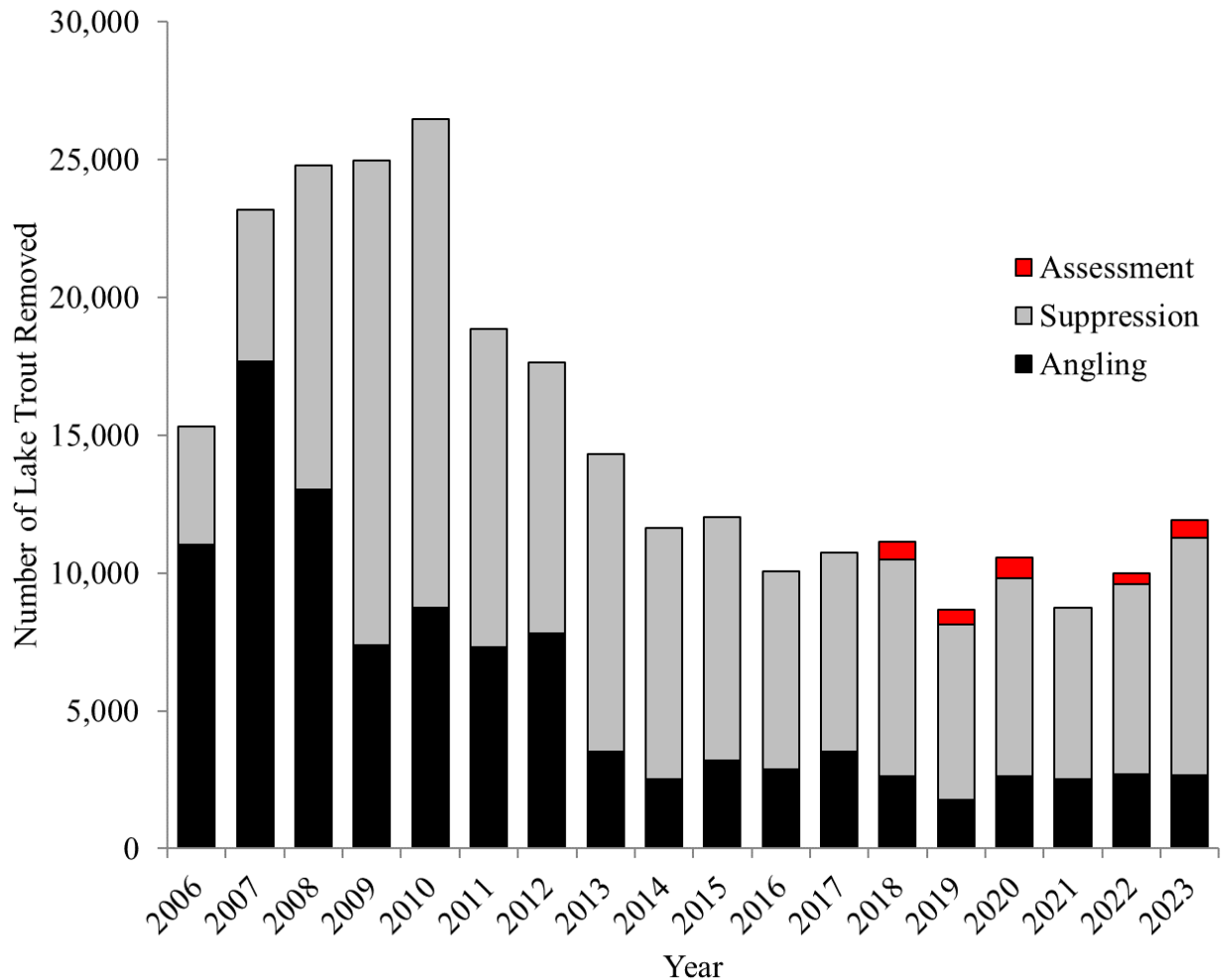


Figure 3. Number of Lake Trout removed during assessment netting, suppression netting, and by incentivized angling 2006–2023, Lake Pend Oreille, Idaho.

Preliminary data specific to the assessment netting data are listed in Appendix A, spring 2023 netting program are listed in Appendix B, and fall 2023 netting program data are listed in Appendix C.

**Angler Incentive Program**

Anglers turned in a total of 2,677 Lake Trout heads in 2023 (Figure 3). This represented 22% of the total Lake Trout removed from LPO in 2023. A total of 195 different anglers participated in the program in 2023. Data were collected from all submitted heads to describe the size structure of the fish harvested under this program. Eight LPO derbies were recipients of Clark Fork Settlement Agreement sponsorship funding. These were the Lake Pend Oreille Idaho Club Spring (April 29–May 7), Members Only (September 23–24), and Fall derbies (November 18–26); the Lake Pend Oreille Anglers Club Spring (May 19–21) and Fall (November 1–3) derbies; the Capt’n’s Table Halloween (October 28–29) derby; the Oktoberfish derby (October 7–8); and the North Idaho

Sportsman Association (NISA) derby (June 9–11). The entire \$2,000 sponsorship for each derby was dedicated towards Lake Trout prizes.

In 2023, 16 Bull Trout were misidentified and submitted for payment as putative Lake Trout. Genetic samples were taken from these fish for species confirmation. The high compliance (<1 % misidentification rate) by anglers participating in the AIP is indicative of the effectiveness of the ongoing species identification education efforts conducted under the Clark Fork Settlement Agreement Bull Trout Protection and Public Education Program.

Preliminary data specific to the 2023 Lake Trout AIP are listed in Appendix D.

## ***WALLEYE***

### **Telemetry**

From telemetry efforts, it was determined that Walleyes were concentrated at three main areas during the spring: the Clark Fork River and delta, the shoreline between Contest Point and the Burlington Northern Railroad bridge, and from the Pack River mouth west to the eastern edge of Oden Bay. Walleyes were more widely distributed during the summer period with loose concentrations of fish located in the Clark Fork River and delta, in shallow warmer bays including the Pack River delta, Oden Bay, Kootenai Bay, and downstream to near the Sandpoint Bridges and into the Pend Oreille River. Walleyes were again documented moving to the south end of LPO in the fall (September–November), concurrent with kokanee forming spawning aggregations in that area. These data were regularly posted on the Idaho Department of Fish and Game website (<https://idfg.idaho.gov/news/panhandle>) and numerous anglers responded positively to this information.

### **Netting**

Gill netting proved to be an effective method for capturing Walleyes during the pre-spawn period. Walleyes were concentrated in relatively shallow water and catch rates were relatively high while bycatch was reasonably low. A total of 453 Walleyes were removed (Figure 4), with five of 19 incidentally caught Bull Trout being mortalities (26%). In addition, 418 Northern Pike were caught during Walleye netting efforts.

Preliminary data specific to the 2023 Walleye Netting Program are listed in Appendix E.

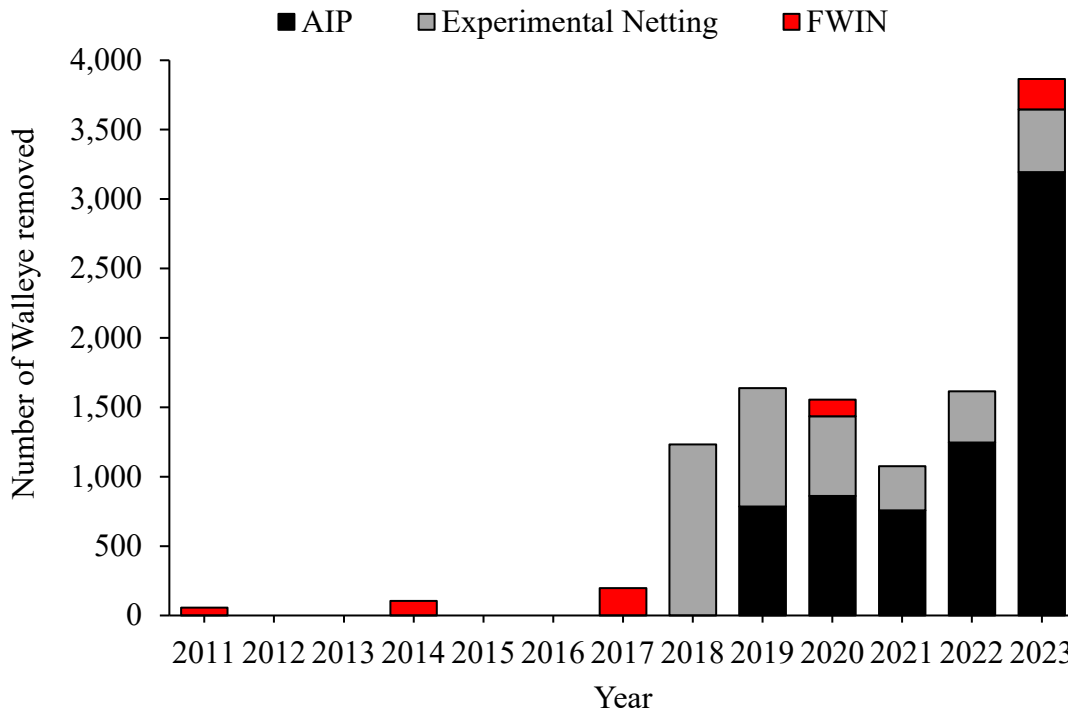


Figure 4. Number of Walleyes removed in the Lake Pend Oreille basin through the angler incentive program (AIP), experimental suppression netting, and fall Walleye index netting (FWIN) surveys, 2011 through 2023.

### Angler Incentive Program

Anglers submitted 3,194 Walleye heads in 2023 (Figure 4). Thirteen of the heads contained a coded wire tag. A total of 232 unique anglers participated in this program in 2023. No Bull Trout heads were misidentified and submitted to the Walleye AIP in 2023.

Data specific to the 2023 Walleye AIP are listed in Appendix F.

### Fall Walleye Index Netting (FWIN)

The FWIN survey was conducted from October 2–5, 2023. Forty-eight gill net-nights were fished among all sampled areas. A total of 217 Walleyes were collected (Figure 4). Walleye catch per unit effort (CPUE) ranged from 0 to 34 Walleyes per net and fish were captured at 39 of the 48 sampled sites. Mean CPUE for Walleye was 4.52 fish/net (SD = 6.04). Walleye catch was distributed across all areas where netting occurred. Catch rates in 2023 were higher than those recorded in 2020 and more closely resembled those measured in 2017 (Figure 5). Preliminary 2023 FWIN data are listed in Appendix G.

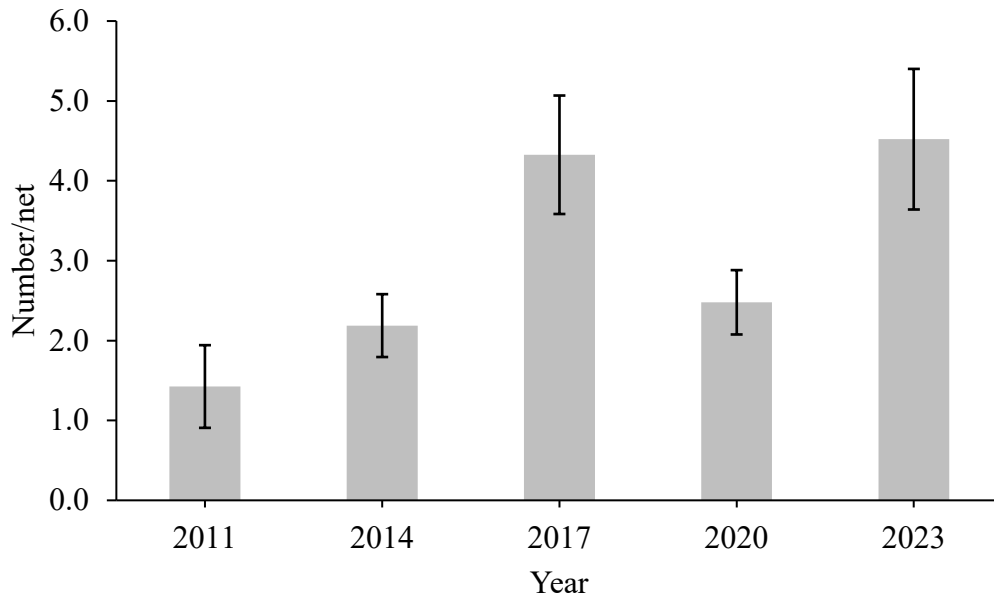


Figure 5. Walleye CPUE data from the 2011–2023 FWIN surveys.

### RECOMMENDATIONS

1. Continue Lake Trout suppression netting at the existing effort level.
2. Continue to implement the Lake Trout random assessment netting program in early January to avoid kokanee bycatch.
3. Continue the Lake Trout AIP, including angler payouts and derby sponsorships.
4. Continue the use of netting to suppress the Walleye population at the existing level.
5. Continue the Walleye AIP as a tool to suppress the Walleye population.

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**APPENDIX A. 2023 LPO ASSESSMENT NETTING SUMMARY**

## 2023 Lake Pend Oreille Assessment Netting Summary

Jeff Strait

### Overview

During the randomized Lake Trout *Salvelinus namaycush* assessment netting for 2023, we set gill nets along the shoreline (in water depths ranging from 18 m to 76 m) at randomly selected locations (stratified to include approximately 40% of sites from the shallow “north end” and 60% of sites from the remainder of the lake). These gill nets were constructed of 91.4 m (300 ft) panels of translucent stretch mesh ranging from 38.1 to 139.7 mm (1.5 – 5.5 in, hereafter mesh sizes are given in inches). Each panel contained a single mesh size and panels were strung together to create 274.32 m (900 ft) “boxes”. Boxes were randomly strung together to create a ten box “gang”, and a single gang was set at each randomly selected site. Each gang contained equal effort of each mesh size (listed above). This stratified random netting effort is hereafter referred to as LKT assessment netting.

A total of 638 Lake Trout ranging from 187 mm to 824 mm were captured using an effort of 79,552.8 m (261,000 ft) of net. Of the total captured, we removed 633 Lake Trout and implanted five acoustic transmitters in Lake Trout to inform future suppression efforts. During this sampling event, we collected otoliths from Lake Trout for aging. We collected otoliths from fish throughout the lake, on both the north and south end. Lake Trout were separated into 50 mm length bins with a goal of 10 samples per length bin. We collected 123 otoliths from 18 of 29 total sites.

To develop an index of Lake Whitefish *Coregonus clupeaformis* abundance in Lake Pend Oreille, we counted Lake Whitefish caught as bycatch at a stratified random subset of sites. On days we enumerated Lake Whitefish, we measured fish from one 91.4 m net of each mesh size. We counted and measured a total of 3,277 Lake Whitefish ranging from 180 mm to 530 mm in 30,175.2 m (99,000 ft) of net.

As part of the bycatch during these efforts, ten different species were captured including ESA threatened Bull Trout *Salvelinus confluentus*. A total of 167 Bull Trout were captured during the assessment netting efforts with an average direct mortality rate of 22.8%. We PIT-tagged 94 and recaptured 40 previously PIT-tagged Bull Trout. In addition to typical PIT tagging efforts to monitor Bull Trout, we implanted acoustic transmitters in 46 Bull Trout. Release condition was monitored for all Bull Trout; condition was broken down as following:

- Good = 116
- Fair = 13
- Poor = 0
- Not Reported = 0
- Mortalities = 38 (mort recaps = 11)

In addition to tagging Bull Trout, we collected tissue samples for genetic analysis from 110 of the released Bull Trout.

The following tables and figures provide summary information on catch and bycatch from gill net efforts during the randomized LKT assessment netting 2023.

## Tables

Table 1. Summary of the 2023 LKT assessment gill netting sets. For each species encountered, statistics include the number captured (Captured), released alive (Released), the number removed (Removed), tagged with PIT tags (PIT), tagged with acoustic transmitters (AC), and recaptured individuals (Recaptured). For species other than Lake Trout, Walleye, and Northern Pike, the number of individuals removed represents fish that were ‘dead on capture’.

Species	Captured	Released	Removed	PIT	AC	Recaptured
Lake Whitefish	3,277	3,277	0	0	0	0
Lake Trout	638	5	633	0	5	0
Kokanee	204	189	15	0	0	0
Bull Trout	167	129	38	94	46	40
Walleye	111	0	111	0	0	0
Yellow Perch	21	18	3	0	0	0
Northern Pike	12	0	12	0	0	0
Smallmouth Bass	10	10	0	0	0	0
Brown Trout	9	9	0	0	0	0
Westslope Cutthroat Trout	5	4	1	0	0	0

Table 2. Summary of total length (mm) data for Lake Trout, Bull Trout, Bull Trout mortalities, and Lake Whitefish captured in gill nets during the fall 2023 LKT assessment netting on LPO.

Species	Mean TL	SE	Max TL	Min TL
Lake Trout	415.5	6.1	824	187
Bull Trout	510.7	7.1	766	219
Bull Trout Mortalities	530.6	15.3	691	275
Lake Whitefish	344.7	1.4	530	180

Table 3. The mean daily catch per unit effort (CPUE, # fish / 274 m of net) and standard error (SE) for Lake Trout (LKT), Bull Trout (BLT), Bull Trout mortalities (BLT Morts), and Lake Whitefish (LWF) by mesh size from gill nets during the 2023 LKT assessment netting efforts on LPO.

<b>Mesh Size (in)</b>	<b>LKT CPUE</b>	<b>LKT SE</b>	<b>BLT CPUE</b>	<b>BLT SE</b>	<b>BLT Mort CPUE</b>	<b>BLT Mort SE</b>	<b>BLT Mortality Rate</b>	<b>LWF CPUE</b>	<b>LWF SE</b>
1.5	2.83	0.80	0.07	0.07	0.00	0.00	0.00	11.00	5.580
1.75	2.90	0.86	0.38	0.14	0.00	0.00	0.00	42.18	22.070
2	4.24	1.77	0.21	0.10	0.07	0.05	0.27	30.27	10.800
2.5	2.48	0.56	0.76	0.18	0.17	0.10	0.15	50.82	12.750
3	1.38	0.30	0.62	0.25	0.21	0.08	0.43	50.18	12.110
3.5	2.34	0.60	0.90	0.27	0.34	0.13	0.31	53.09	8.770
4	2.03	0.60	1.03	0.30	0.24	0.11	0.23	40.09	4.230
4.5	1.86	0.43	1.00	0.24	0.21	0.08	0.22	18.36	3.930
5	1.21	0.30	0.83	0.31	0.07	0.05	0.13	1.27	0.490
5.5	0.90	0.45	0.28	0.12	0.03	0.03	0.17	0.64	0.240
Mean	2.22	0.67	0.61	0.20	0.13	0.06	0.19	29.79	8.097

Table 4. Catch statistics for Lake Trout (LKT), Bull Trout (BLT), and Lake Whitefish (LWF) during the randomized assessment netting from 2018–2023 on LPO. This includes the total number of each species caught (n), mean catch per unit effort (CPUE, # fish / 274 m of net), and the standard error (SE).

Year	n LKT	CPUE LKT	SE LKT	n BLT	CPUE BLT	SE BLT	n LWF	CPUE LWF	SE LWF
2018	628	2.17	0.26	241	0.83	0.08	3,126	10.78	2.17
2019	516	2.15	0.21	327	1.36	0.13	3,436	14.32	2.91
2020	777	3.24	0.32	211	0.88	0.09	4,759	19.83	3.81
2022	402	1.55	0.19	121	0.47	0.06	3,408	13.11	2.44
2023	638	2.20	0.25	167	0.58	0.06	3,277	11.30	1.61

## Figures

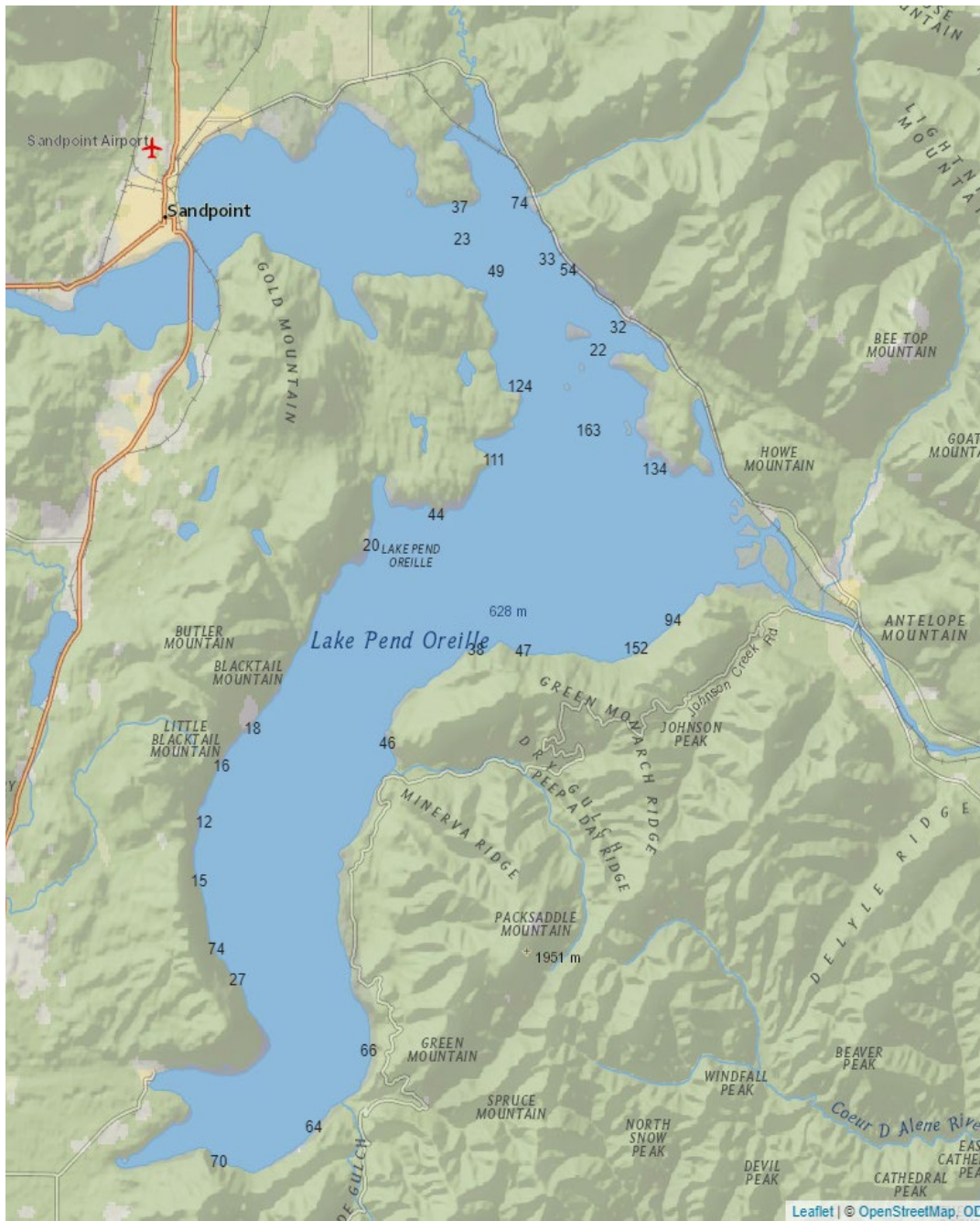


Figure 1. Map of randomly selected sampling locations in Lake Pend Oreille during the 2023 Lake Trout Assessment Netting. The annotations denote the number of Lake Trout captured at each location.



Figure 2. Map of the subsample of locations in Lake Pend Oreille during the 2023 Lake Trout Assessment Netting at which Lake Whitefish were enumerated and measured. The annotations denote the number of Lake Whitefish captured at each location.

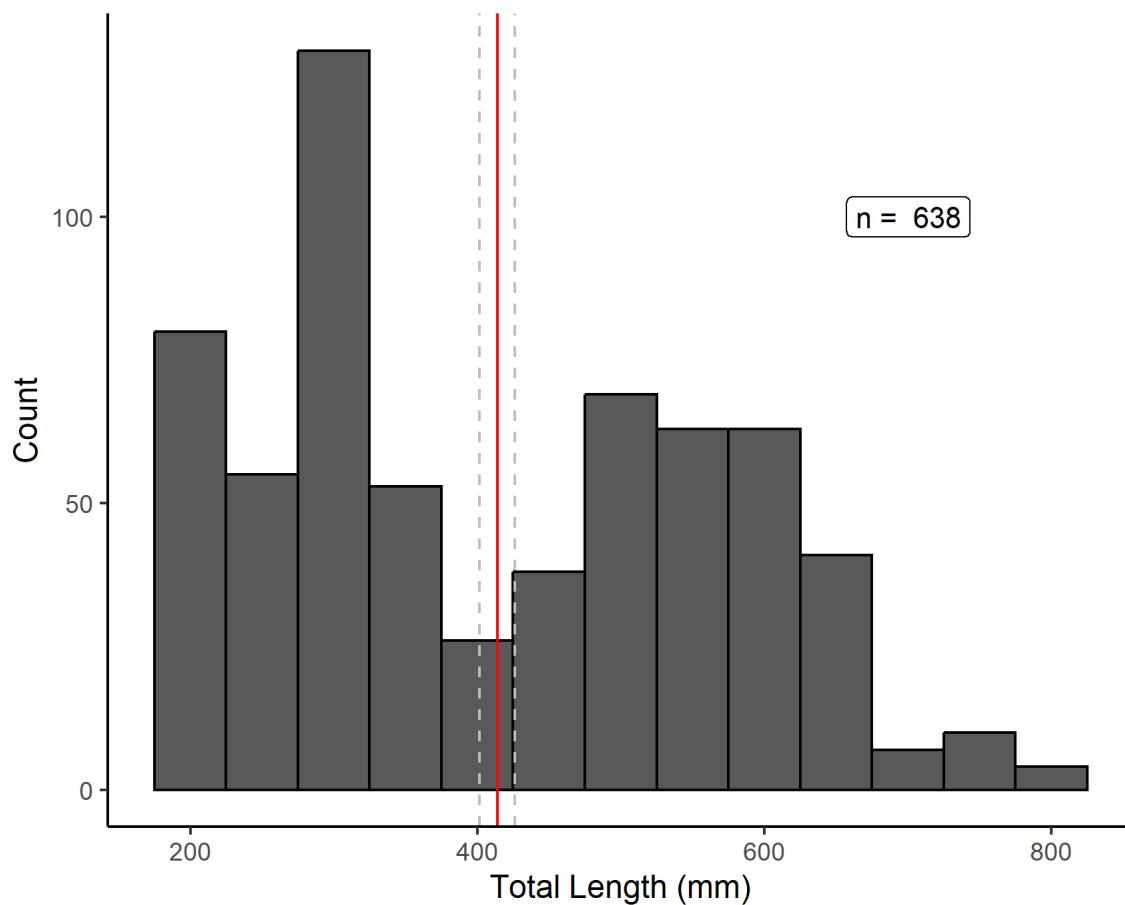


Figure 3. Length frequency distribution of Lake Trout captured in gill nets during the 2023 LKT assessment netting efforts on LPO. The vertical red line represents the mean total length (mm) and the dashed grey lines represent two standard errors above and below the sample mean.



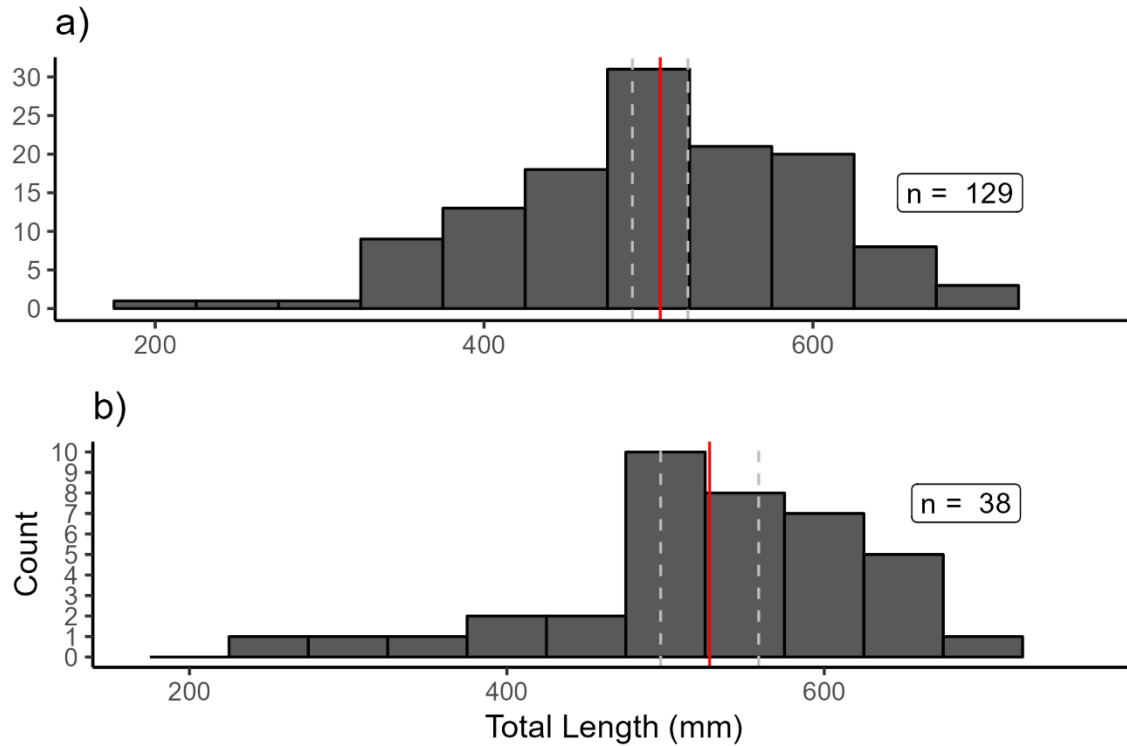


Figure 4. Length frequency distributions of Bull Trout captured in gill nets during the 2023 LKT assessment netting efforts on LPO. Panel a) is the length frequency of Bull Trout released alive and panel b) is the length frequency of Bull Trout direct mortalities. The vertical red lines represent the mean total length (mm) for each group and the dashed grey lines represent two standard errors above and below the sample mean.

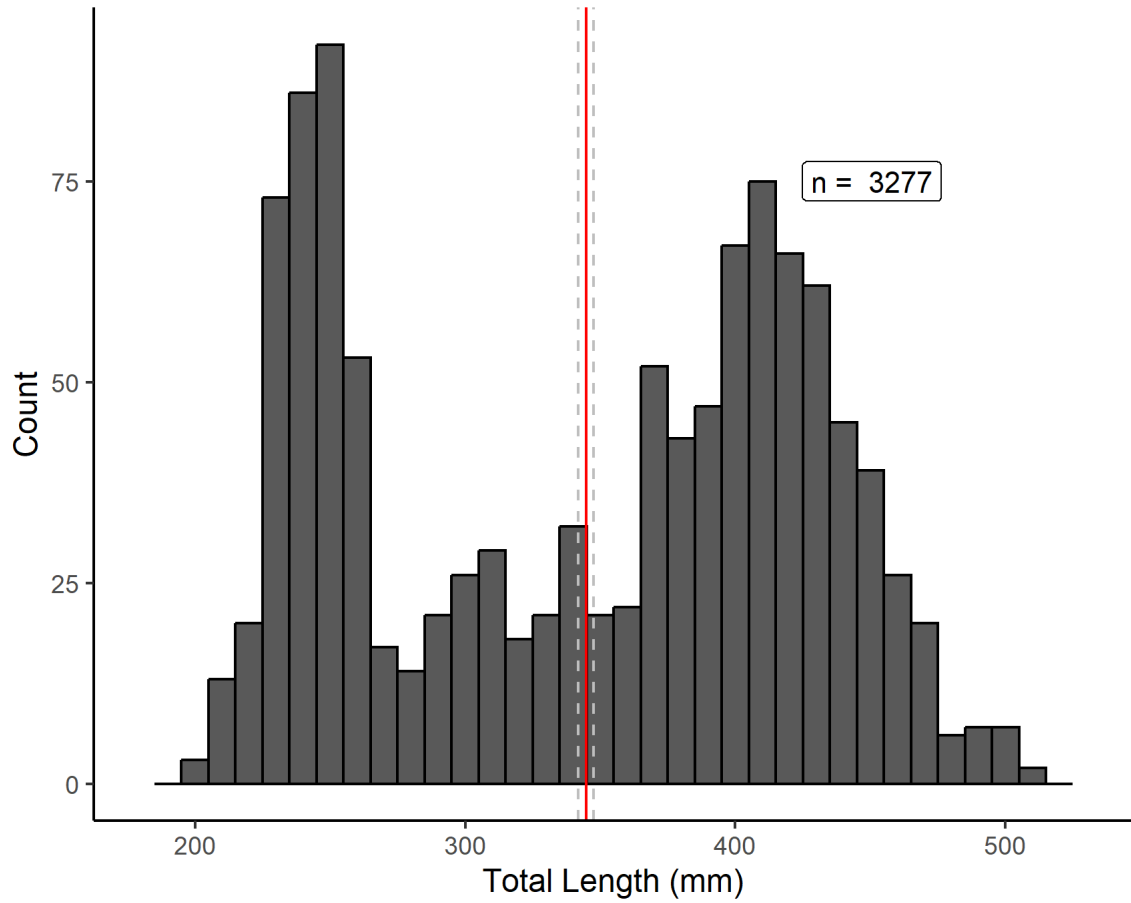


Figure 5. Length frequency distribution of Lake Whitefish captured and measured from a subset of the 2023 LKT assessment nets on LPO. The vertical red line represents the mean total length (mm) and the dashed grey lines represent two standard errors above and below the sample mean.

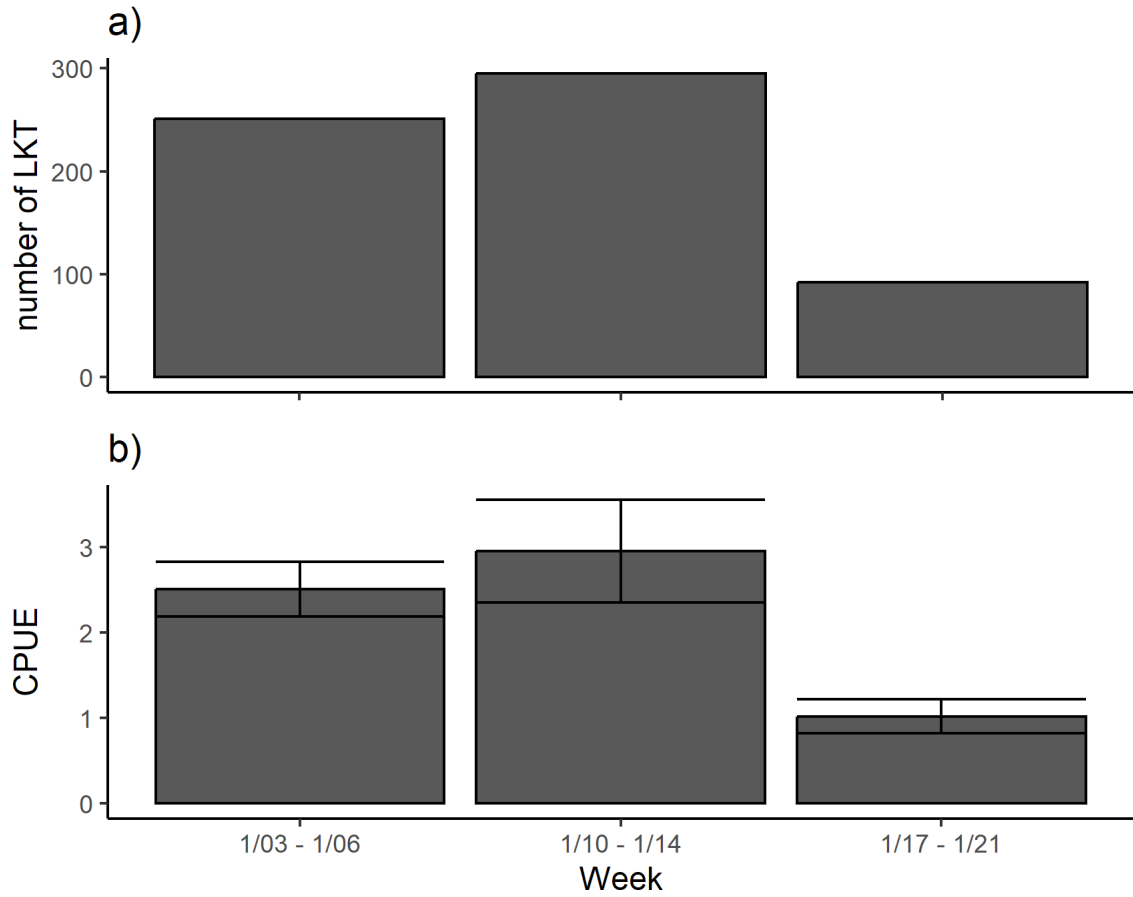


Figure 6. Total weekly catch (a) and mean weekly catch per unit effort with standard error bars (b, # fish / 274 m of gill net) of Lake Trout captured in gillnets during the 2023 LKT assessment netting efforts on LPO.

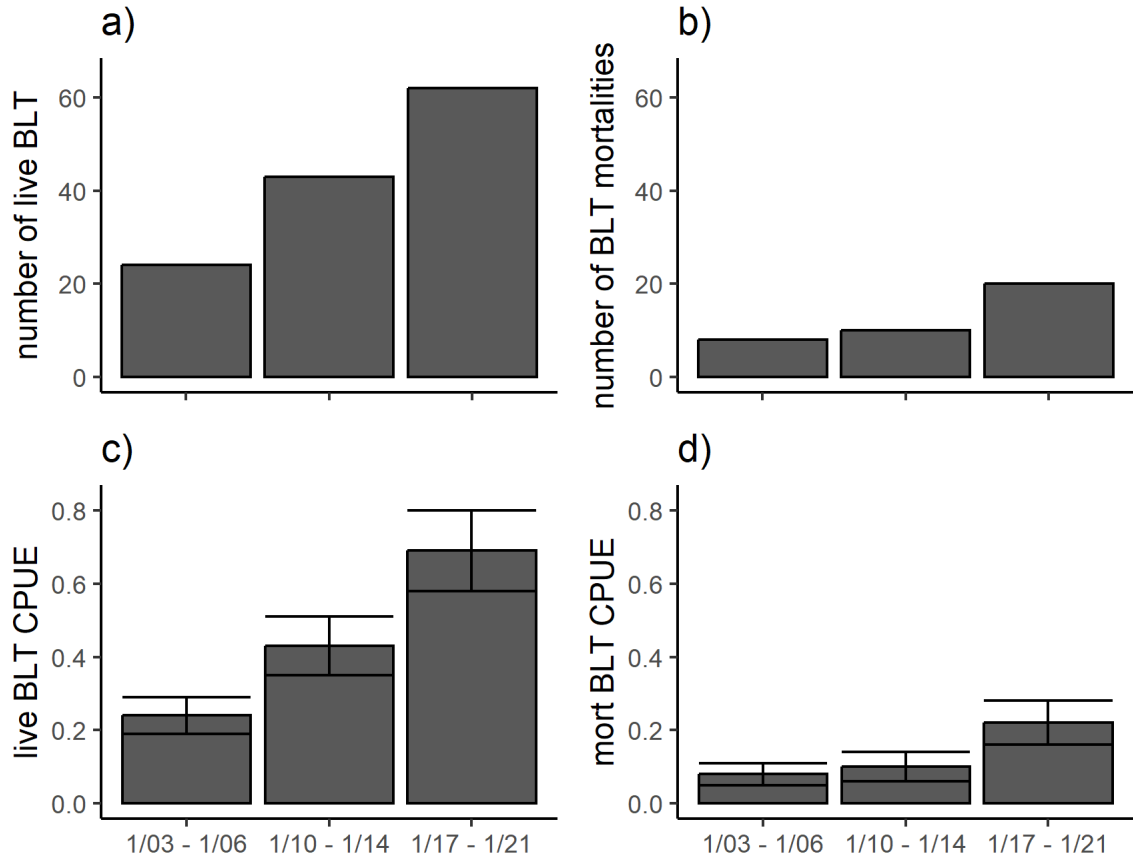


Figure 7. Total weekly catch of Bull Trout released alive (a) and direct mortalities (b), and the mean weekly catch per unit effort with standard error bars (# fish / 274 m of gill net) of Bull Trout captured and released alive (c) and direct mortalities (d) from gill nets during the 2023 LKT assessment netting efforts on LPO.

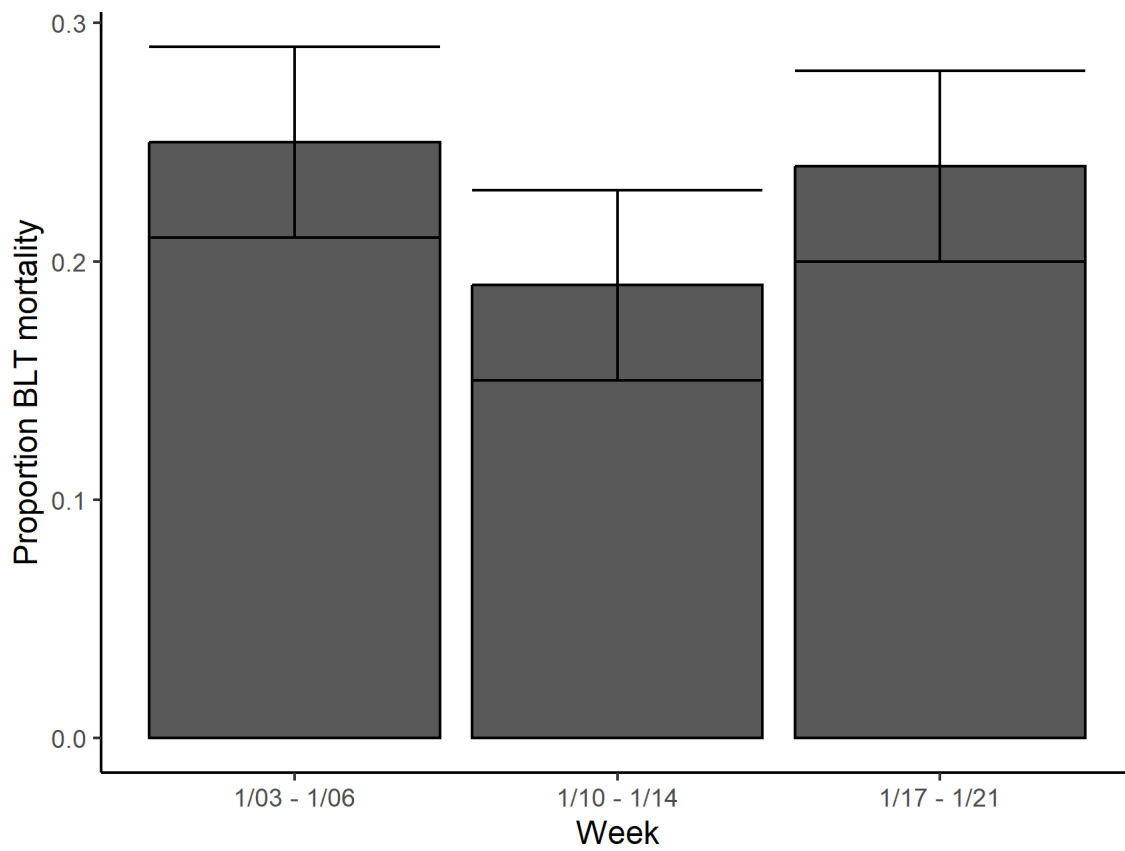


Figure 8. The mean (and standard error) proportion of Bull Trout bycatch resulting in direct mortality during each week of the 2023 LKT assessment netting efforts on LPO.

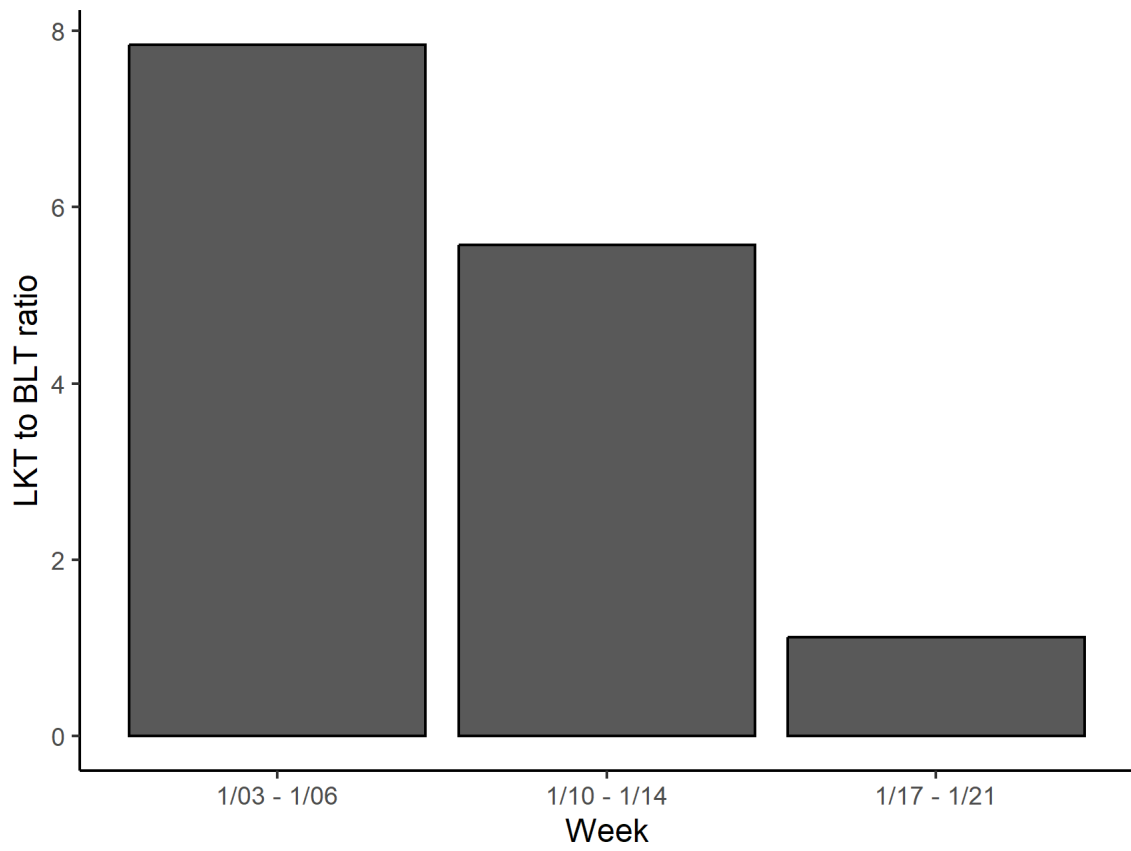


Figure 9. Mean weekly Lake Trout to Bull Trout catch ratios during the 2023 LKT assessment netting efforts on LPO.

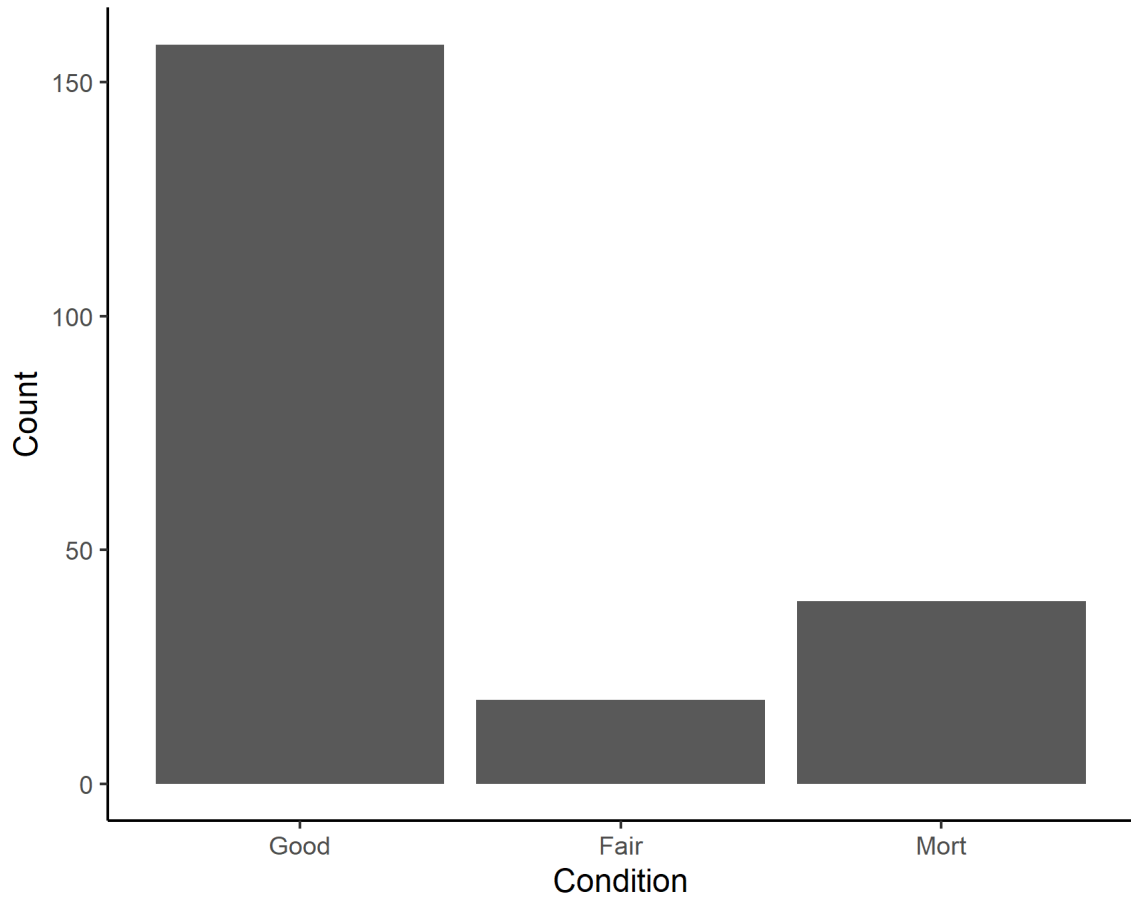


Figure 10. Condition index of Bull Trout captured during the 2023 LKT assessment netting efforts on LPO.

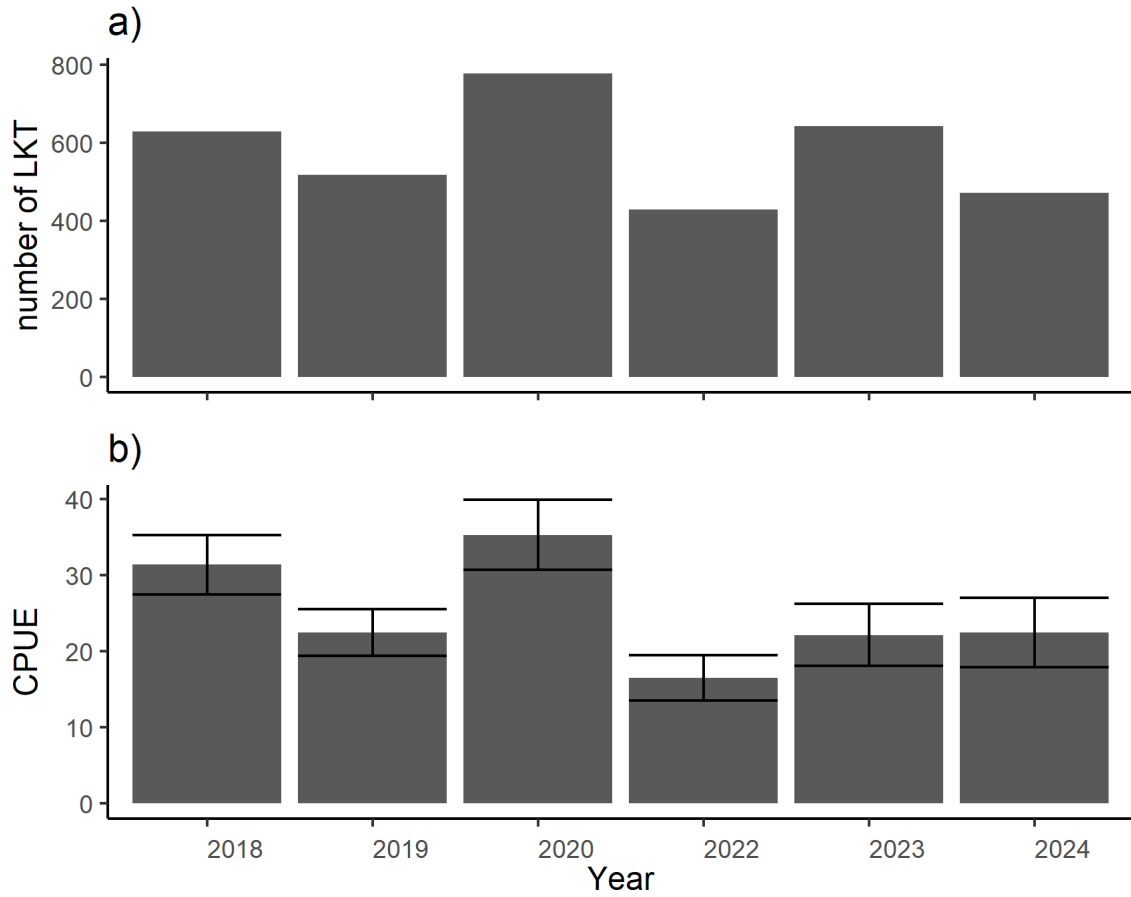


Figure 11. Annual catch (a) and mean catch per unit effort with standard error bars (b, # fish per 274 m of gill net) of Lake Trout during the designated LKT assessment netting efforts from 2018–2023 on LPO. Note: During the 2021–2022 netting year we moved assessment netting from December to January; there is no gap in data collection, only a two-week shift in start date.



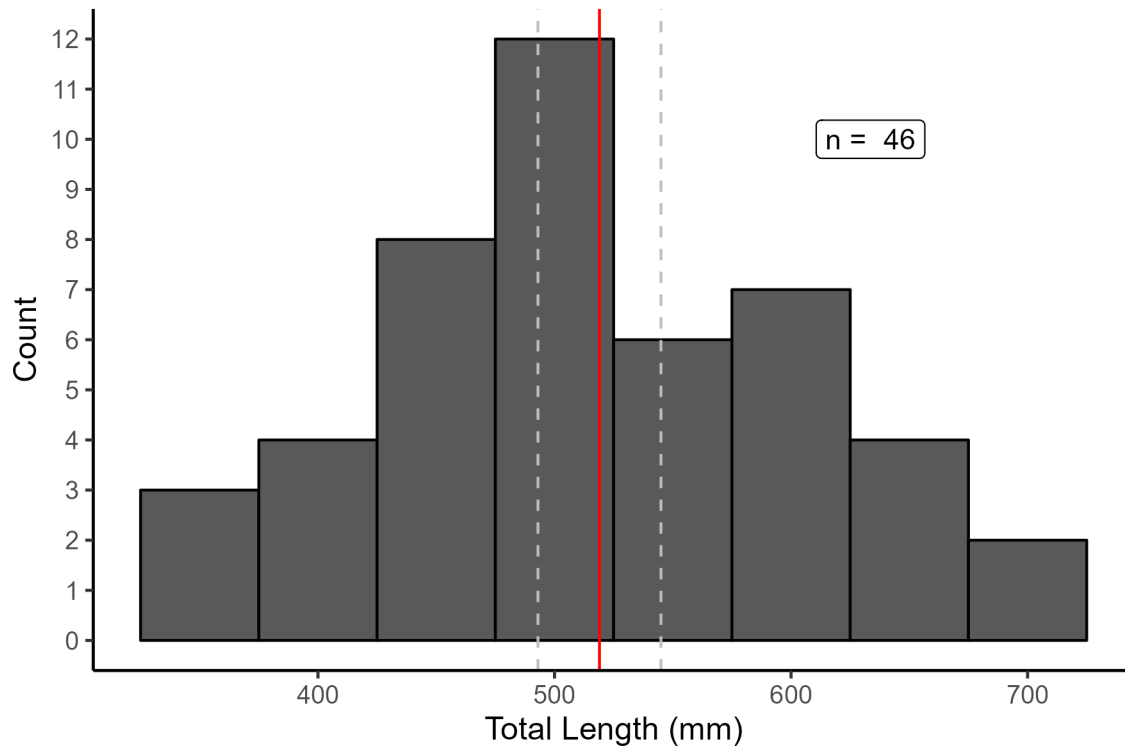


Figure 12. Length frequency distribution of Bull Trout tagged with Innovasea acoustic transmitters during the 2023 LKT assessment netting efforts on LPO. The vertical red line represents the mean total length (mm) and the dashed grey lines represent two standard errors above and below the sample mean.

**APPENDIX B. SPRING 2023 LPO LAKE TROUT NETTING SUMMARY**

## Spring 2023 Lake Pend Oreille Lake Trout Netting Summary

Jeff Strait

### Overview

During spring 2023, gill netting effort was divided into two categories based on mesh sizes fished and the primary target. We fished a combination of 50.8, 63.5, and 76.2 mm (2.0, 2.5, and 3.0 inch) mesh gill nets (hereafter, Small Mesh) to target juvenile Lake Trout *Salvelinus namaycush* and 127 and 139.7 mm (5.0 and 5.5 inch) mesh gill nets (hereafter, Large Mesh) to target adult Lake Trout. A total of 4,477 Lake Trout were removed using 283,098 m (928,800 ft) of net during the spring 2023. In the Small Mesh sets, a total of 3,511 Lake Trout were removed ranging from 192 mm to 762 mm total length using 123,444 m (405,000 ft) of net. In the Large Mesh sets, a total of 966 Lake Trout were removed ranging from 314 mm to 998 mm total length using 159,654.2 m (523,800 ft) of net.

As part of the bycatch during these efforts, 11 different species were captured including ESA threatened Bull Trout *S. confluentus*. A total of 130 Bull Trout were captured during the Lake Trout suppression efforts with an average direct mortality rate of 16.9%. We PIT tagged 54 and recaptured 64 previously tagged Bull Trout. Bull Trout condition was broken down as following:

- Good = 76
- Fair = 28
- Poor = 4
- Not Reported = 0
- Mortalities = 22 (mort recaps = 10)

In addition to the mark-recapture data collection for Bull Trout, we also collected 74 genetic samples from tagged and released Bull Trout.

The following tables and figures provide summary information on catch and bycatch from gill net efforts during the complete spring 2023 netting season.

## Tables

**Table 1:** Summary of the spring 2023 gill netting from Large Mesh and Small Mesh sets. For each species, we include the total number of fish captured (Captured), those released alive (Released), tagged with PIT, T-bar, or acoustic tags (Tagged), previously-tagged recaptured fish (Recaptured), and fish removed from LPO (Removed). Tag type depends on the species. Typically, Bull Trout are tagged/recaptured with PIT tags, Rainbow Trout and Smallmouth Bass with T-bar tags, and Lake Trout, Walleye, and Northern Pike with a combination of T-bar and acoustic tags. For species other than Lake Trout, Walleye, or Northern Pike, the number of individuals “removed” represents fish that were dead-on-capture.

Set Type	Species	Captured	Released	Tagged	Recaptured	Removed
Large Mesh	Lake Trout	966	2	0	2	964
	Bull Trout	79	73	34	43	6
	Brown Trout	24	22	0	0	2
	Northern Pike	22	0	0	0	22
	Smallmouth Bass	13	13	0	0	0
	Walleye	6	0	0	0	6
	Rainbow Trout	2	2	2	0	0
	Kokanee	1	0	0	0	1
Small Mesh	Lake Trout	3,511	1	0	1	3,510
	Bull Trout	51	35	19	20	16
	Walleye	42	0	0	0	42
	Kokanee	33	23	0	0	10
	Yellow Perch	12	11	0	0	1
	Westslope Cutthroat Trout	8	6	0	0	2
	Brown Trout	6	6	0	0	0
	Northern Pike	3	0	0	0	3
Sculpin (Var. Sp.)	1	0	0	0	1	

**Table 2:** Totals of the spring 2023 gill netting statistics for both Large Mesh and Small Mesh netting combined. For each species, we include the total number of fish captured (Captured), those released alive (Released), tagged with PIT, T-bar, or acoustic tags (Tagged), previously-tagged recaptured fish (Recaptured), and fish removed from LPO (Removed). Tag type depends on the species. Typically, Bull Trout are tagged/recaptured with PIT tags, Rainbow Trout and Smallmouth Bass with T-bar tags, and Lake Trout, Walleye, and Northern Pike with a combination of T-bar and acoustic tags. For species other than Lake Trout, Walleye, or Northern Pike, the number of individuals “removed” represents fish that were dead-on-capture.

Species	Captured	Released	Tagged	Recaptured	Removed
Lake Trout	4,477	3	0	3	4,474
Bull Trout	130	108	53	63	22
Walleye	48	0	0	0	48
Kokanee	34	23	0	0	11
Brown Trout	30	28	0	0	2
Northern Pike	25	0	0	0	25
Smallmouth Bass	13	13	0	0	0
Yellow Perch	12	11	0	0	1
Westslope Cutthroat Trout	8	6	0	0	2
Rainbow Trout	2	2	2	0	0
Sculpin (Var. Sp.)	1	0	0	0	1

**Table 3:** Summary of length data for Lake Trout (LKT), Bull Trout (BLT), and Bull Trout mortalities (BLT Mortalities) captured in gill nets during the spring 2023.

Set Type	Species	Mean TL	SE	Max TL	Min TL
Large Mesh	BLT	581.8	6.5	742	464
	BLT Mortalities	531.5	39.7	658	372
	LKT	608.3	2.5	998	314
Small Mesh	BLT	463.7	18.5	658	281
	BLT Mortalities	395.8	13.4	493	250
	LKT	305.1	1.1	762	192

**Table 4:** Catch data for Lake Trout, Bull Trout, and Bull Trout mortalities from Large Mesh, Small Mesh, and all gill nets combined (All Nets) during the spring 2023. These statistics include the total number of Lake Trout (LKT), live Bull Trout (BLT), Bull Trout mortalities (BLT Morts), the mean catch ratios of Lake Trout to live Bull Trout (LKT:BLT), Lake Trout to Bull Trout mortalities (LKT:BLT Morts), and the mean proportion of Bull Trout captures that resulted in direct mortality (Prop Morts).

Set Type	LKT	BLT	BLT Morts	LKT:BLT	LKT:BLT Morts	Prop Morts
Large Mesh	966	73	6	13.2	161.0	0.08
Small Mesh	3,511	35	16	100.3	219.4	0.46
All Nets	4,477	108	22	41.5	203.5	0.17

**Table 5:** Catch per unit effort statistics for Lake Trout, Bull Trout, and Bull Trout mortalities from Large Mesh, Small Mesh, and all gill nets combined (All Nets) during the spring 2023. These statistics include the total number of 274 m gill net panels fished (Effort), and the Mean and SE of daily catch per unit effort (# fish / 274 m of net) for Lake Trout (LKT CPUE, LKT SE), Bull Trout (BLT CPUE, BLT SE), and Bull Trout mortalities (BLT Mort CPUE, BLT Mort SE).

Set Type	Effort	LKT CPUE	LKT SE	BLT CPUE	BLT SE	BLT Mort CPUE	BLT Mort SE
Large Mesh	582	2.5	0.5	0.110	0.02	0.009	0.004
Small Mesh	450	8.2	1.0	0.059	0.01	0.020	0.008
All Nets	1,032	5.0	0.6	0.090	0.01	0.020	0.004

**Table 6:** Catch data for Lake Trout, Bull Trout, and Bull Trout mortalities for each gill net mesh size (inches) fished during the spring 2023. These statistics include the total number of Lake Trout (LKT), live Bull Trout (BLT), Bull Trout mortalities (BLT Morts), the mean catch ratios of Lake Trout to live Bull Trout (LKT:BLT), Lake Trout to Bull Trout mortalities (LKT:BLT Morts), and the mean proportion of Bull Trout captures that resulted in direct mortality (Prop Morts).

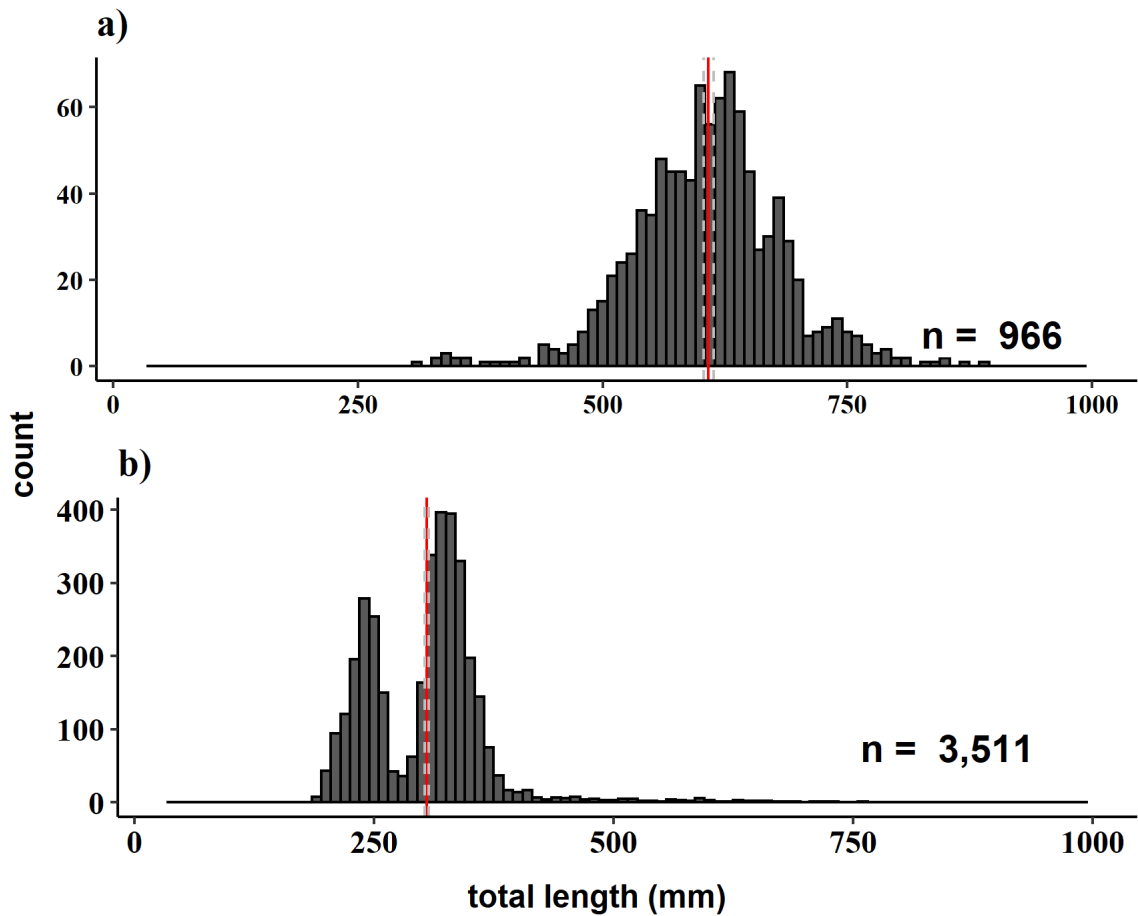
Mesh Size (in)	LKT	BLT	BLT Morts	LKT:BLT	LKT:BLT Morts	Prop Morts
5.5	495	48	3	10.3	165.0	0.06
5	335	23	3	14.6	111.7	0.13
4.5	136	2	0	68.0		0.00
2.5	1,743	26	13	67.0	134.1	0.50
2	1,328	8	3	166.0	442.7	0.38
1.5	440	1	0	440.0		0.00

**Table 7:** Catch per unit effort statistics for Lake Trout, Bull Trout, and Bull Trout mortalities for each gill net mesh size (inches) fished during the spring 2023. These statistics include the total number of 274 m (900 ft) gill net panels fished (Effort), and the mean and SE of daily catch per unit effort (# fish / 274 m of net) for Lake Trout (LKT CPUE, LKT SE), Bull Trout (BLT CPUE, BLT SE), and Bull Trout mortalities (BLT Mort CPUE, BLT Mort SE).

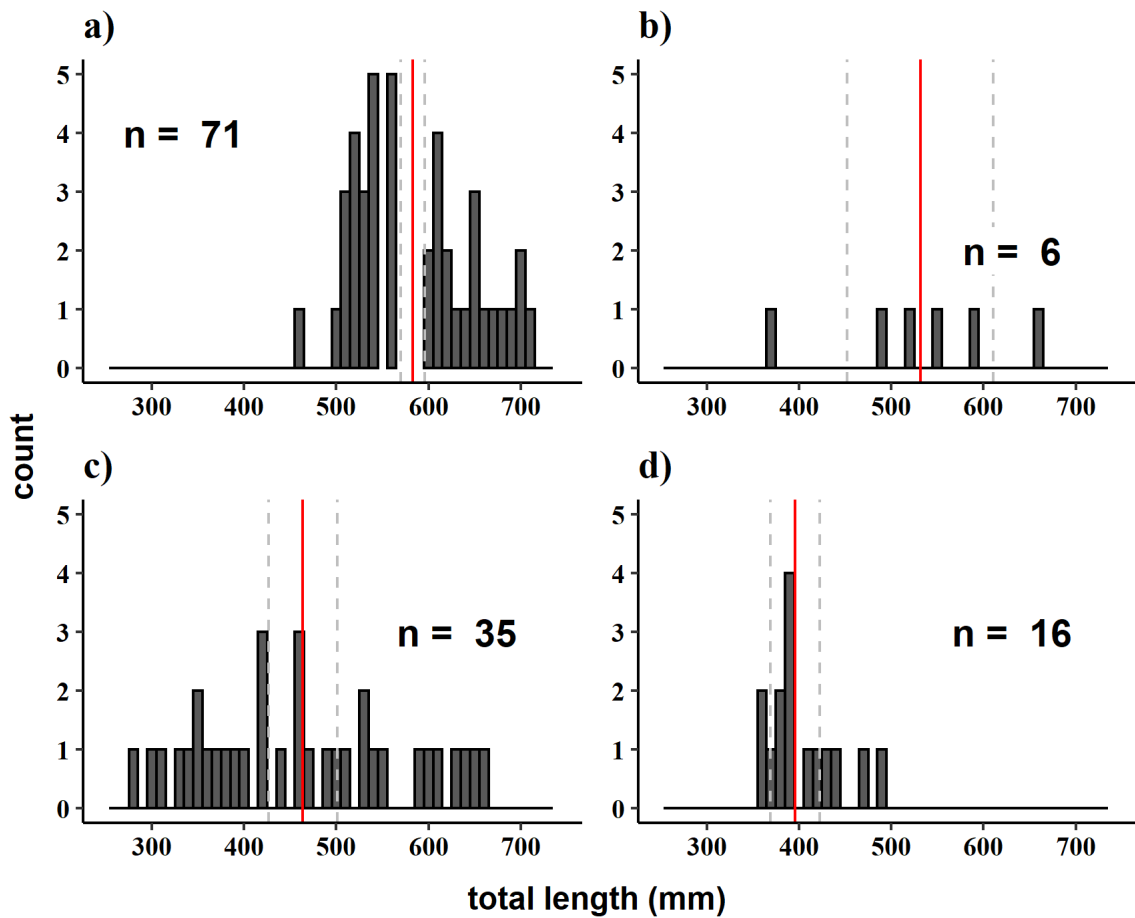
Mesh Size (in)	Effort	LKT CPUE	LKT SE	BLT CPUE	BLT SE	BLT Mort CPUE	BLT Mort SE
5.5	349	1.4	0.2	0.10	0.03	0.008	0.004
5	202	1.6	0.3	0.10	0.04	0.020	0.010
4.5	31	4.4	1.0	0.06	0.04	0.000	0.000
2.5	210	8.5	2.0	0.10	0.03	0.060	0.020
2	195	6.7	1.0	0.04	0.02	0.010	0.010
1.5	45	9.5	2.0	0.02	0.02	0.000	0.000



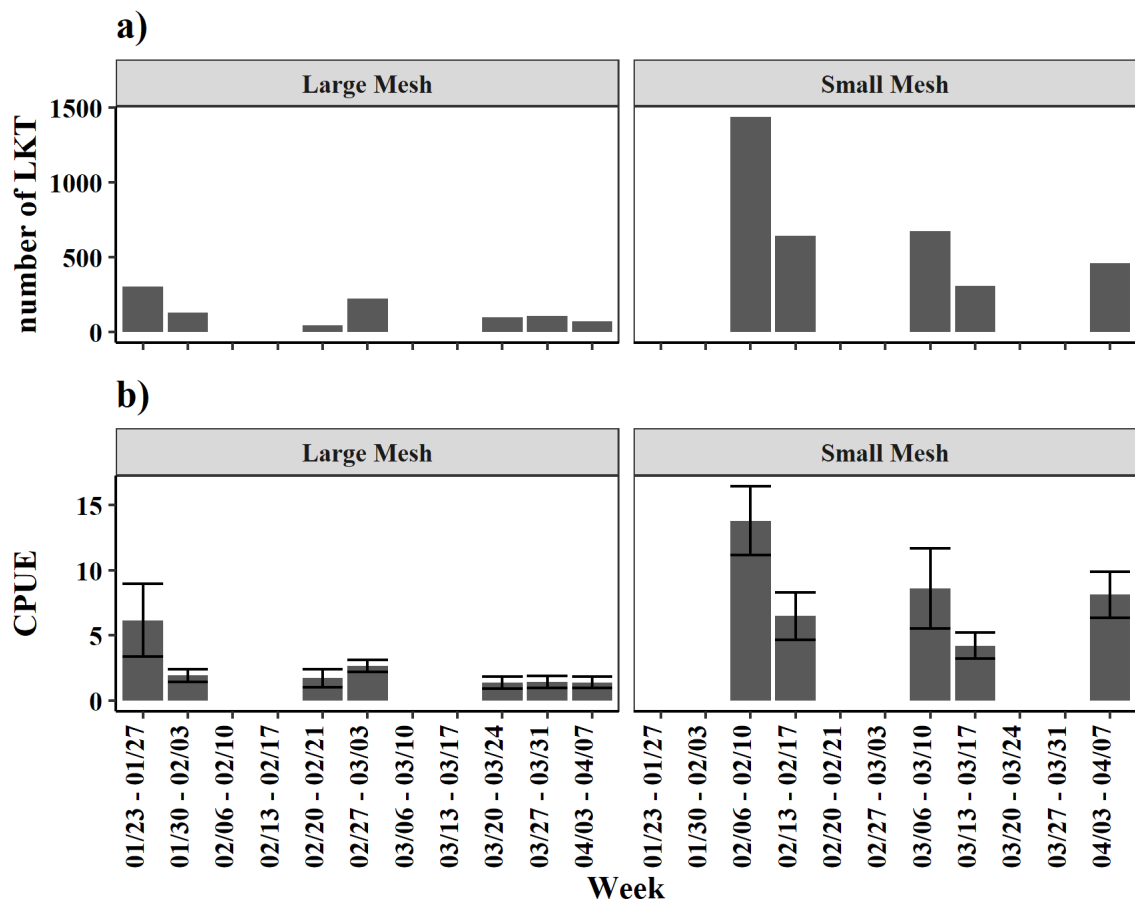
## Figures



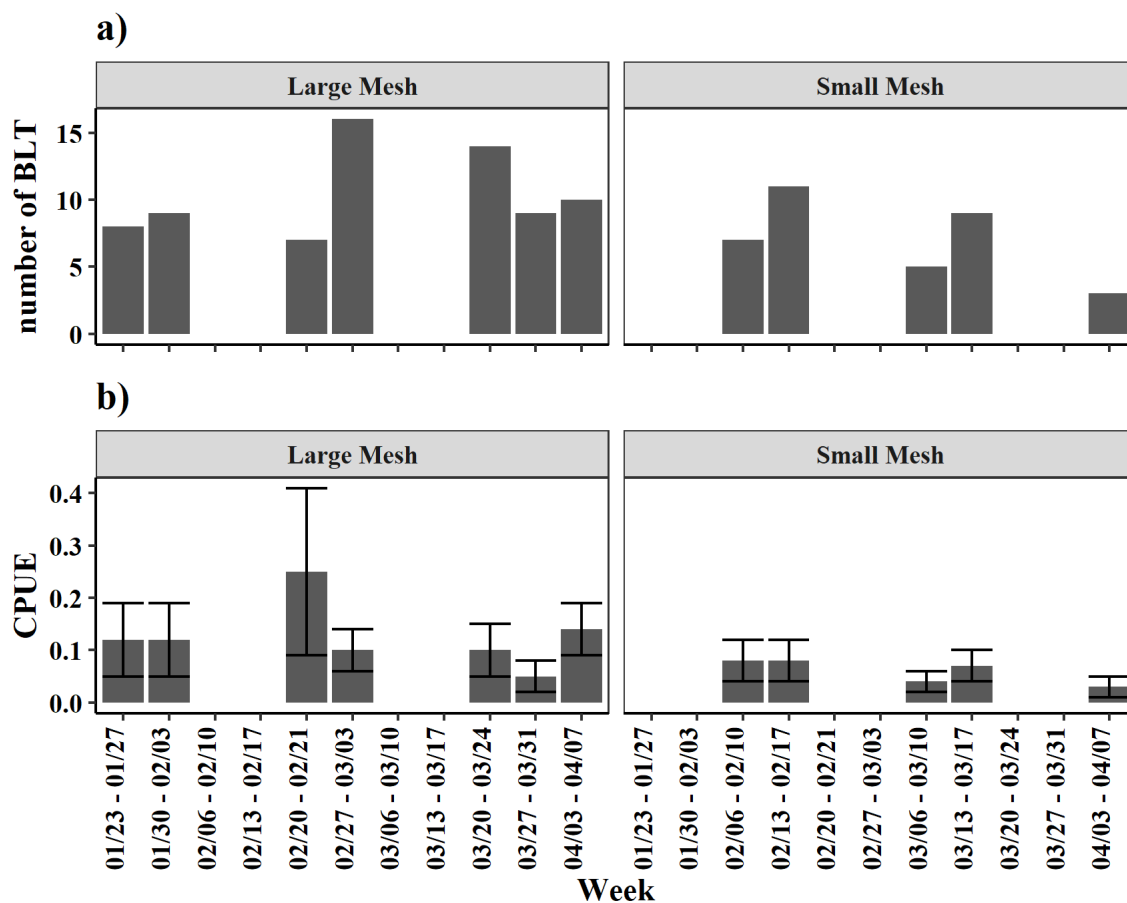
**Figure 1:** Length frequencies of Lake Trout captured in gill nets during spring 2023 Large Mesh (a) and Small Mesh (b) netting efforts. Vertical red lines represent the sample mean length for each group and the dashed grey lines represent two standard errors above and below the sample mean.



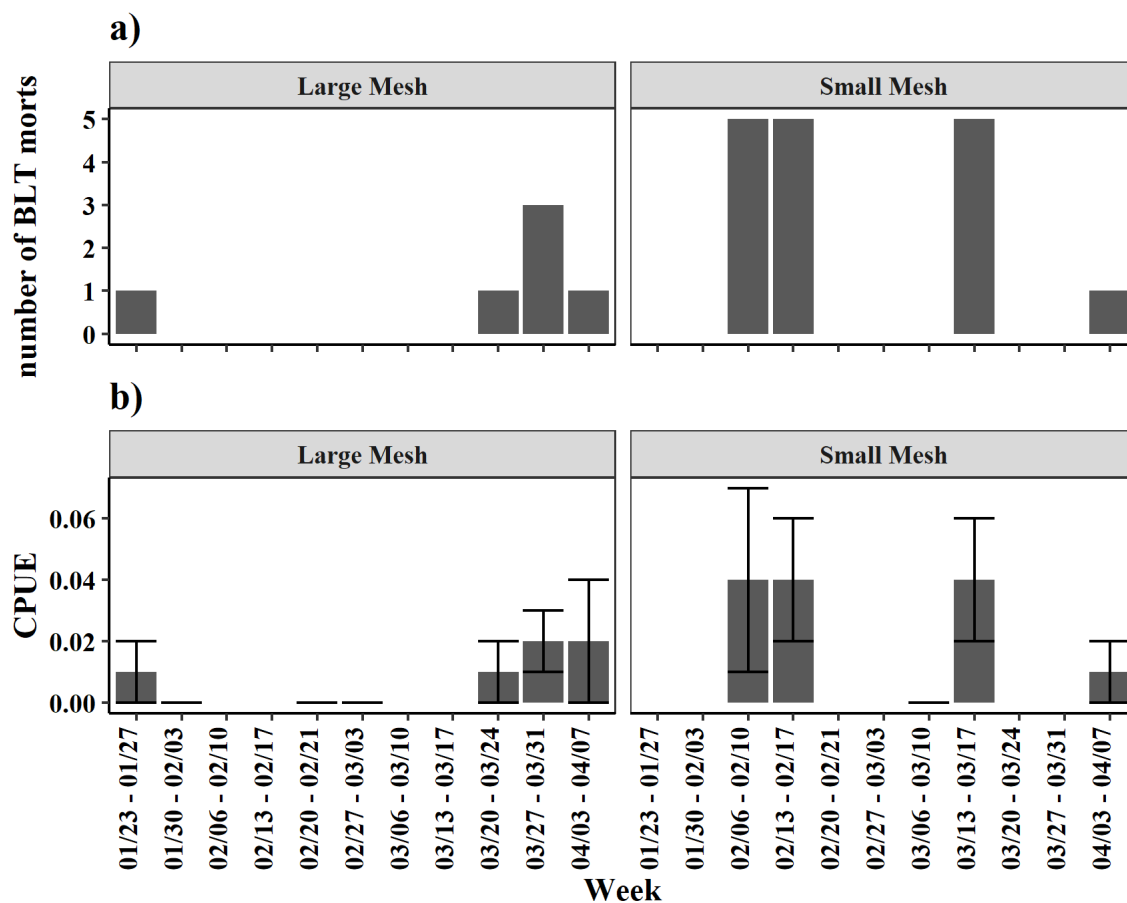
**Figure 2:** Length frequencies of Bull Trout captured in gill nets during spring 2023 netting efforts. Panels a) and c) are the length frequencies of Bull Trout released alive in the Large Mesh and Small Mesh netting efforts, respectively. Panels b) and d) are the length frequencies of Bull Trout mortalities in the Large Mesh and Small Mesh netting efforts, respectively. Vertical red lines represent the sample mean length for each group and the dashed grey lines represent two standard errors above and below the sample mean.



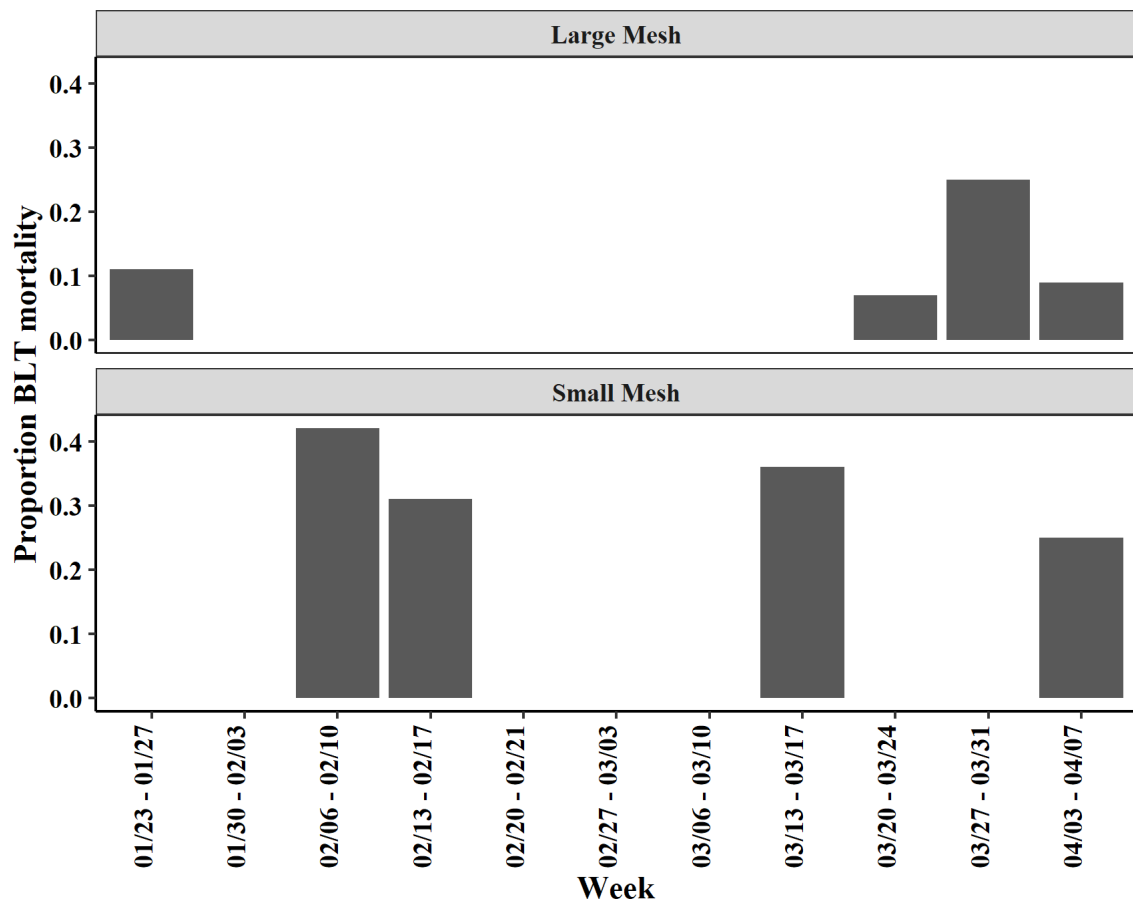
**Figure 3:** Weekly catch (a) and mean weekly CPUE (b, # fish / 274 m of net, with SE bars) of Lake Trout captured during the spring 2023 gill netting efforts.



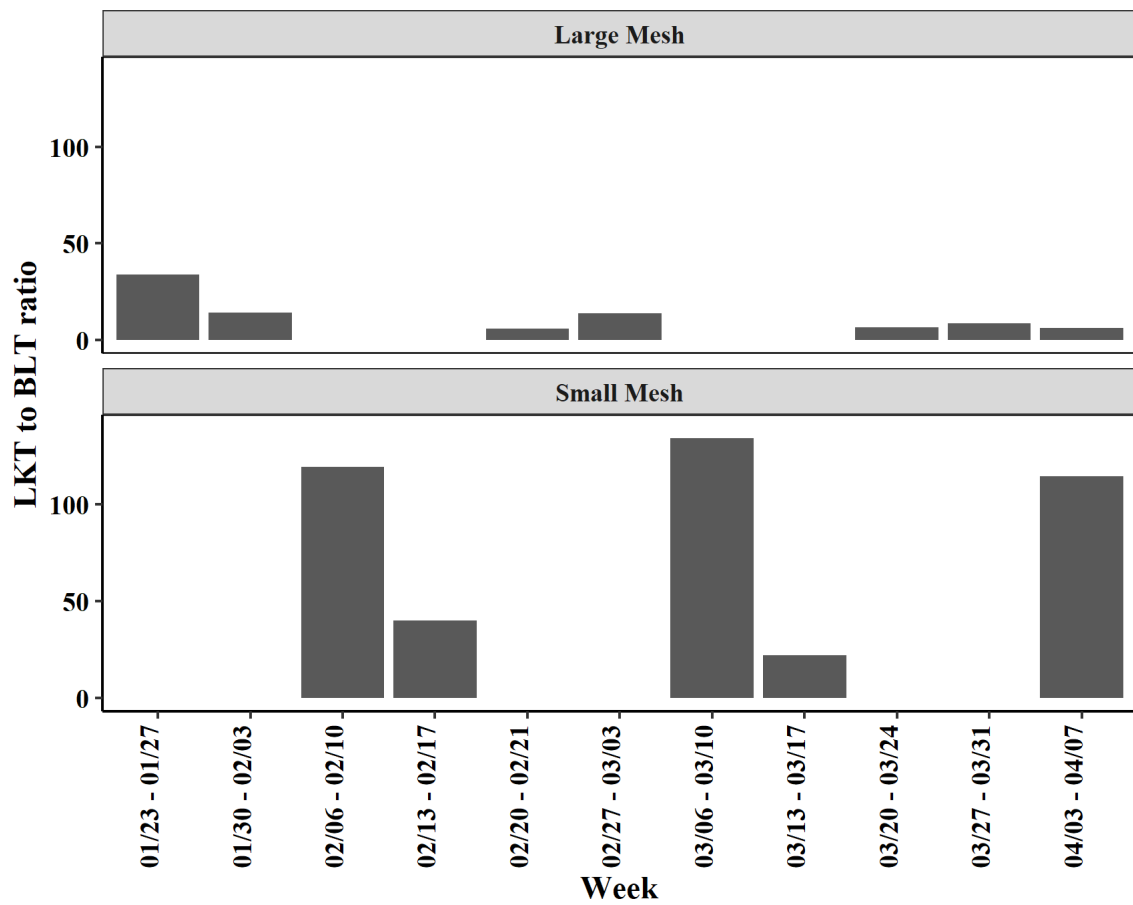
**Figure 4:** Weekly catch (a) and mean weekly CPUE (b; # fish / 274 m of net, with SE bars) of Bull Trout captured and released alive during the spring 2023 gill netting efforts.



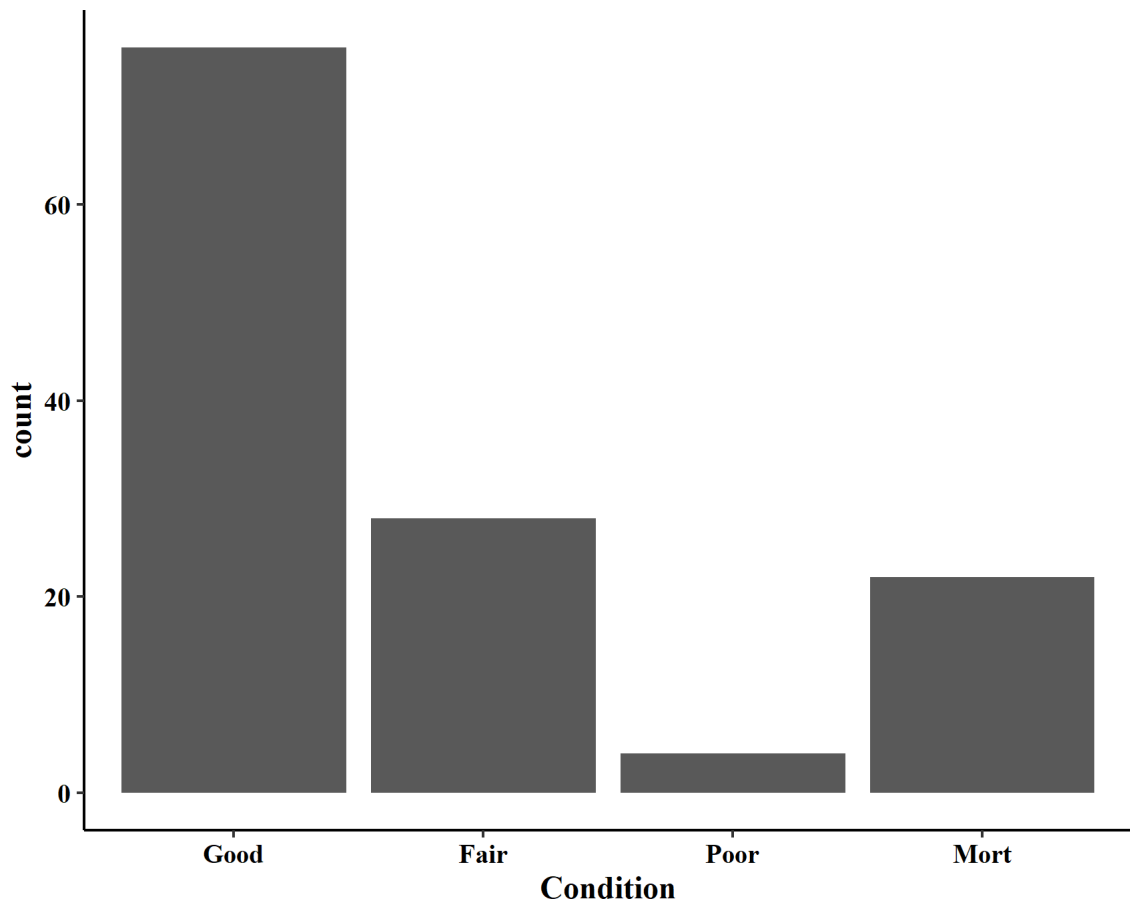
**Figure 5:** Weekly catch (a) and mean weekly CPUE (b; # fish / 274 m of net, with SE bars) of direct Bull Trout mortalities during the spring 2023 gill netting efforts.



**Figure 6:** Proportion bycatch resulting in direct mortalities for Bull Trout captured in Large Mesh (a) and Small Mesh (b) netting during the spring 2023 gill netting efforts.

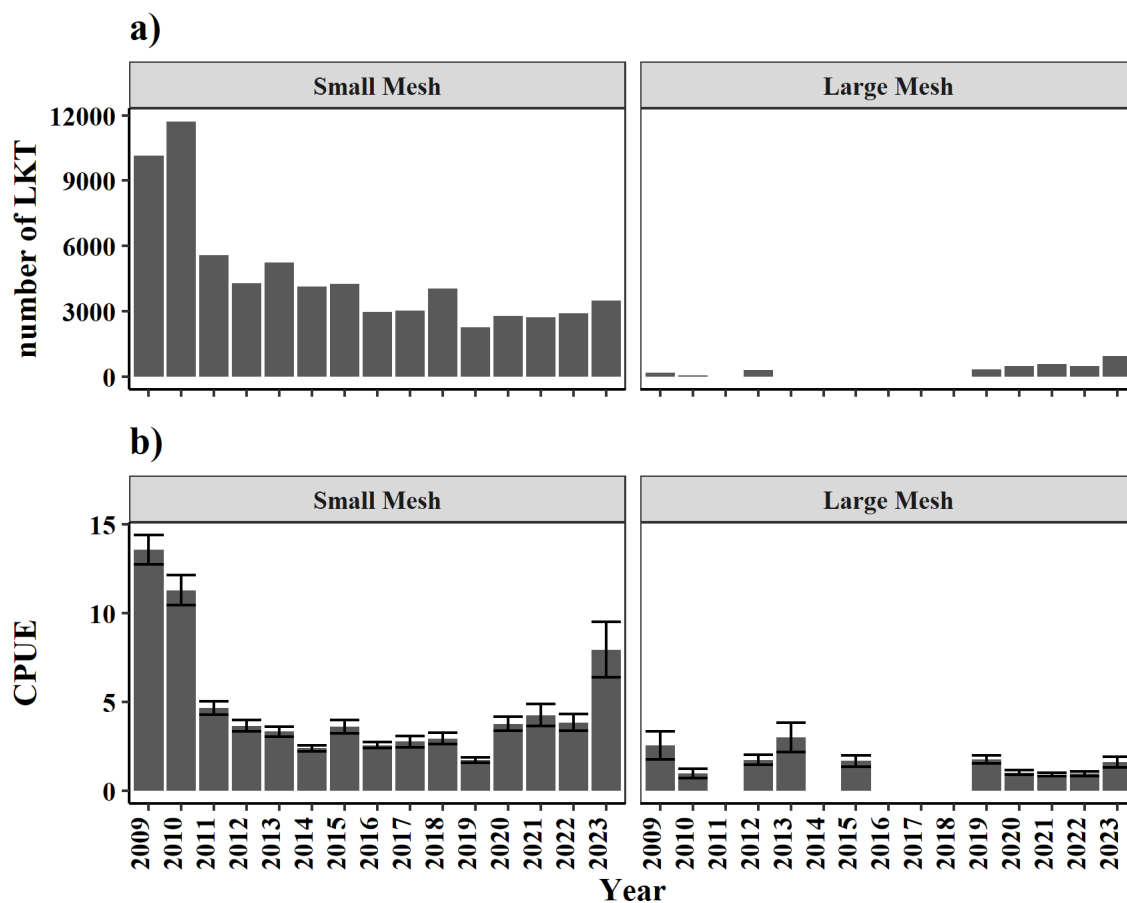


**Figure 7:** Lake Trout to Bull Trout catch ratios in Large Mesh (a) and Small Mesh (b) netting during the spring 2023 gill netting efforts.



**Figure 8:** Condition index of Bull Trout captured during spring 2023 netting efforts.





**Figure 9:** Annual catch (a) and mean CPUE (b) of Lake Trout in large and small mesh gill netting efforts during the designated spring netting season 2009–present.

**APPENDIX C. FALL 2023 LPO LAKE TROUT NETTING SUMMARY**

**Fall 2023 Lake Pend Oreille  
Lake Trout Netting Summary  
Jeff Strait**

**Overview**

During the fall of 2023, gill net effort was divided into two categories based on the primary life history stage targeted and the mesh sizes fished. From 09/05 to 10/26 we targeted spawning adult Lake Trout *Salvelinus namaycush* using 139.7 and 127 mm (5.5 and 5.0 inch) mesh gill nets (hereafter, Spawner). In the Spawner gill net sets, 1,846 Lake Trout were captured ranging from 227 mm to 1,012 mm total length using an effort of 208,208.9 m (683,100 ft) of net.

From 10/30 to 12/15 we fished 38.1, 63.5, 50.8, and 76.2 mm (1.5, 2.0, 2.5, and 3.0 inch) mesh gill nets to target juvenile Lake Trout in the nurseries (hereafter, LKT Suppression or Small Mesh). In the LKT suppression gill net sets 2,349 Lake Trout were captured ranging from 175 mm to 793 mm total length using an effort of 178,033.7 m (584,100 ft) of net. A grand total of 4,195 Lake Trout were captured during the fall 2023 netting season. We also recaptured one Lake Trout with an acoustic tag at a spawning location.

As part of the bycatch during these efforts, 16 different species were captured including ESA Threatened Bull Trout *S. confluentus*. A total of 1,030 Bull Trout were captured during the Lake Trout suppression efforts with an average direct mortality rate of 23.8%. We PIT tagged 610 and recaptured 244 previously tagged Bull Trout. Of the recaptured Bull Trout 69 were direct mortalities. Bull Trout release condition was qualitatively graded as “Good”, “Fair”, or “Poor” immediately prior to release, and is broken down below:

- Good = 628
- Fair = 145
- Poor = 12
- Not Reported = 0
- Total Mortalities = 245
  - Morts that were previously PIT-tagged = 69

In addition to marking Bull Trout with PIT tags, we collected tissue samples for genetic analysis from 718 of the released Bull Trout.

Gerrard-strain Rainbow Trout *Oncorhynchus mykiss* are occasionally captured as bycatch during fall gill netting, and we used these occasions to deploy T-bar anchor tags. Each fish was double tagged with one reward value and one non-reward T-bar tag. We tagged a total of 44 Rainbow Trout and recaptured 0 previously tagged Rainbow Trout.

The following tables and figures provide summary information on catch and bycatch from gill net efforts during the complete fall 2023 netting season.

## Tables

**Table 1:** Summary of fall 2023 Spawner gill net sets. For each species, we include the total number of fish captured (Captured), those released alive (Released), tagged with PIT, T-bar, or acoustic tags (Tagged), previously-tagged recaptured fish (Recaptured), and fish removed from LPO (Removed). Tag type depends on the species. Typically, Bull Trout are tagged/recaptured with PIT tags, Rainbow Trout and Smallmouth Bass with T-bar tags, and Lake Trout, Walleye, and Northern Pike with a combination of T-bar and acoustic tags. For species other than Lake Trout, Walleye, or Northern Pike, the number of individuals “removed” represents fish that were dead-on-capture.

Species	Captured	Released	Tagged	Recaptured	Removed
Lake Trout	1,846	1	0	1	1,845
Bull Trout	634	497	359	190	137
Kokanee	153	27	0	0	126
Smallmouth Bass	140	139	0	5	1
Rainbow Trout	72	41	41	0	31
Brown Trout	34	21	0	0	13
Walleye	30	1	1	0	29
Westslope Cutthroat Trout	9	2	2	0	7
Rainbow X Cutthroat Trout	6	2	0	0	4
Lake Whitefish	2	1	0	1	1

**Table 2:** Summary of fall 2023 LKT Suppression gill net sets. For each species, we include the total number of fish captured (Captured), those released alive (Released), tagged with PIT, T-bar, or acoustic tags (Tagged), previously-tagged recaptured fish (Recaptured), and fish removed from LPO (Removed). Tag type depends on the species. Typically, Bull Trout are tagged/recaptured with PIT tags, Rainbow Trout and Smallmouth Bass with T-bar tags, and Lake Trout, Walleye, and Northern Pike with a combination of T-bar and acoustic tags. For species other than Lake Trout, Walleye, or Northern Pike, the number of individuals “removed” represents fish that were dead-on-capture.

Species	Captured	Released	Tagged	Recaptured	Removed
Lake Trout	2,349	0	0	0	2,349
Bull Trout	396	288	251	54	108
Walleye	299	0	0	0	299
Yellow Perch	22	19	0	0	3
Kokanee	17	16	0	0	1
Brown Trout	8	5	0	0	3
Northern Pike	3	0	0	0	3
Pygmy Whitefish	3	2	0	0	1
Rainbow Trout	3	3	3	0	0
Sculpin (Var. Sp.)	2	1	0	0	1
Brown Bullhead	1	1	0	0	0
Peamouth	1	1	0	0	0

**Table 3:** Combined totals of fall 2023 Spawner and LKT Suppression gill net sets. For each species, we include the total number of fish captured (Captured), those released alive (Released), tagged with PIT, T-bar, or acoustic tags (Tagged), previously-tagged recaptured fish (Recaptured), and fish removed from LPO (Removed). Tag type depends on the species. Typically, Bull Trout are tagged/recaptured with PIT tags, Rainbow Trout and Smallmouth Bass with T-bar tags, and Lake Trout, Walleye, and Northern Pike with a combination of T-bar and acoustic tags. For species other than Lake Trout, Walleye, or Northern Pike, the number of individuals “removed” represents fish that were dead-on-capture.

Species	Captured	Released	Tagged	Recaptured	Removed
Lake Trout	4,195	1	0	1	4,194
Bull Trout	1,030	785	610	244	245
Kokanee	170	43	0	0	127
Walleye	329	1	1	0	328
Smallmouth Bass	140	139	0	5	1
Rainbow Trout	75	44	44	0	31
Brown Trout	42	26	0	0	16
Yellow Perch	22	19	0	0	3
Westslope Cutthroat Trout	9	2	2	0	7
Rainbow X Cutthroat Trout	6	2	0	0	4
Northern Pike	3	0	0	0	3
Pygmy Whitefish	3	2	0	0	1
Lake Whitefish	2	1	0	1	1
Sculpin (Var. Sp.)	2	1	0	0	1
Brown Bullhead	1	1	0	0	0
Peamouth	1	1	0	0	0

**Table 4:** Summary of length (mm) data for Lake Trout, Bull Trout, and Bull Trout direct mortalities captured during fall 2023 Spawner and LKT Suppression (1.5, 1.75, 2.0, 2.5, and 3.0 inch mesh) LKT Suppression gill net sets.

Project	Species	Mean TL	SE	Max TL	Min TL
Spawner	BLT	538.6	3.7	768	260
	BLT Mortalities	564.6	8.5	744	246
	LKT	634.8	2.1	1,012	227
LKT Suppression	BLT	389.4	6.5	689	107
	BLT Mortalities	415.4	7.8	580	201
	LKT	301.6	1.3	793	175

**Table 5:** The total number of Lake Trout (LKT), Bull Trout (BLT), Bull Trout direct mortalities (BLT Morts), the mean catch ratios of Lake Trout to Bull Trout (LKT:BLT), Lake Trout to Bull Trout mortalities (LKT:BLT Morts), and the mean proportion of Bull Trout captures that resulted in direct mortality (Prop Morts) from Spawner, LKT Suppression (1.5, 1.75, 2.0, 2.5, and 3.0 inch mesh), and all gill nets combined (All Nets) during fall 2023.

Project	LKT	BLT	BLT Morts	LKT:BLT	LKT:BLT Morts	Prop Morts
Spawner	1,846	634	137	2.9	13.5	0.22
LKT Suppression	2,349	396	108	5.9	21.8	0.27
All Nets	4,195	1,030	245	4.1	17.1	0.24

**Table 6:** Catch per unit effort statistics for Lake Trout, Bull Trout, and Bull Trout mortalities from Spawner, LKT Suppression (1.5, 1.75, 2.0, 2.5, and 3.0 inch mesh), and all gill nets combined (All Nets) during fall 2023. These statistics include the total number of 274 m gill net panels fished (Effort), and the Mean and SE of daily catch per unit effort (# fish / 274 m of net) for Lake Trout (LKT CPUE, LKT SE), Bull Trout (BLT CPUE, BLT SE), and Bull Trout mortalities (BLT Mort CPUE, BLT Mort SE).

Project	Effort	LKT CPUE	LKT SE	BLT CPUE	BLT SE	BLT Mort CPUE	BLT Mort SE
Spawner	759	2.4	0.17	0.8	0.06	0.2	0.02
LKT Suppression	649	3.1	0.28	0.6	0.05	0.2	0.03
All Nets	1,408	2.8	0.16	0.7	0.04	0.2	0.02



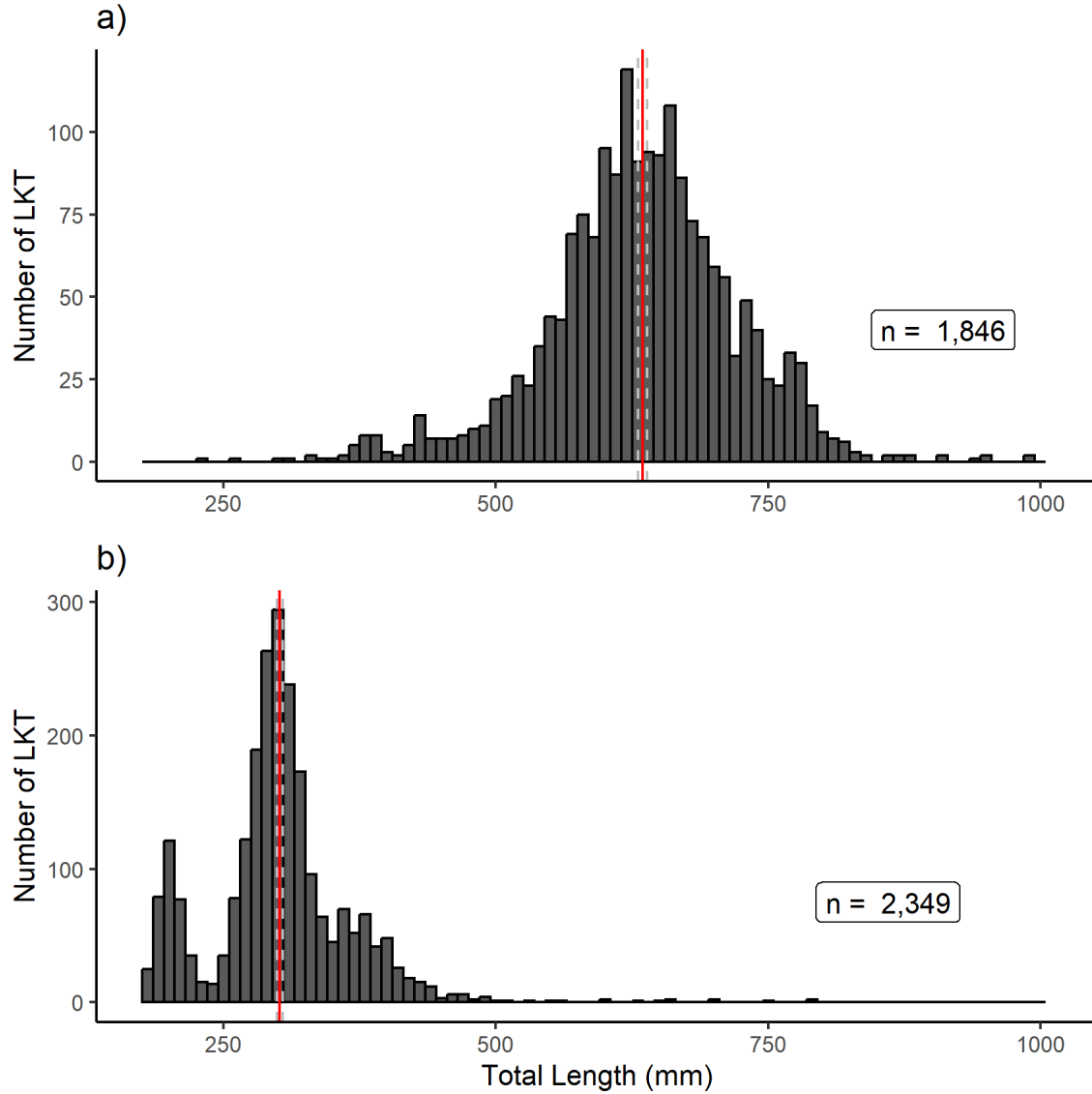
**Table 7:** Catch data for Lake Trout, Bull Trout, and Bull Trout mortalities for each gill net mesh size (inches) fished during fall 2023. These statistics include the total number of Lake Trout (LKT), Bull Trout (BLT), Bull Trout mortalities (BLT Morts), the mean catch ratios of Lake Trout to Bull Trout (LKT:BLT), Lake Trout to Bull Trout mortalities (LKT:BLT Morts), and the mean proportion of Bull Trout captures that resulted in direct mortality (Prop Morts).

Mesh Size (in)	LKT	BLT	BLT Morts	LKT:BLT	LKT:BLT Morts	Prop Morts
5.5	929	230	50	4.04	18.58	0.22
5	917	404	87	2.27	10.54	0.22
3	108	47	16	2.30	6.75	0.34
2.5	880	218	73	4.04	12.05	0.33
2	906	85	14	10.66	64.71	0.16
1.75	96	14	0	6.86		0.00
1.5	359	32	5	11.22	71.80	0.16

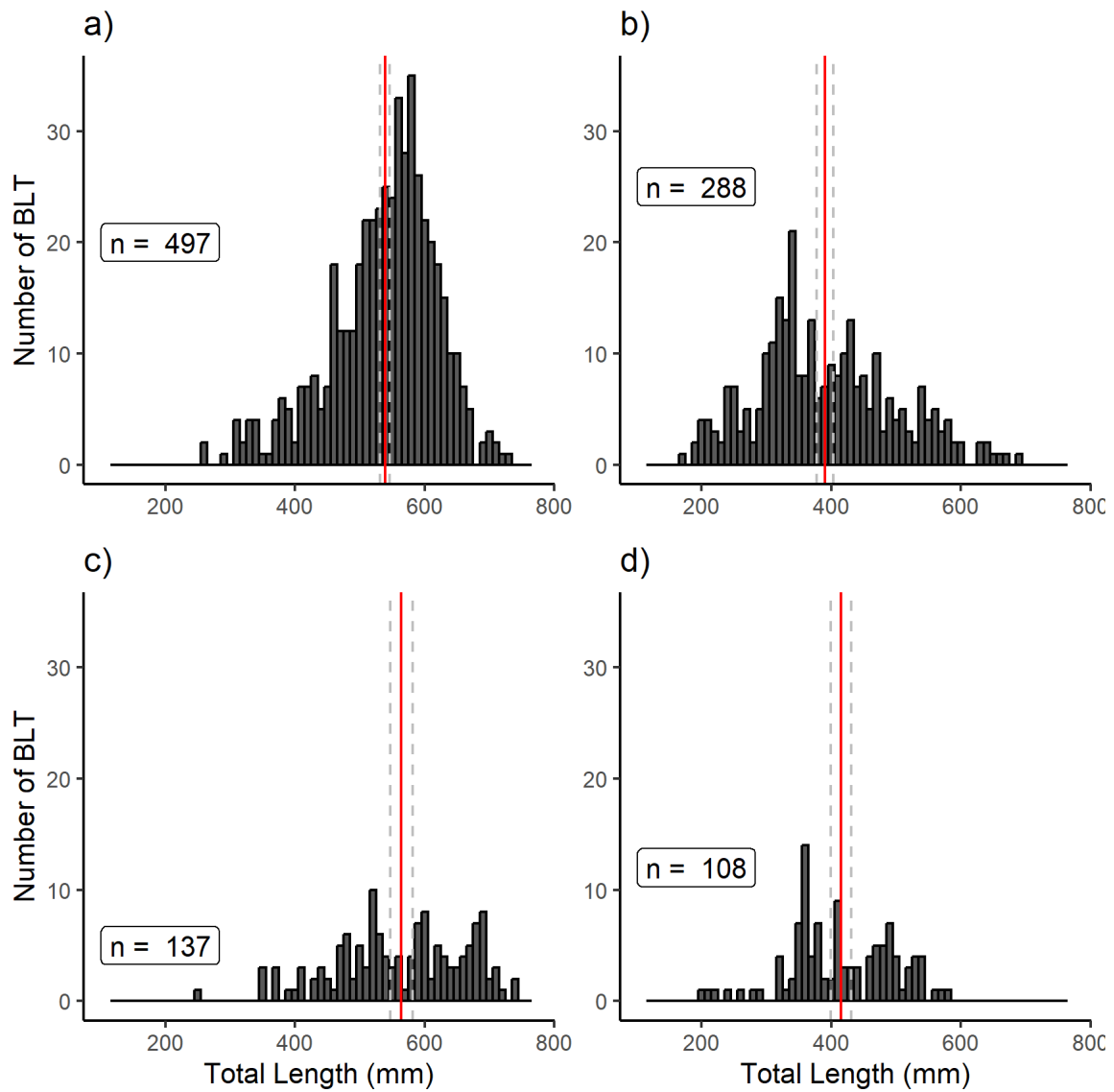
**Table 8:** Catch per unit effort statistics for Lake Trout, Bull Trout, and Bull Trout mortalities for each gill net mesh size (inches) fished during fall 2023. These statistics include the total number of 274 m gill net panels fished (Effort), and the mean and SE of daily catch per unit effort (# fish / 274 m of net) for Lake Trout (LKT CPUE, LKT SE), Bull Trout (BLT CPUE, BLT SE), and Bull Trout mortalities (BLT Mort CPUE, BLT Mort SE).

Mesh Size (in)	Effort	LKT CPUE	LKT SE	BLT CPUE	BLT SE	BLT Mort CPUE	BLT MORT SE
5.5	379	2.48	0.26	0.59	0.06	0.13	0.02
5	380	2.37	0.23	1.05	0.10	0.22	0.03
3	60	1.80	0.43	0.78	0.18	0.27	0.11
2.5	240	3.83	0.50	0.93	0.10	0.33	0.06
2	178	4.92	0.91	0.52	0.08	0.10	0.04
1.75	51	1.94	0.34	0.27	0.06	0.00	0.00
1.5	120	2.92	0.57	0.28	0.06	0.06	0.03

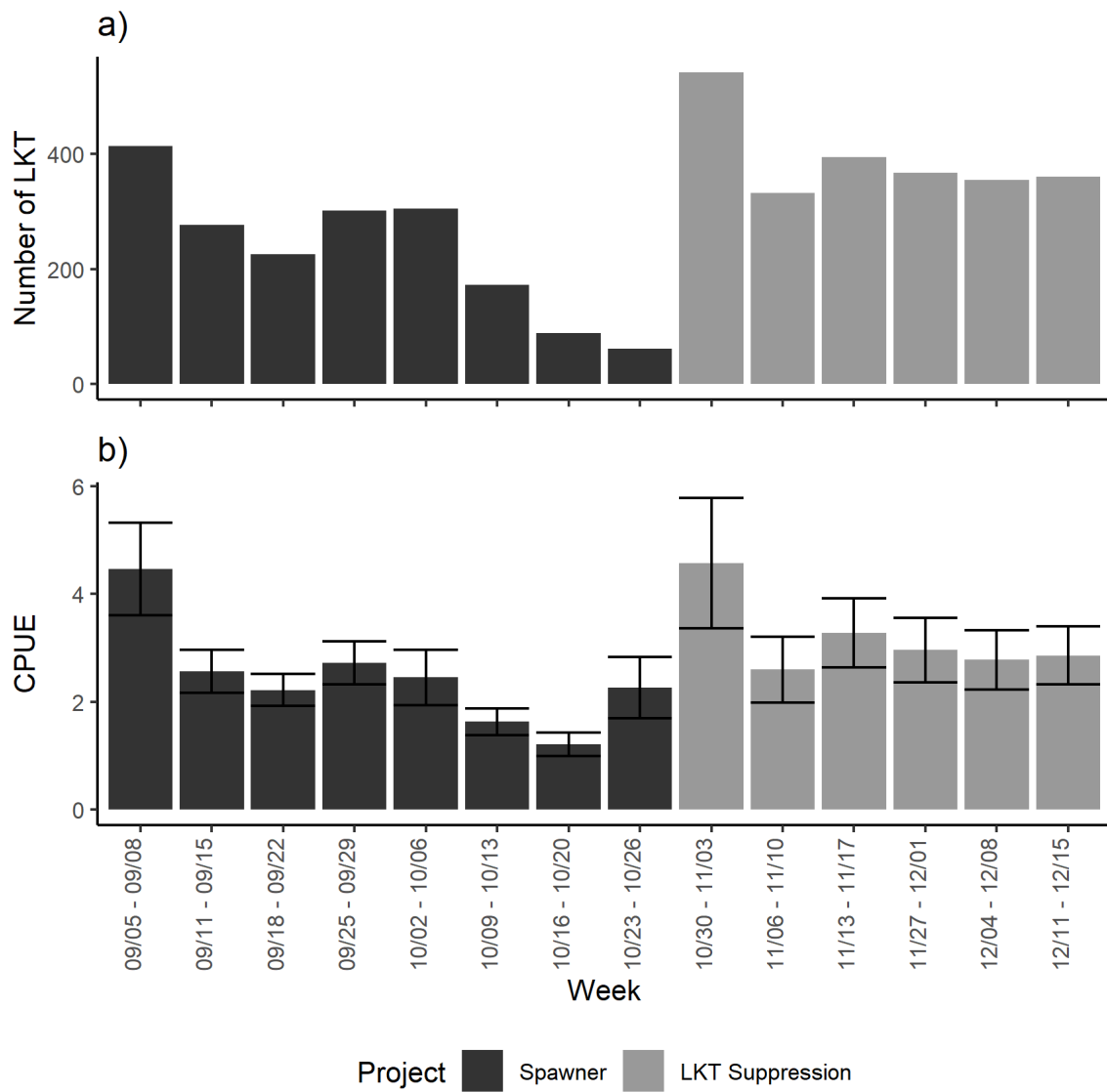
## Figures



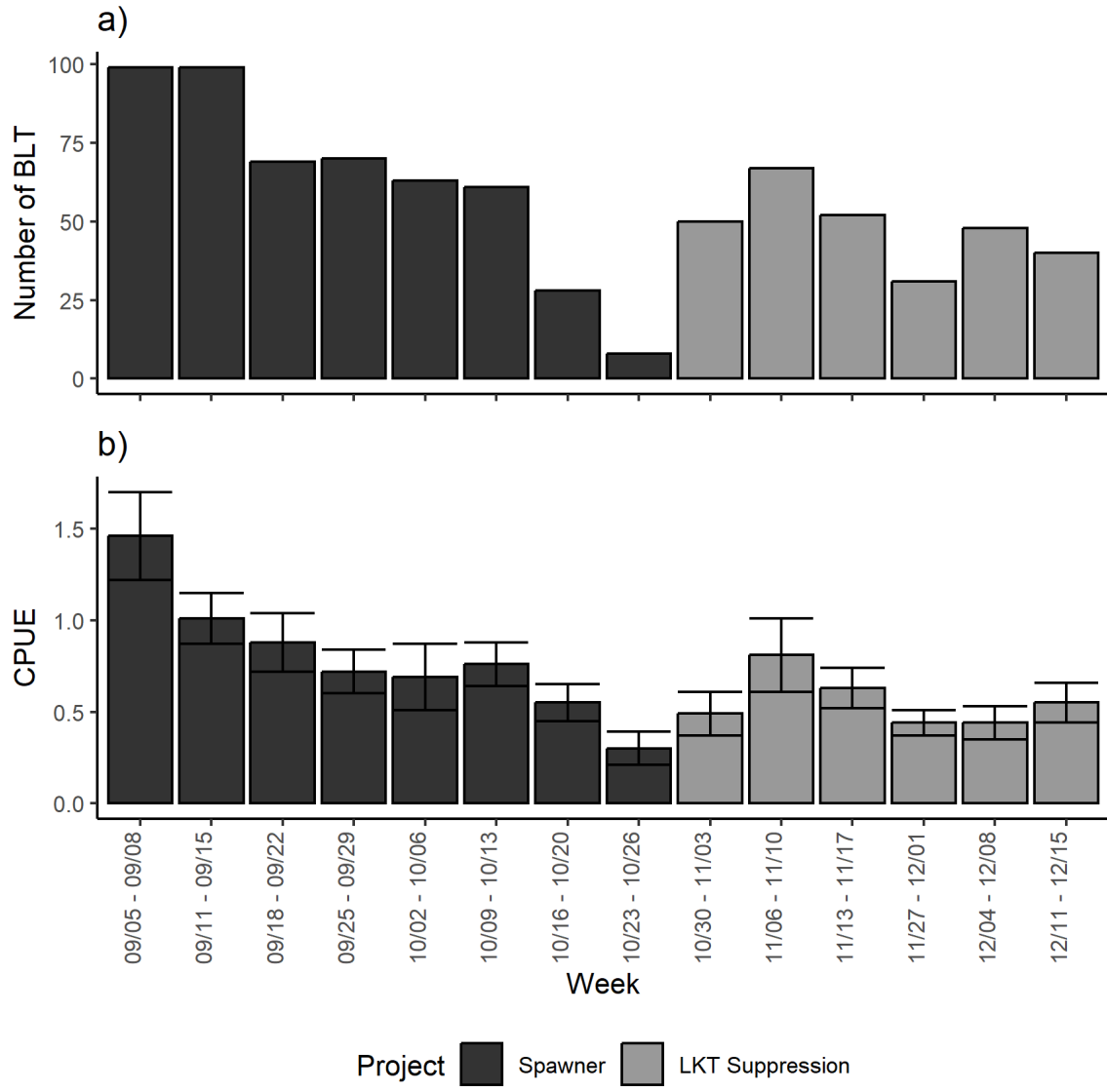
**Figure 1:** Length frequency distributions of Lake Trout captured in (a) Spawner (5.0 and 5.5 inch) and (b) Small Mesh gill nets (1.5, 1.75, 2.0, 2.5, and 3.0 inch) during fall 2023 Spawner and LKT Suppression efforts. The vertical red lines represent the mean total length (mm) for each group and the dashed grey lines represent two standard errors above and below the sample mean.



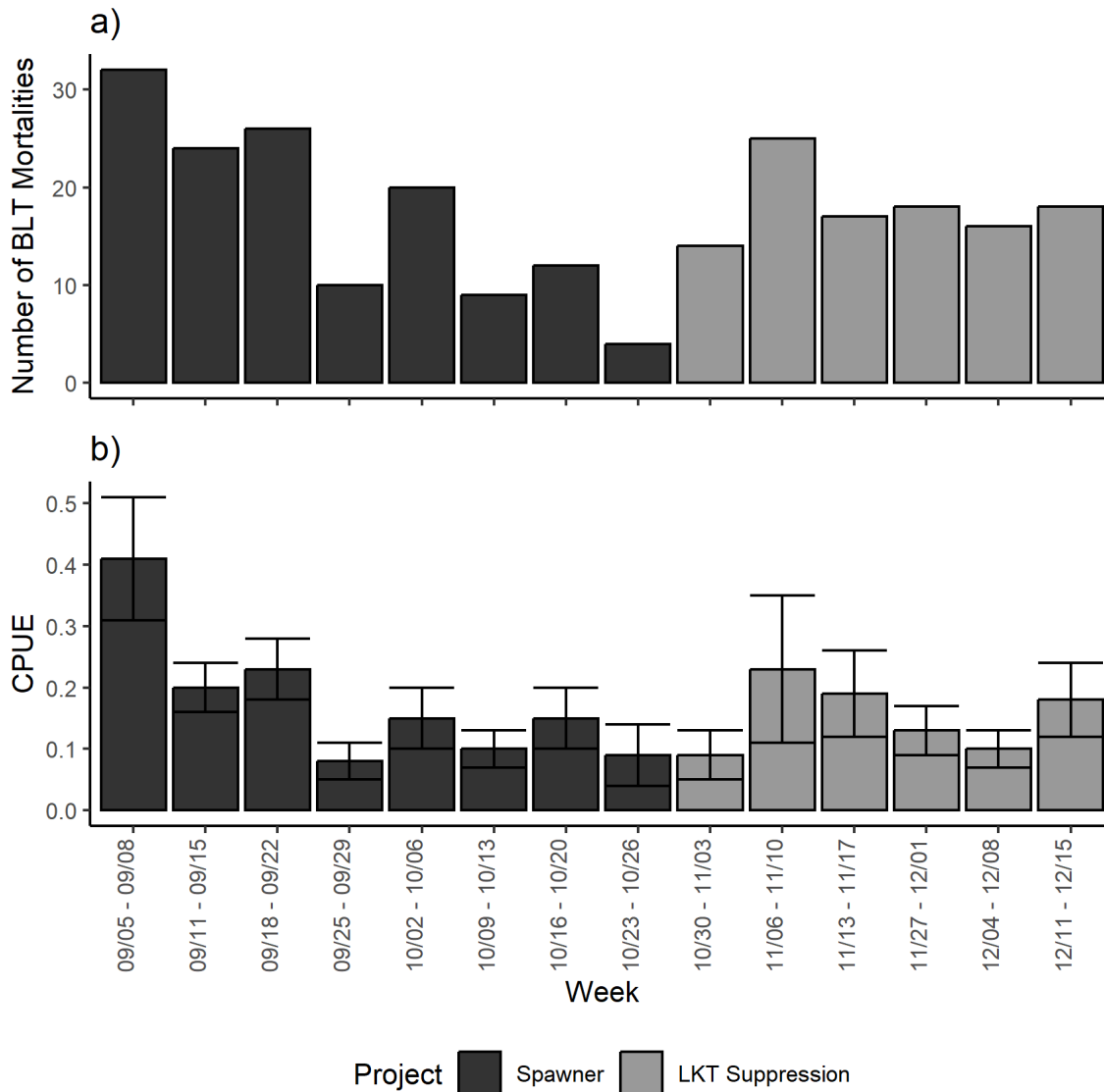
**Figure 2:** Length frequency distributions of Bull Trout captured in gill nets during fall 2023 netting efforts. Panels a) and c) are the length frequencies of Bull Trout released alive and those resulting in direct mortalities from Spawner (5.0 and 5.5 inch) gill net sets, respectively. Panels b) and d) are the length frequencies of Bull Trout released alive and those resulting in direct mortalities from the LKT Suppression (1.5, 1.75, 2.0, 2.5, and 3.0 inch) netting efforts, respectively. The vertical red lines represent the mean total length (mm) for each group and the dashed grey lines represent two standard errors above and below the sample mean.



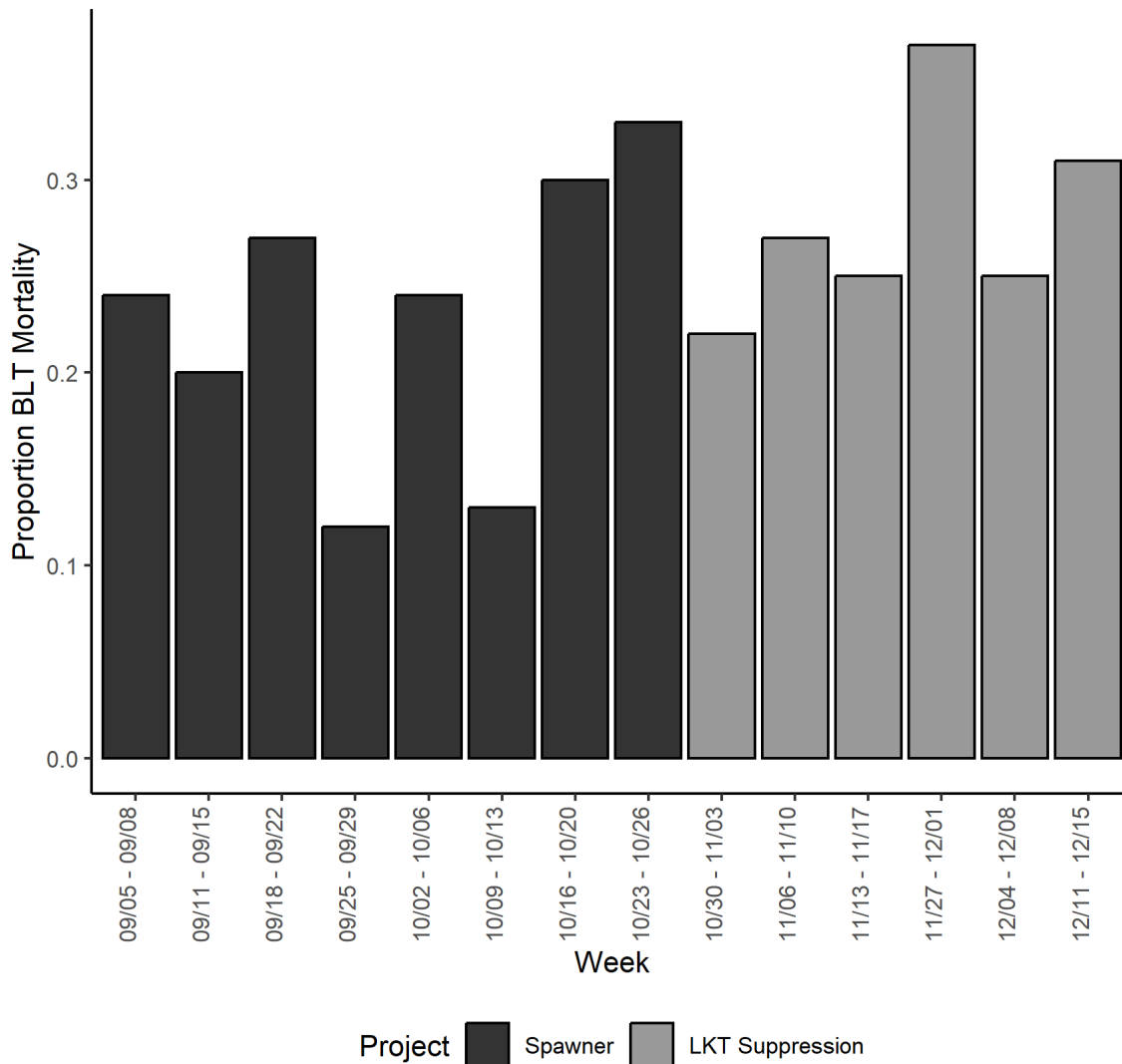
**Figure 3:** Total catch (a) and mean daily catch per unit effort with standard error bars (b, number of LKT per 274 m of gill net) of Lake Trout captured during each week of fall 2023 gill net sets. Spawner sets include 5.0 and 5.5 inch mesh, and LKT Suppression includes 1.5, 1.75 2.0, 2.5, and 3.0 inch mesh.



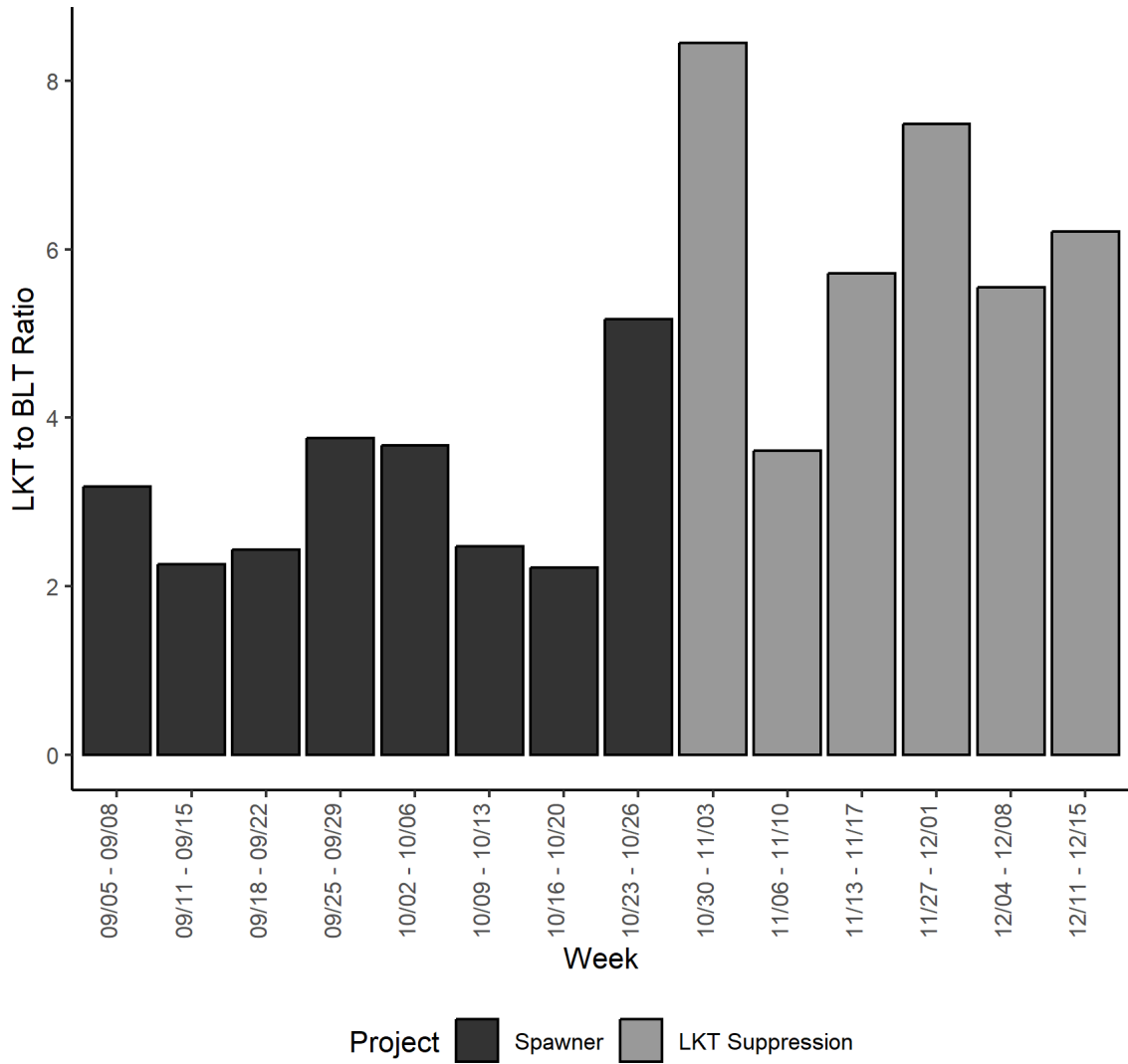
**Figure 4:** Total catch (a) and mean daily catch per unit effort with standard error bars (b, number of BLT per 274 m of gill net) of Bull Trout captured during each week of fall 2023 gill net sets. Large mesh sets include 5.0 and 5.5 inch mesh, and small mesh includes 1.5, 1.75, 2.0, 2.5, and 3.0 inch mesh.



**Figure 5:** Total catch (a) and mean daily catch per unit effort with standard error bars (b, number of BLT per 274 m of gill net) of Bull Trout direct mortalities during each week of fall 2023 gill net sets. Spawner sets include 5.0 and 5.5 inch mesh, and LKT Suppression sets includes 1.5, 1.75, 2.0, 2.5, and 3.0 inch mesh.

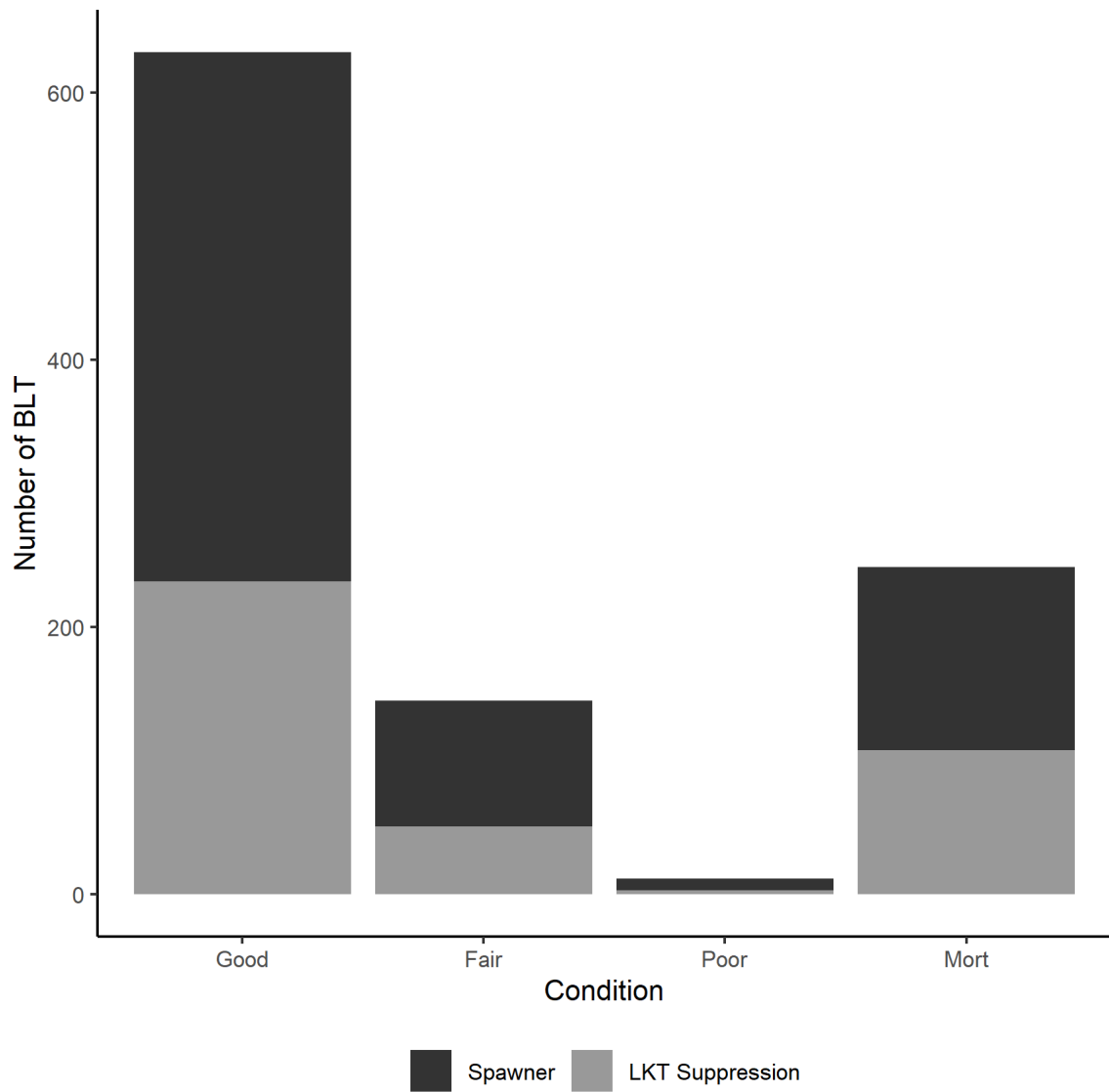


**Figure 6:** The mean daily proportion of Bull Trout bycatch resulting in direct mortality from large (5.0 and 5.5 inch) and small mesh (1.5, 1.75, 2.0, 2.5, and 3.0 inch) in the Spawner and LKT Suppression gill net sets during each week of fall 2023.

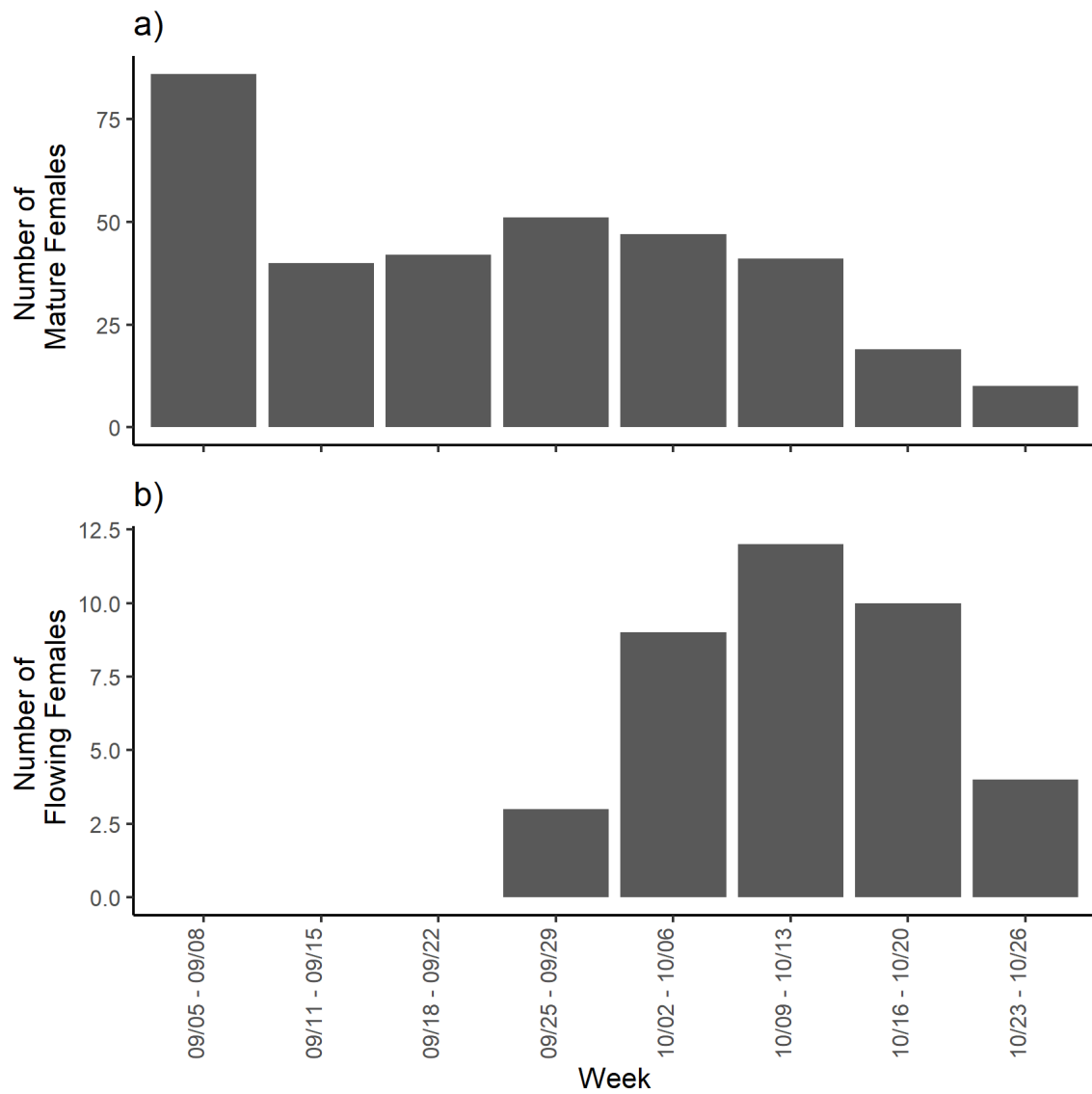


**Figure 7:** The mean daily Lake Trout to Bull Trout catch ratios from large (5.0 and 5.5 inch) and small mesh (1.5, 1.75, 2.0, 2.5, and 3.0 inch) in the Spawner and LKT Suppression gill net sets during each week of fall 2023.

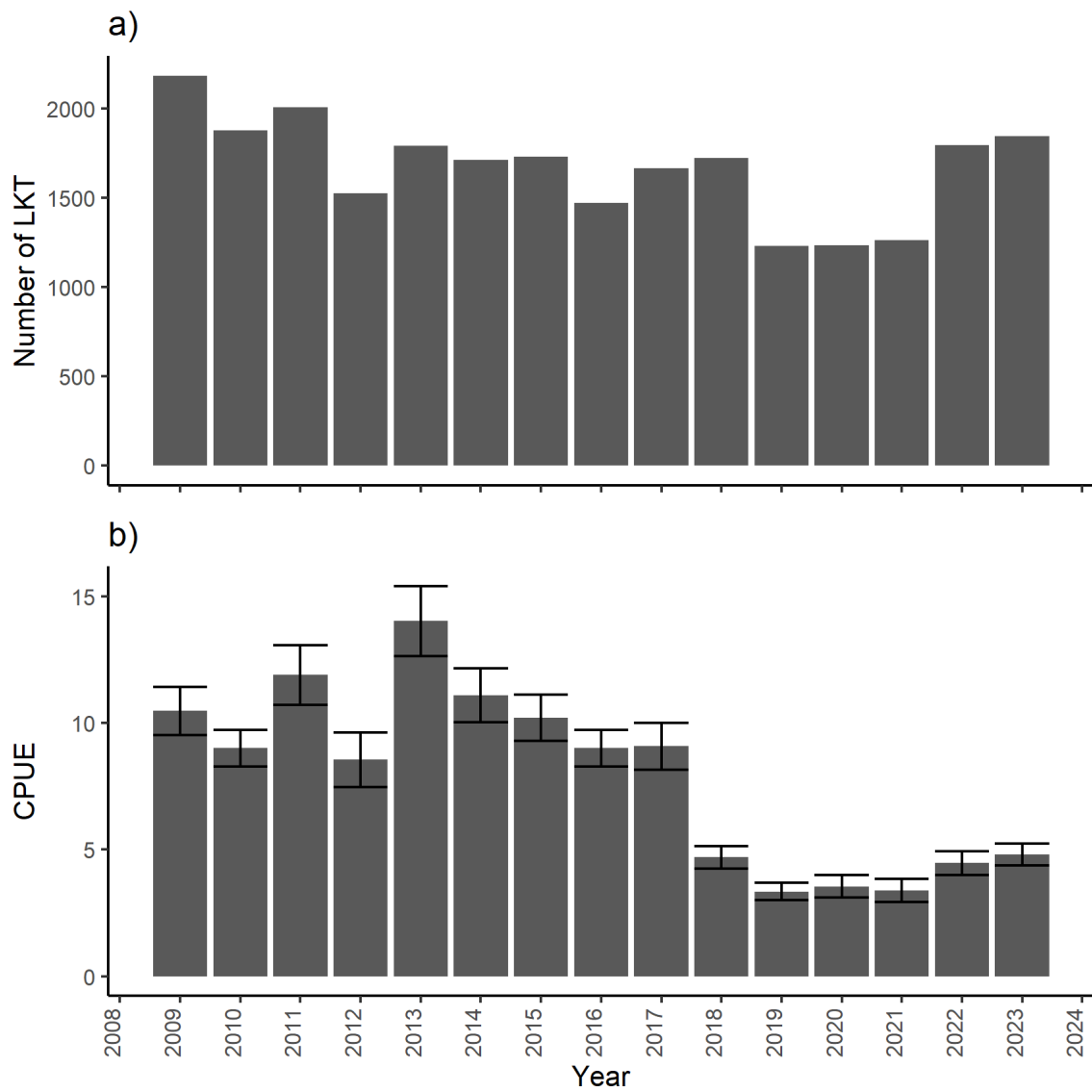




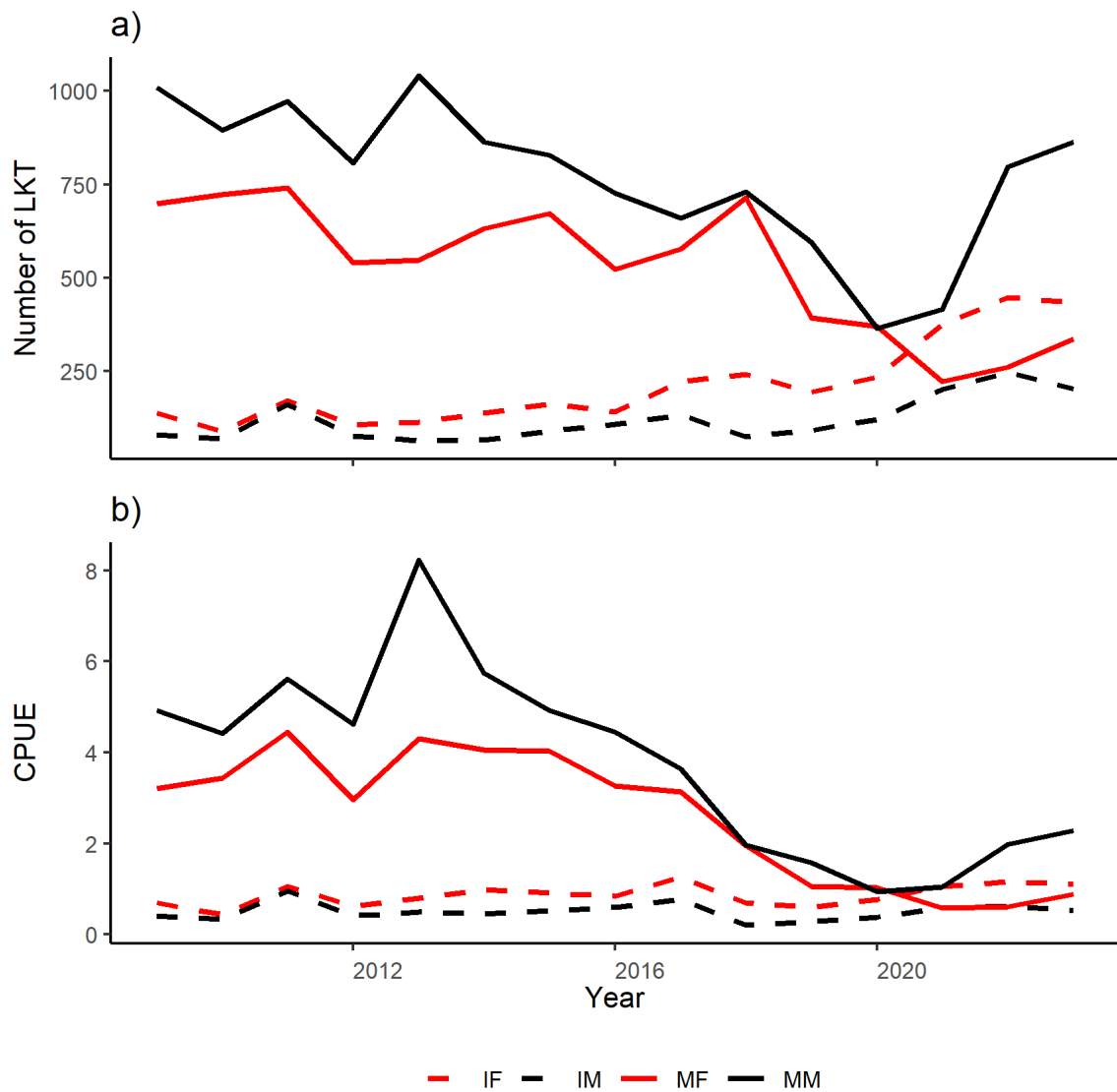
**Figure 8:** Condition index of Bull Trout captured in large (5.0 and 5.5 inch) and small mesh (1.5, 1.75, 2.0, 2.5, and 3.0 inch) in the Spawner and LKT Suppression gill net sets during fall 2023.



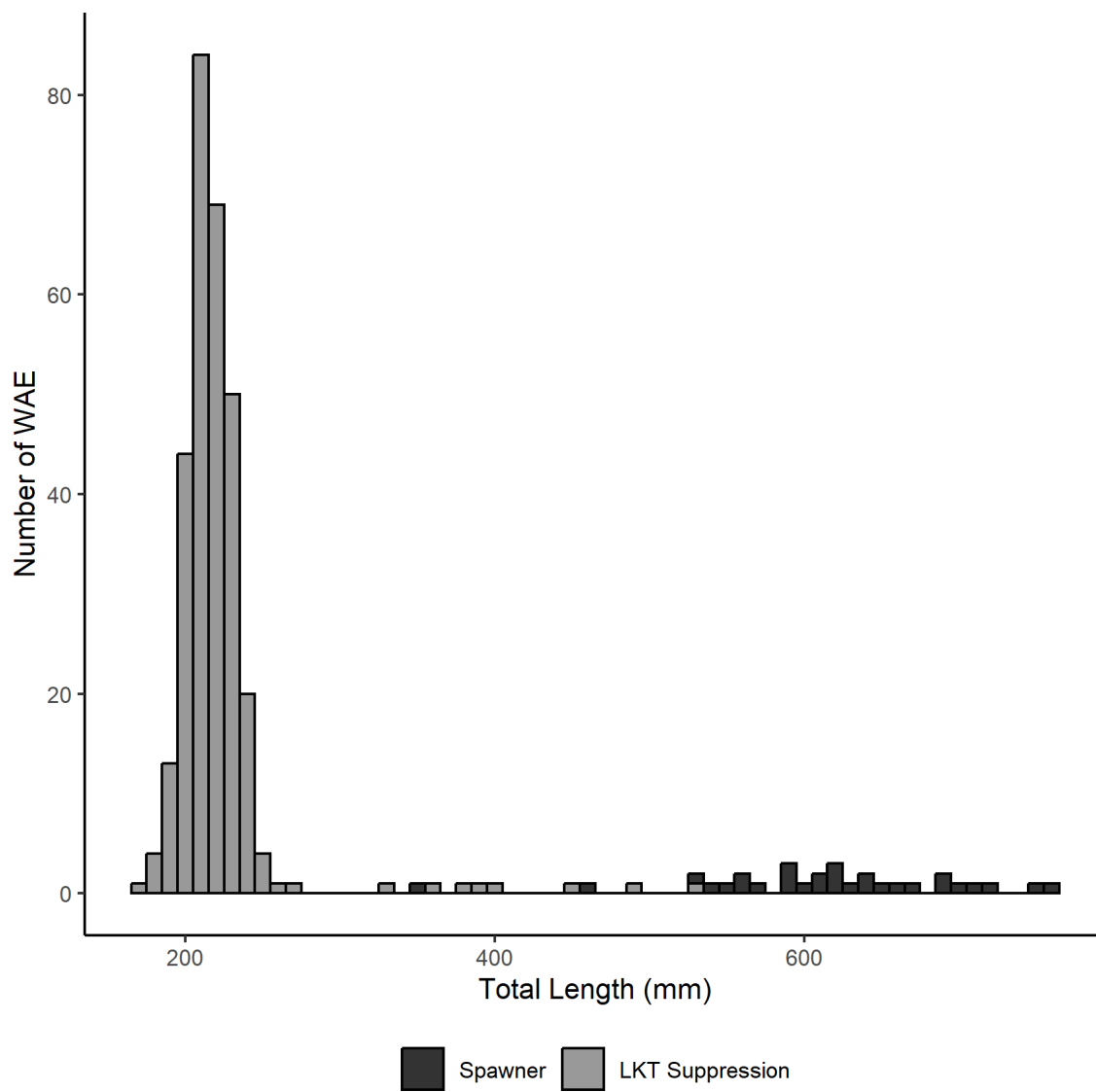
**Figure 9:** The total catch of mature female Lake Trout (a) and mature female Lake Trout that were flowing (expressing eggs) at time of capture (b) during each week of fall 2023 Spawner gill net sets.



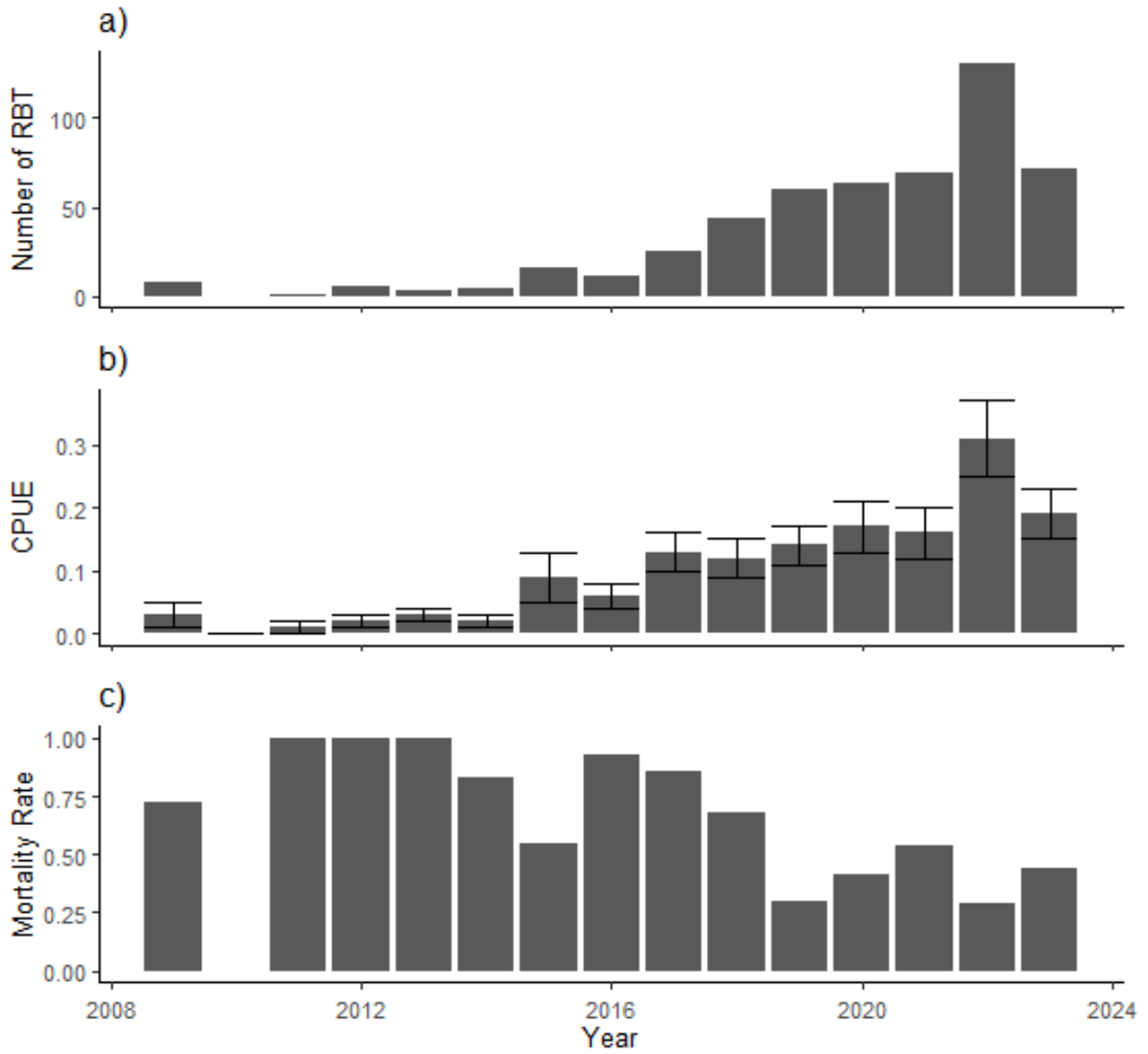
**Figure 10:** Annual catch (a) and mean daily catch per unit effort with standard error bars (b, number of LKT per 274 m of gill net) of Lake Trout during designated fall Spawner gill net sets 2009–2023.



**Figure 11:** Annual catch (a) and mean daily catch per unit effort (b, number of LKT per 274 m of gill net) of Lake Trout during designated fall Spawner gill net sets 2009–2023. Each line represents distinct sex and maturity classifications – immature females (IF), immature males (IM), mature females (MF), and mature males (MM).



**Figure 12:** Length frequency distributions of Walleyes captured in (a) large (5.0 and 5.5 inch) and (b) small mesh gill nets (1.5, 1.75, 2.0, 2.5, and 3.0 inch) during fall 2023 Spawner and LKT Suppression efforts.



**Figure 13:** Total catch (a), mean daily catch per unit effort with standard error bars (b, number of RBT per 274 m of gill net), and mean mortality rate of Rainbow Trout during designated fall Spawner gill net sets from 2009 – 2023.

**APPENDIX D. LAKE TROUT ANGLER INCENTIVE PROGRAM SUMMARY**

## 2023 LPO Lake Trout Angler Incentive Program Summary

Ken Bouwens  
Rob Jakubowski

Total Lake Trout heads submitted = 2,677

Total Bull Trout heads submitted = 16

Total unique anglers participating = 195

### Tables

Table 1. Number of Lake Trout removed through the Lake Pend Oreille, Idaho, Angler Incentive Program (AIP).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2006	--	--	--	--	1,317	2,136	1,033	2,200	1,755	1,689	661	250	11,041
2007	415	789	895	1,261	2,445	3,107	2,809	1,949	1,864	1,046	831	254	17,665
2008	216	241	363	544	771	2,117	2,612	1,878	2,178	862	940	298	13,020
2009	144	156	179	263	1,033	1,321	1,178	1,051	969	409	483	180	7,366
2010	330	351	380	343	873	1,558	1,354	988	1,261	766	330	206	8,740
2011	146	78	105	256	347	2,049	1,115	718	940	930	348	292	7,324
2012	140	103	96	233	928	1,552	1,534	977	1,119	419	388	324	7,813
2013	121	115	95	163	359	468	677	396	454	315	232	158	3,553
2014	85	47	40	90	300	480	361	354	297	130	191	135	2,510
2015	19	47	45	74	257	326	526	660	477	438	217	108	3,194
2016	36	84	63	97	313	491	417	525	322	213	248	62	2,871
2017	42	79	25	186	386	574	775	697	387	193	140	47	3,531
2018	106	21	48	140	135	315	530	391	424	272	156	80	2,618
2019	51	46	27	27	143	286	287	183	246	221	109	134	1,760
2020	107	71	72	37	158	367	470	501	271	319	155	113	2,641
2021	31	21	21	54	109	415	422	433	360	310	282	51	2,509
2022	40	22	12	107	182	623	415	324	470	202	206	79	2,682
2023	178	72	37	52	177	252	498	423	376	214	230	168	2,677
<b>Total</b>													<b>103,515</b>



Table 2. Number of unique anglers participating in the Lake Pend Oreille, Idaho, Angler Incentive Program (AIP). The number of anglers per year may not equal the monthly totals for that year because an individual may submit heads in multiple months.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2007	47	75	108	210	345	327	264	209	187	245	122	48	1,051
2008	33	35	56	97	159	207	218	171	168	114	123	53	722
2009	24	21	27	43	165	164	147	144	114	81	89	38	532
2010	31	34	34	68	141	156	121	89	95	78	62	25	446
2011	21	19	18	57	72	166	141	92	92	98	59	45	445
2012	31	23	26	57	114	144	123	96	88	75	61	54	422
2013	17	14	10	27	62	58	46	39	48	45	27	26	207
2014	12	9	7	23	59	52	34	42	35	29	31	20	195
2015	9	11	14	29	51	29	35	34	52	39	31	23	186
2016	5	11	14	21	54	48	37	41	33	29	30	10	183
2017	6	9	7	29	60	61	53	47	48	31	25	13	215
2018	15	7	10	22	29	29	46	42	40	41	23	13	171
2019	10	8	10	16	49	41	33	25	31	22	17	14	165
2020	12	16	12	14	39	59	41	29	31	41	21	23	206
2021	13	7	11	29	43	45	39	32	36	43	39	16	214
2022	7	8	4	33	38	54	49	29	46	48	27	11	224
2023	21	15	14	17	42	36	38	36	29	34	33	16	195

## Figures

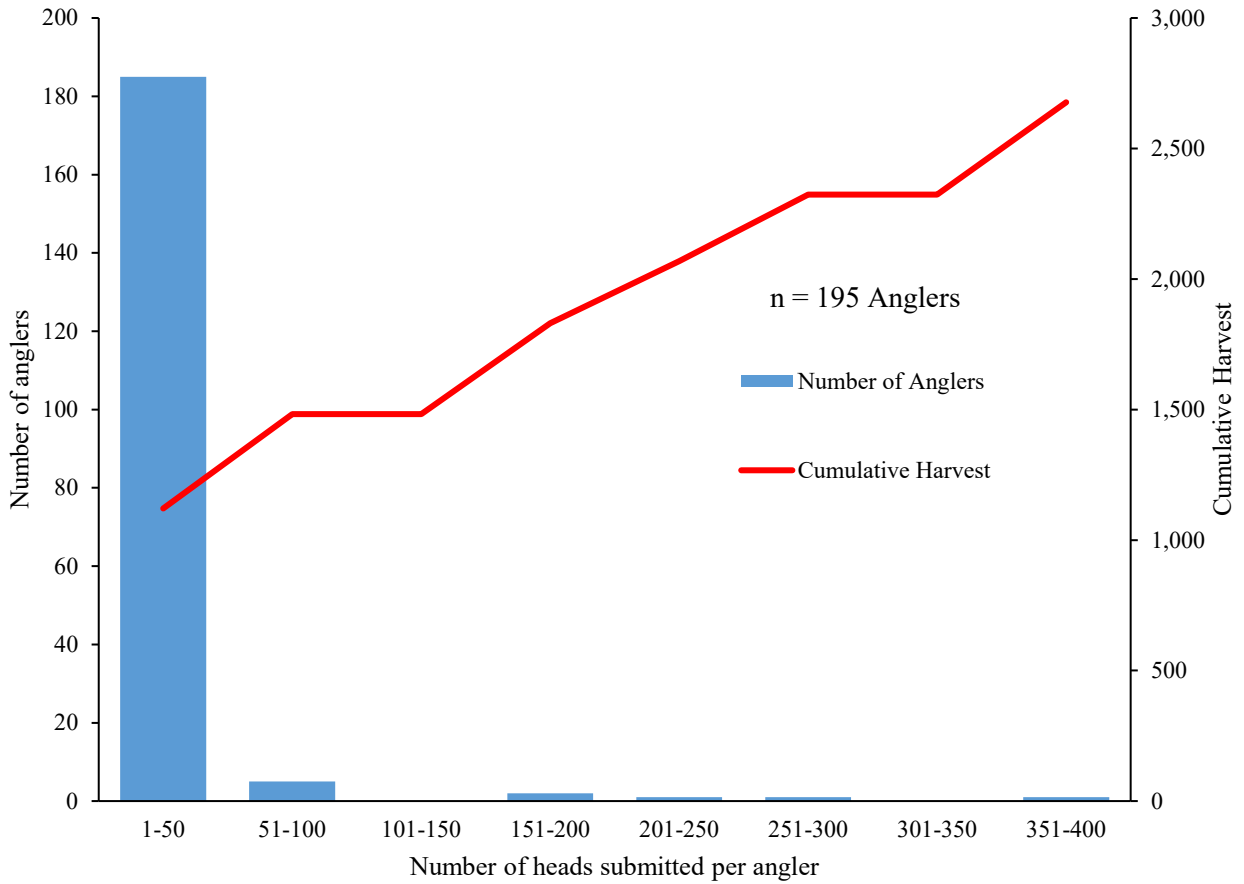


Figure 1. Total number of anglers and percent of total yearly harvest, grouped by number of heads submitted per angler, through the Lake Pend Oreille Lake Trout AIP during 2023.

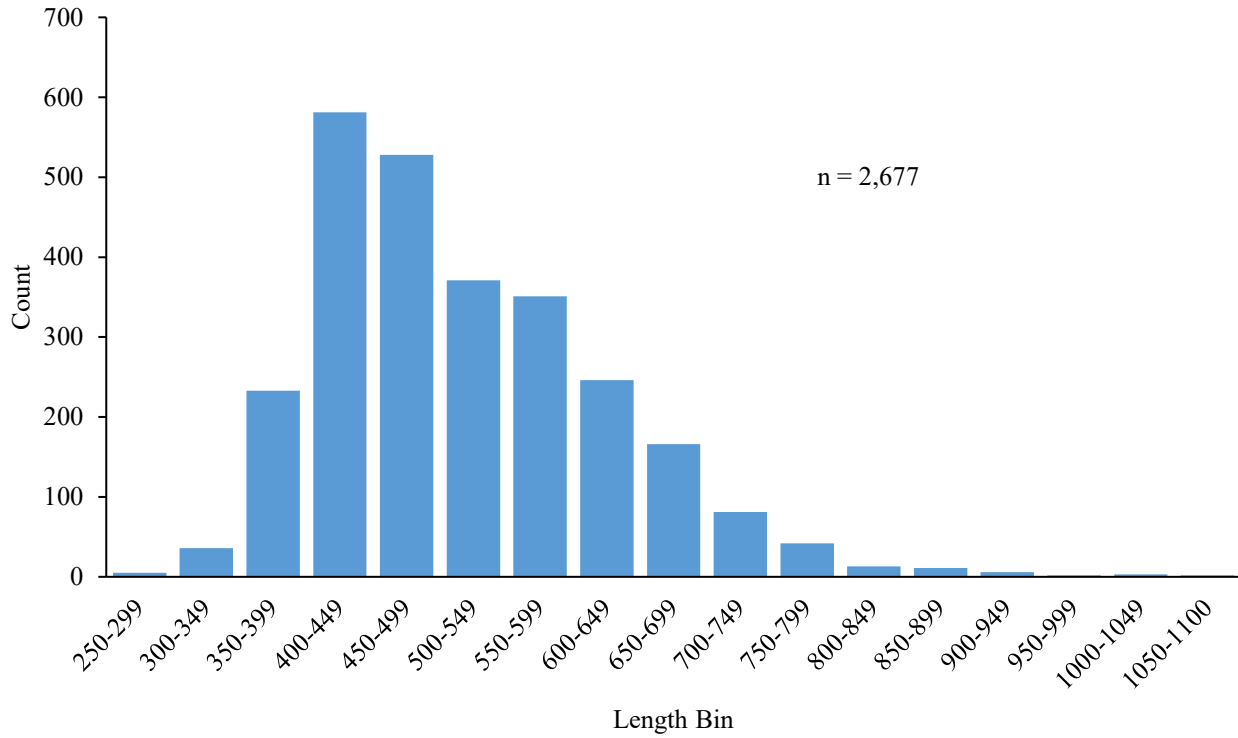


Figure 2. Length-frequency plot of Lake Trout captured by anglers participating in the AIP during 2023 by estimated total length bins. Lengths were derived using a head length to total length regression formula, developed from Lake Trout captured by the Lake Pend Oreille Predator Suppression Program.

**APPENDIX E. 2023 LPO WALLEYE NETTING PROGRAM SUMMARY**

## Spring 2023 LPO Walleye Netting Summary

4/10/2023 – 4/28/2023

Eric Geisthardt

### Overview

During spring 2023 (April 10–28) Walleye suppression gill netting we fished a combination of 3.0, 3.5, 4.0, and 4.5 inch (76.2, 88.9, 101.6, and 114.3 mm) mesh gill nets to target Walleyes *Sander vitreus* in Lake Pend Oreille, Idaho. A total of 502 Walleyes were captured and 453 were removed (249 mm to 799 mm total length) using 162,000 ft (49,377.6 m) of net. We also tagged 42 Walleyes using coded-wire tags to add to the Angler Incentive Program. Of the recaptures ( $n = 7$ ), 7 were previously implanted with coded-wire tags.

As part of the bycatch during these efforts, 20 different species were captured including ESA Threatened Bull Trout *Salvelinus confluentus*. We captured a total of 19 Bull Trout which had a direct mortality rate of 26%. We implanted PIT tags in 7 new Bull Trout and recaptured 8 previously tagged Bull Trout with a condition breakdown as follows:

- Good = 14 (7 were previously tagged)
- Fair = 0
- Poor = 0
- Mortalities = 5 (1 was previously tagged)

In addition to the mark-recapture data collection for Bull Trout, we also collected 10 genetic samples from tagged or released Bull Trout.

We used the diversity of species bycatch to tag additional species of management concern with acoustic and/or T-bar anchor tags. Of the bycatch, we tagged 205 Northern Pike *Esox lucius* non-reward and reward T-bar tags and recaptured 3 Northern Pike with previously implanted acoustic tags. We also recapture 4 Smallmouth Bass *Micropterus dolomieu* that were previously tagged with T-bar tags. We also tagged Gerrard-strain Rainbow Trout *Oncorhynchus mykiss* with non-reward and reward T-bar tags. We also tagged a total of 34 Rainbow Trout with reward tags. In addition to T-bar tags, we also implanted 1 Rainbow Trout with an acoustic tag.

- NPK acoustic recaps = 3
- NPK T-bar tagged = 205
- NPK T-bar reward tags = 65
- NPK T-bar recaps = 44
- SMB T-bar recaps = 4
- RBT T-bar tagged = 33
- RBT T-bar reward tags = 32
- RBT acoustic tags = 1

The following tables and figures provide summary information on catch and bycatch from gill-net efforts during the complete spring 2023 netting season.

## Tables

**Table 1:** Summary of the Walleye suppression gill netting catches of game fish species (see Tables 6 and 7 for non-game species) during the spring 2023. For each species, statistics include the number captured (Captured), released alive (Released), tagged with one of several tag types (Tagged), previously released tags that were recaptured (Recaptured), and those removed from LPO (Removed). We tagged Bull Trout with PIT tags, Rainbow Trout and Northern Pike with T-bar tags, Northern Pike and Rainbow Trout received a combination of T-bar and acoustic telemetry tags, and Walleyes received a coded-wire tag. Lake Trout, Walleyes, and Northern Pike removed intentionally; for all other species, “removed” represents fish that were “dead on capture”.

Species	Captured	Released	Tagged	Recaptured	Removed
Walleye	502	49	42	7	453
Northern Pike	418	249	205	44	169
Smallmouth Bass	337	335	0	4	2
Yellow Perch	81	81	0	0	0
Brown Trout	36	24	0	0	12
Rainbow Trout	39	35	34	0	4
Westslope Cutthroat Trout	36	32	0	0	4
Bull Trout	19	14	7	8	5
Lake Trout	18	0	0	0	18
Rainbow X Cutthroat Trout	8	7	2	0	1
Black Crappie	7	7	0	0	0
Mountain Whitefish	4	4	0	0	0
Largemouth Bass	2	2	0	0	0
Pumpkinseed	1	1	0	0	0

**Table 2:** Total catch of each species by location during the spring 2023 Walleyes suppression gill netting. Species captured include: Black Crappie (BCR), Brown Trout (BRT), Bull Trout (BLT), Lake Trout (LKT), Largemouth Bass (LMB), Mountain Whitefish (MWF), Northern Pike (NPK), Rainbow Trout (RBT), Rainbow Trout X Westslope Cutthroat Trout hybrids (RBT X WCT), Smallmouth Bass (SMB), Walleye (WAE), Westslope Cutthroat Trout (WCT), Yellow Perch (YEP), and Pumpkinseed (PKS).

	BCR	BRT	BLT	LKT	LMB	MWF	NPK	RBT	RBTx WCT	SMB	WAE	WCT	YEP	PKS
Clark Fork River Delta	0	11	4	4	0	0	41	2	1	21	15	4	1	0
Kootenai Point	4	5	1	1	2	0	105	0	1	80	48	2	63	0
Pack River Delta	3	18	13	18	0	1	266	37	7	174	250	27	4	1
Train Trestle/ Bottle Bay	0	4	1	6	0	3	6	0	0	63	189	3	13	0

**Table 3:** Summary of length data for Walleyes, Bull Trout, and Bull Trout mortalities captured in gill nets during the spring 2023 Walleye suppression netting.

Species	Mean TL	SE	Max TL	Min TL
WAE	488.4	4.3	800	198
BLT	547.5	17.4	683	493
BLT Mortalities	583.3	26.4	681	533

**Table 4:** Catch data for Walleye, Bull Trout, and Bull Trout mortalities during the spring 2023 Walleye suppression netting. These statistics include the total number of Walleyes (WAE), live Bull Trout (BLT), Bull Trout mortalities (BLT Morts), the mean catch ratios of Walleyes to live Bull Trout (WAE:BLT), Walleyes to Bull Trout mortalities (WAE:BLT Morts), and the mean proportion of Bull Trout captures that resulted in direct mortality (Prop Morts).

Mesh Size (in)	WAE	BLT	BLT Morts	WAE:BLT	WAE:BLT Morts	Prop Morts
4.5	127	6	1	21.17	127	0.17
4	161	8	2	20.13	80.5	0.25
3.5	214	5	2	42.8	107	0.4

**Table 5:** Catch per unit effort statistics for Walleye, Bull Trout, and Bull Trout mortalities during the spring 2023 Walleye suppression netting. These statistics include the total number of 274 m gill net panels fished (Effort), and the Mean and SE of daily catch per unit effort (# fish / 274 m of net) for Walleyes (WAE CPUE, WAE SE), Bull Trout (BLT CPUE, BLT SE), and Bull Trout mortalities (BLT Mort CPUE, BLT Mort SE).

Mesh Size (in)	Effort	WAE CPUE	WAE SE	BLT CPUE	BLT SE	BLT Mort CPUE	BLT Mort SE
4.5	60	2.12	0.52	0.1	0.03	0.02	0.02
4	60	2.68	0.47	0.13	0.07	0.03	0.03
3.5	60	3.57	0.96	0.08	0.03	0.03	0.02

**Table 6:** Subsampled catch of each non-game species from the spring 2023 Walleye suppression gill netting.

Species	n
Lake Whitefish	1683
Longnose Sucker	291
Largescale Sucker	215
Northern Pikeminnow	80
Brown Bullhead	17
Peamouth	15
Tench	3



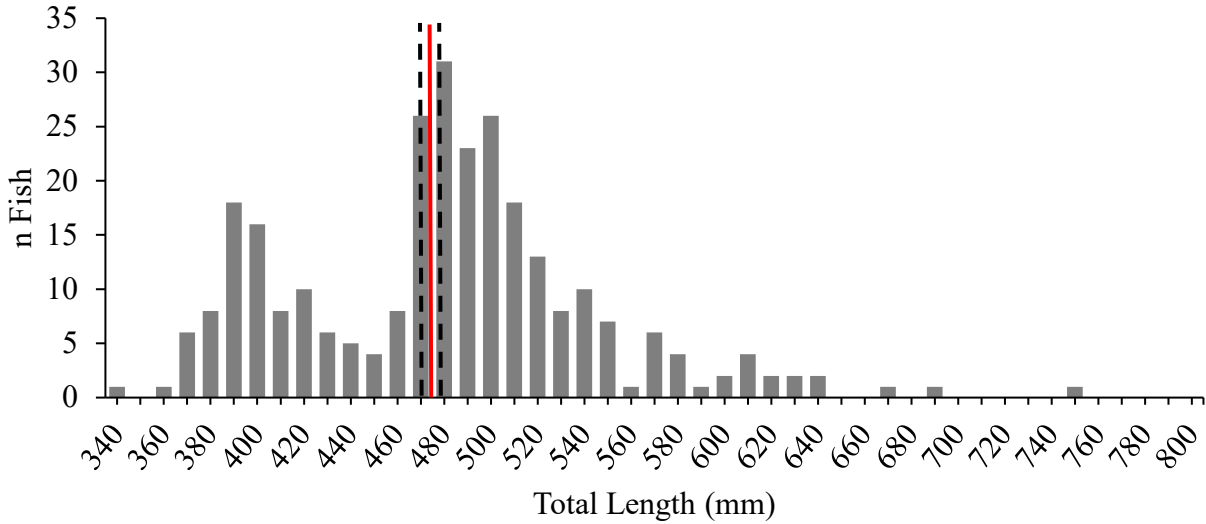
**Table 7:** Subsampled catch of each non-game species by netting location during the spring 2023 Walleye suppression gill netting. Species captured include: Brown Bullhead (BRB), Lake Whitefish (LWF), Largescale Sucker (LSS), Longnose Sucker (LNS), Northern Pikeminnow (NPM), Peamouth (PEA), and Tench (TNC).

	BRB	LWF	LSS	LNS	NPM	PEA	TNC
Fisherman Island to Hawkins Point	0	434	23	22	6	0	0
Kootenai Point	17	0	81	0	11	0	2
Pack River Delta	0	377	73	243	44	15	1
Train Trestle	0	637	38	26	20	0	0

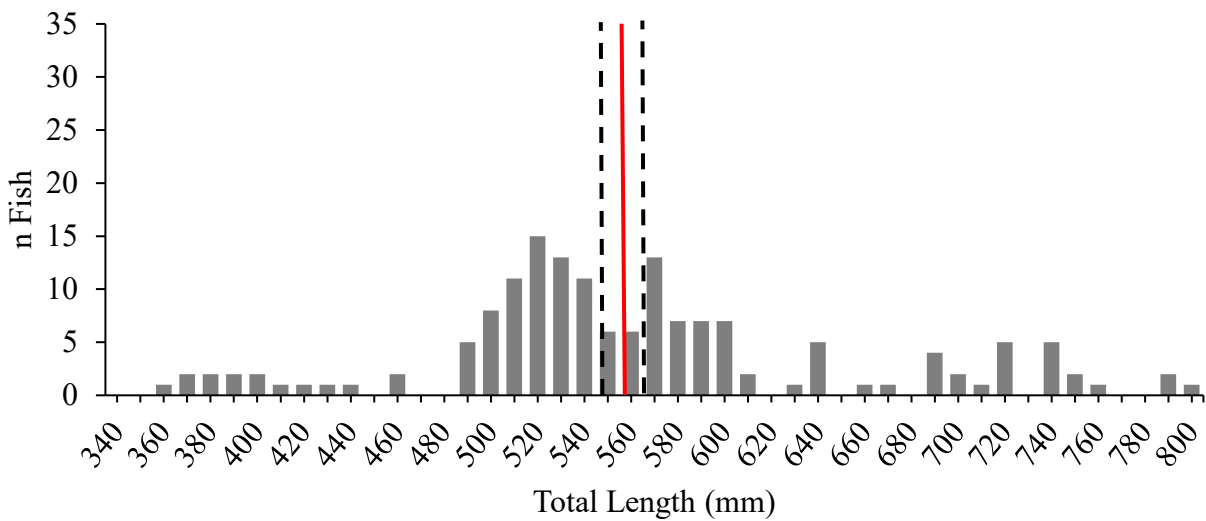
## Figures

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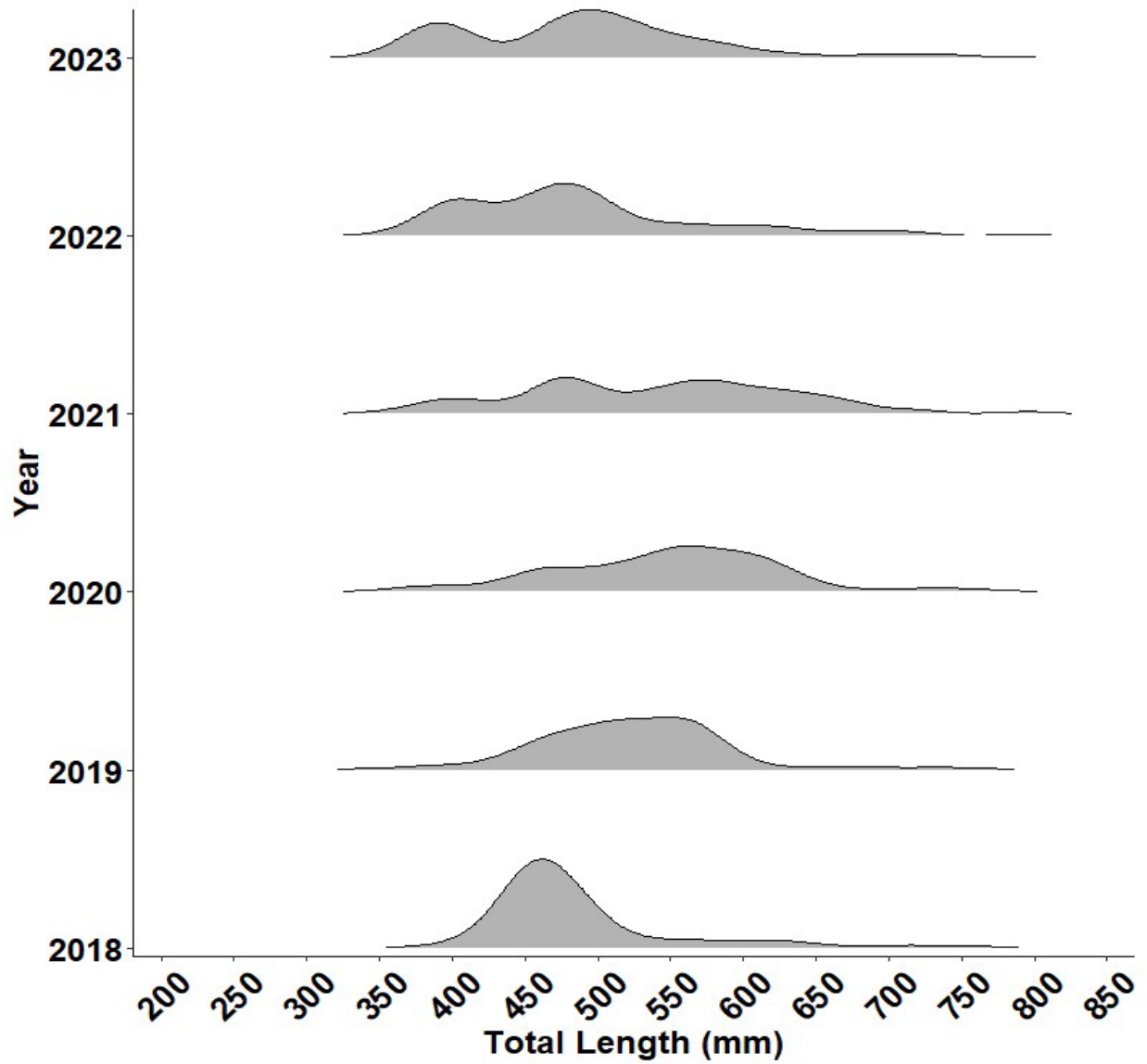
A)



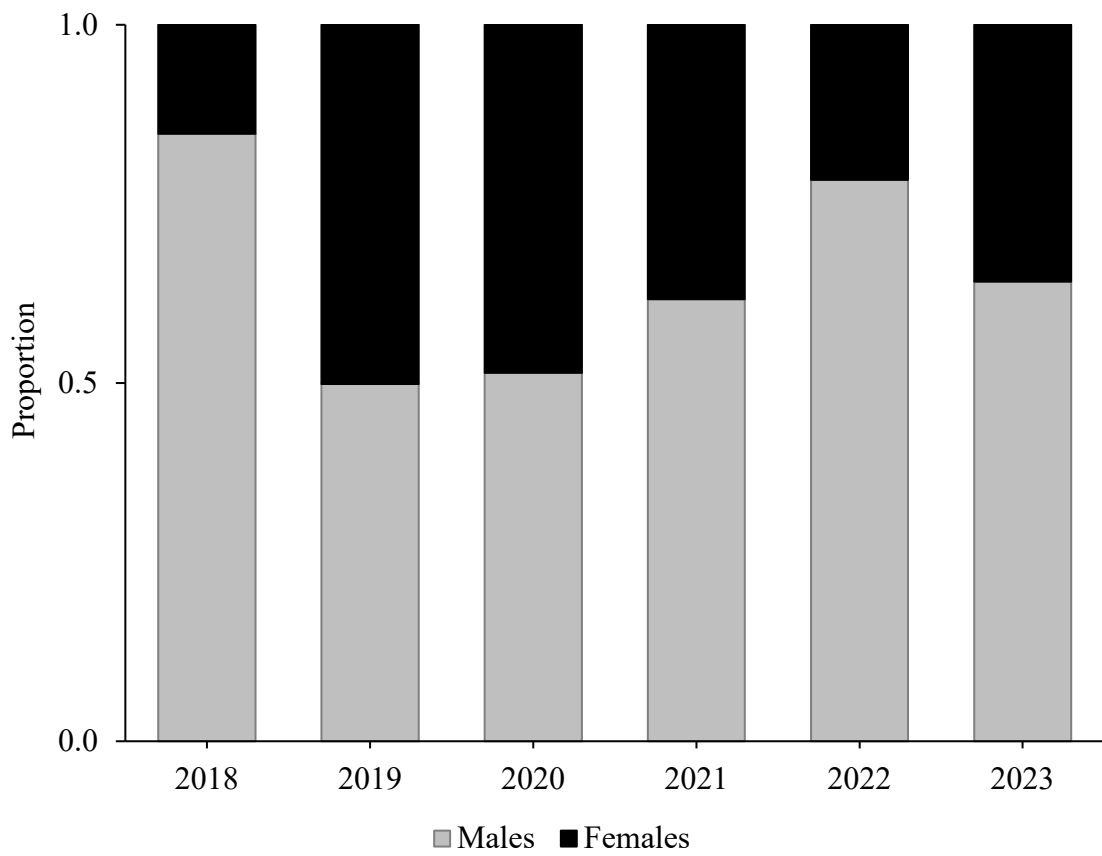
B)



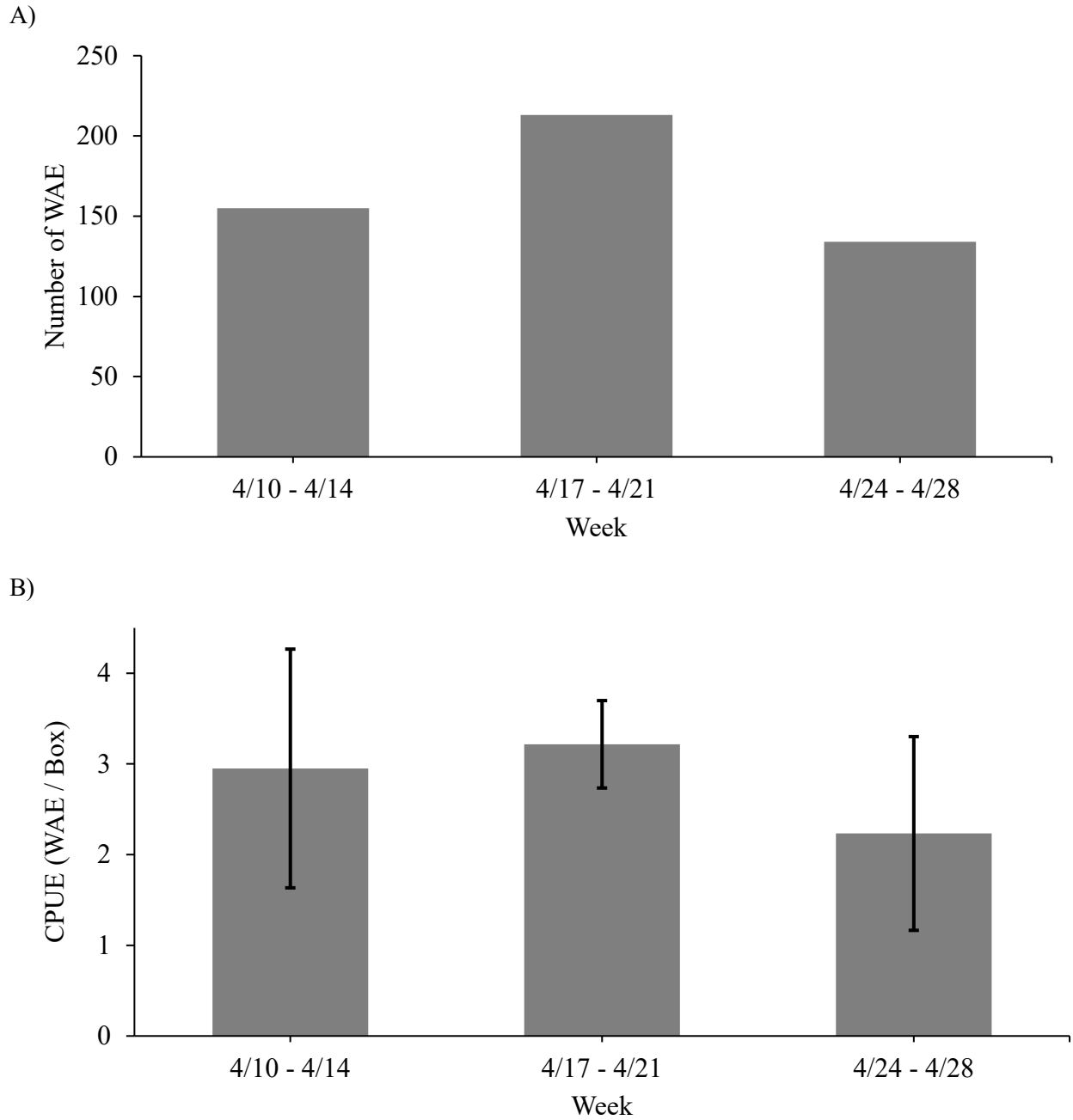
**Figure 1:** Length frequencies of male (A) and female (B) Walleyes captured in gill nets during spring 2023 Walleye suppression netting. Vertical red lines represent the sample mean length for each group and the dashed black lines represent one standard error above and below the sample mean.



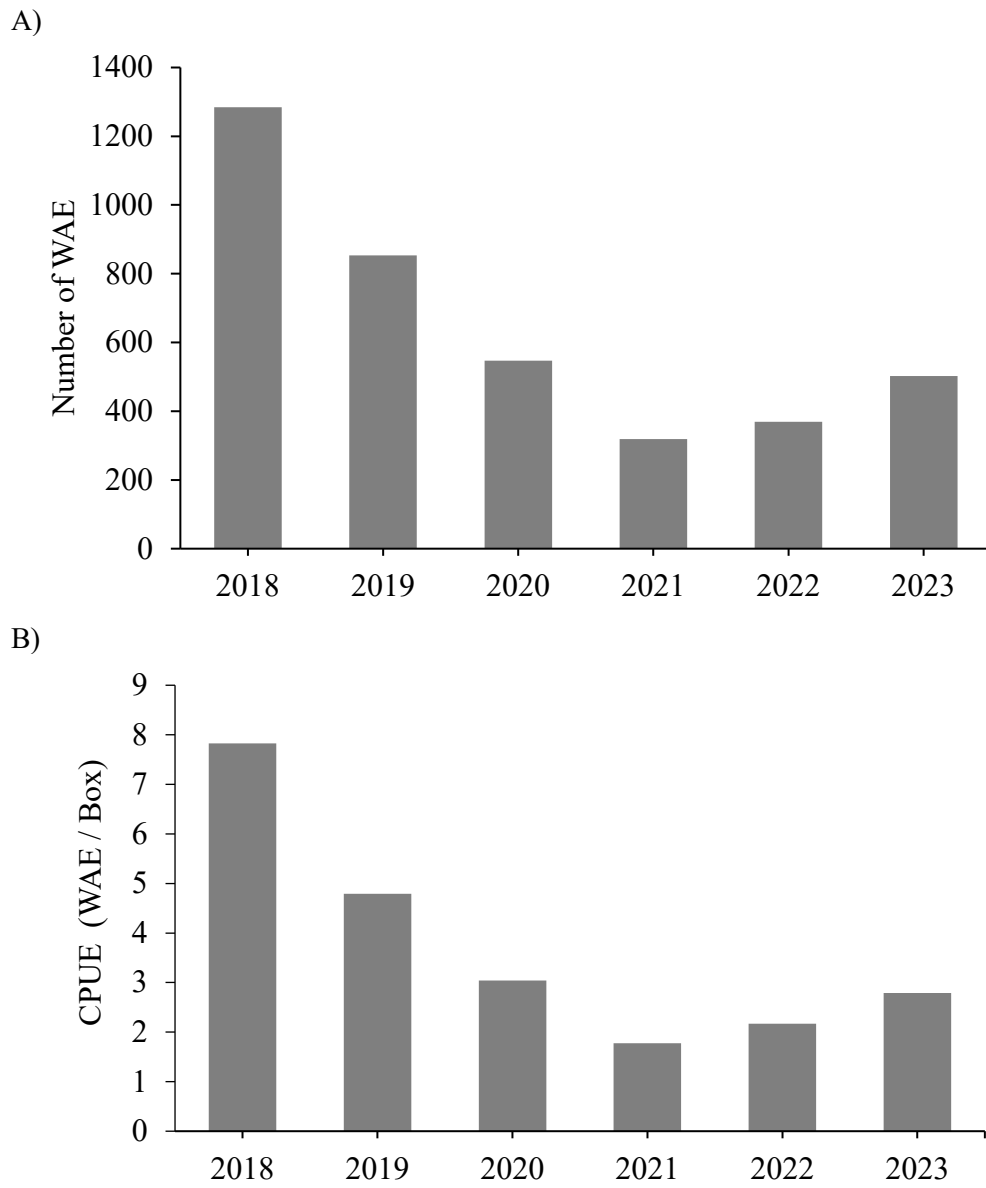
**Figure 2:** Density plots of the relative length frequencies distributions of Walleyes captured during the designated spring gill netting efforts 2018–2023.



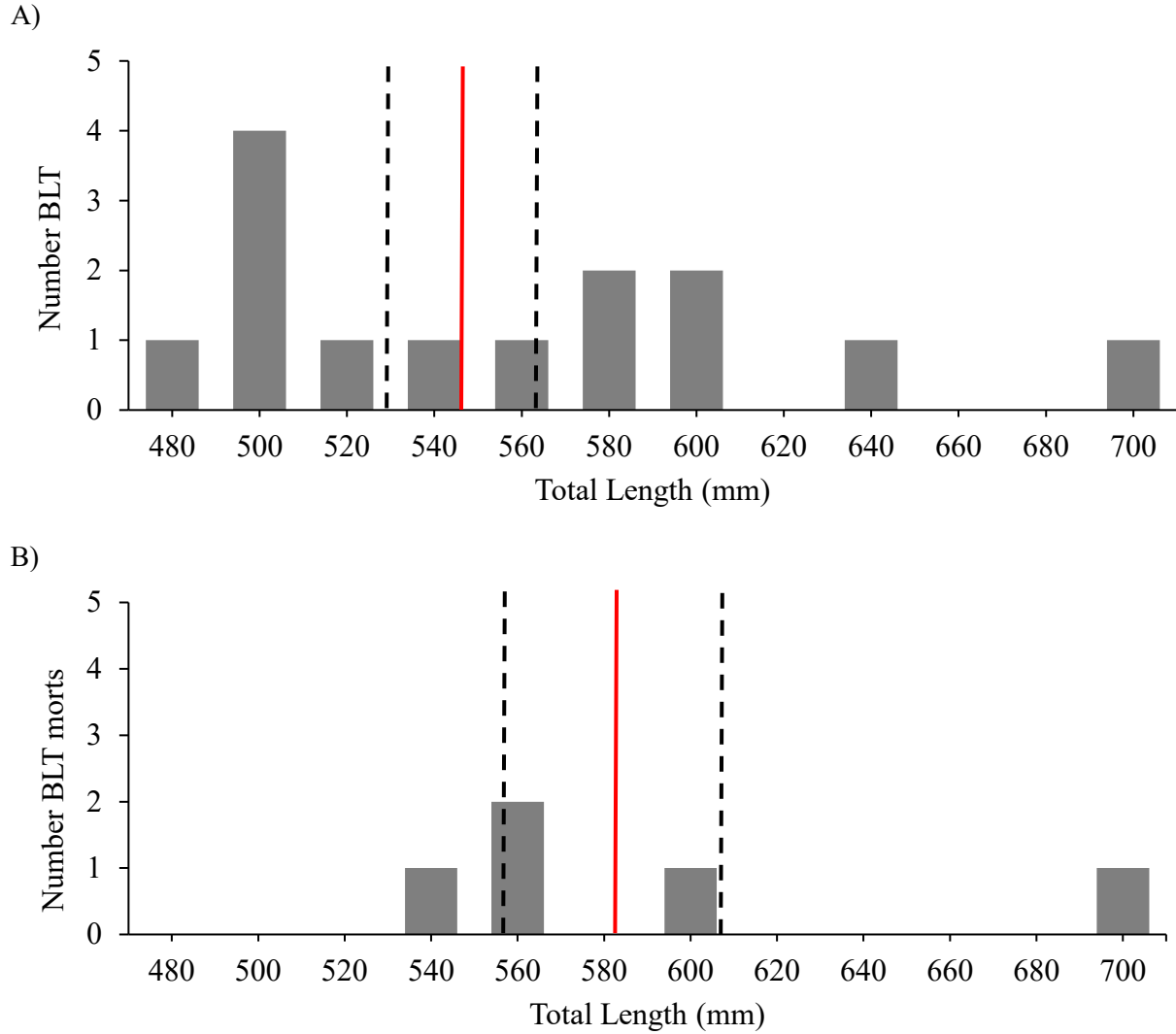
**Figure 3:** Sex ratios of Walleyes captured during the designated spring gill netting efforts 2018–2023.



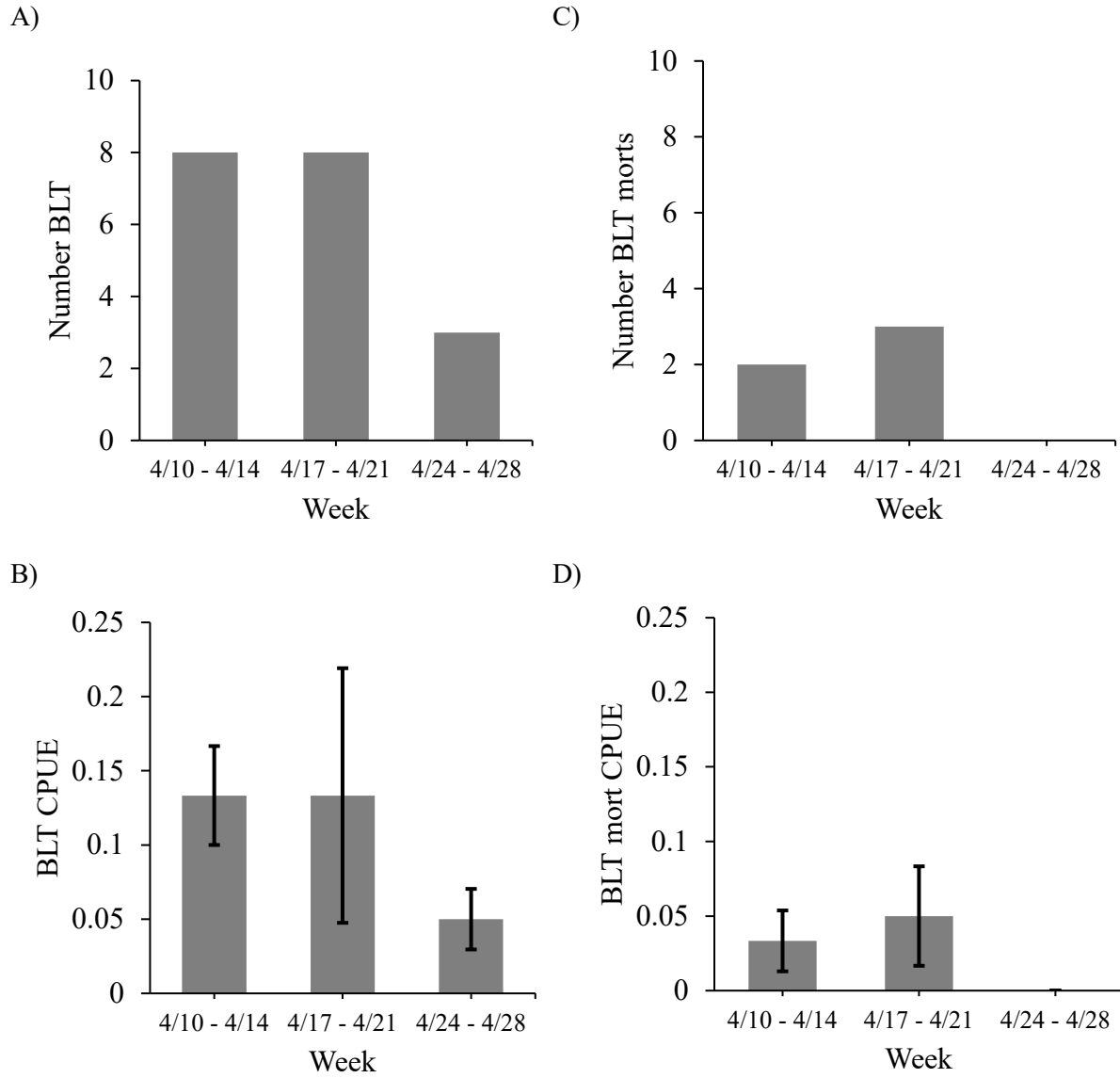
**Figure 4:** Weekly catch (A) and mean weekly CPUE (B, with SE bars) of Walleyes captured during the spring 2023 Walleye suppression netting.



**Figure 5:** Annual catch (A) and CPUE of Walleyes (B) during the designated spring gill netting efforts 2018–2023.

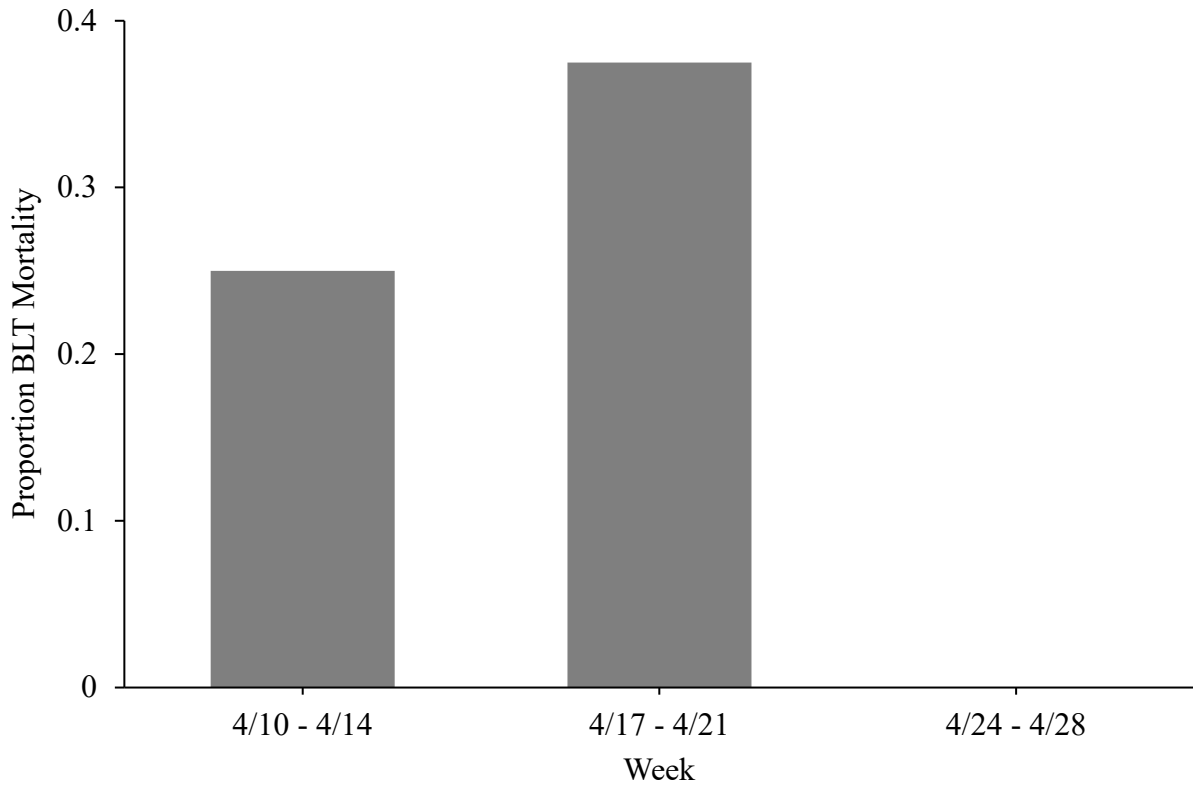


**Figure 6:** Length frequencies of Bull Trout captured in gill nets during spring 2023 Walleye suppression netting. Panel A) is the length frequency of Bull Trout released alive and panel B) that of Bull Trout captures that resulted in direct mortalities. Vertical red lines represent the sample mean length for each group and the dashed black lines represent one standard error above and below the sample mean.

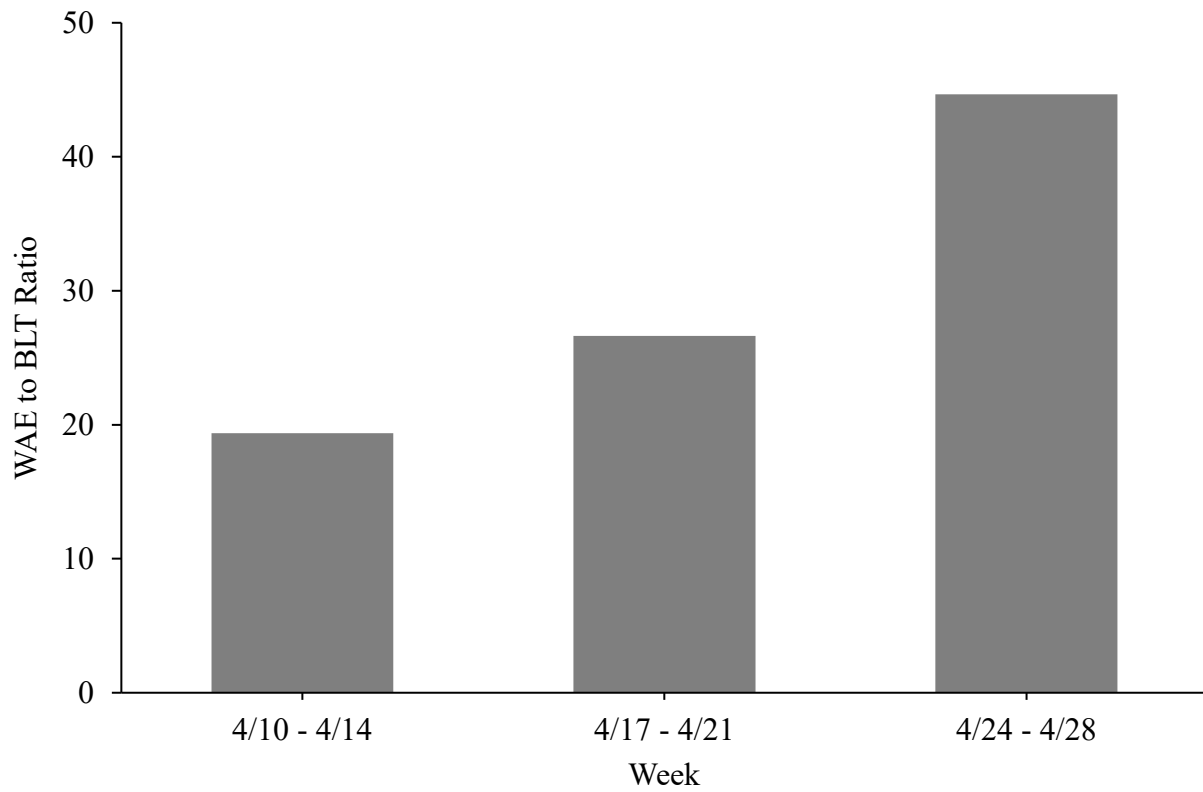


**Figure 7:** Weekly catch (A) and mean weekly CPUE (B, with SE bars) of Bull Trout captured and released alive during the spring 2023 Walleye suppression netting. Panels A) and C) summarize the catch (B) and mean weekly CPUE (D) of direct Bull Trout mortalities during the spring 2023 Walleye suppression netting.

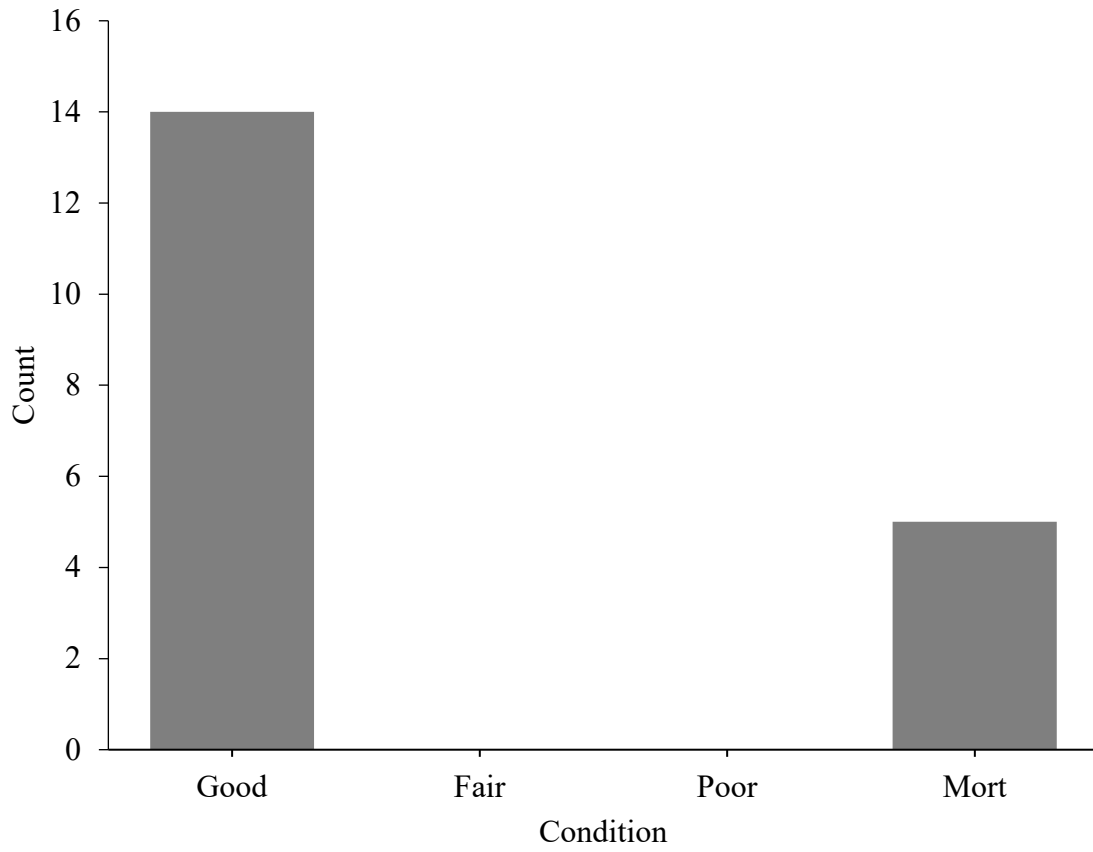




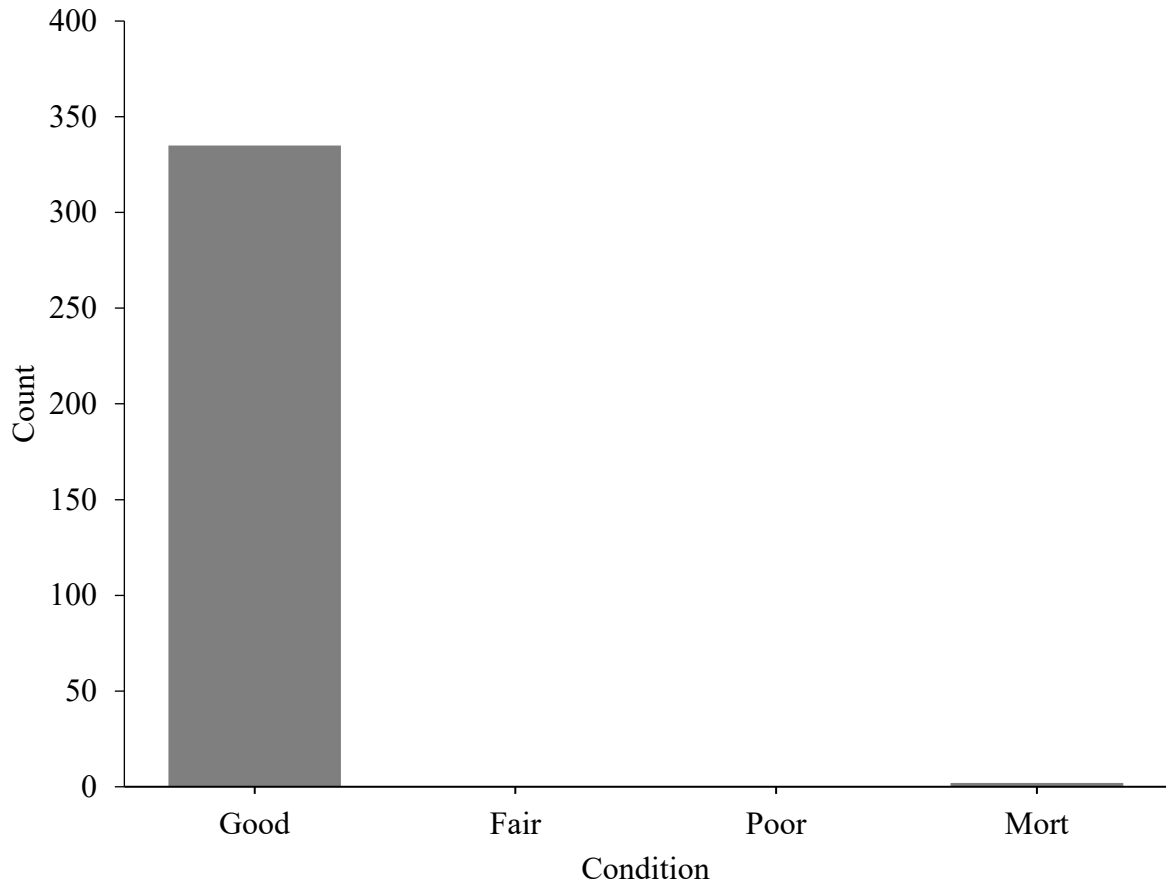
**Figure 8:** Weekly proportion of bycatch resulting in direct mortalities for Bull Trout captured during the spring 2023 Walleye suppression netting.



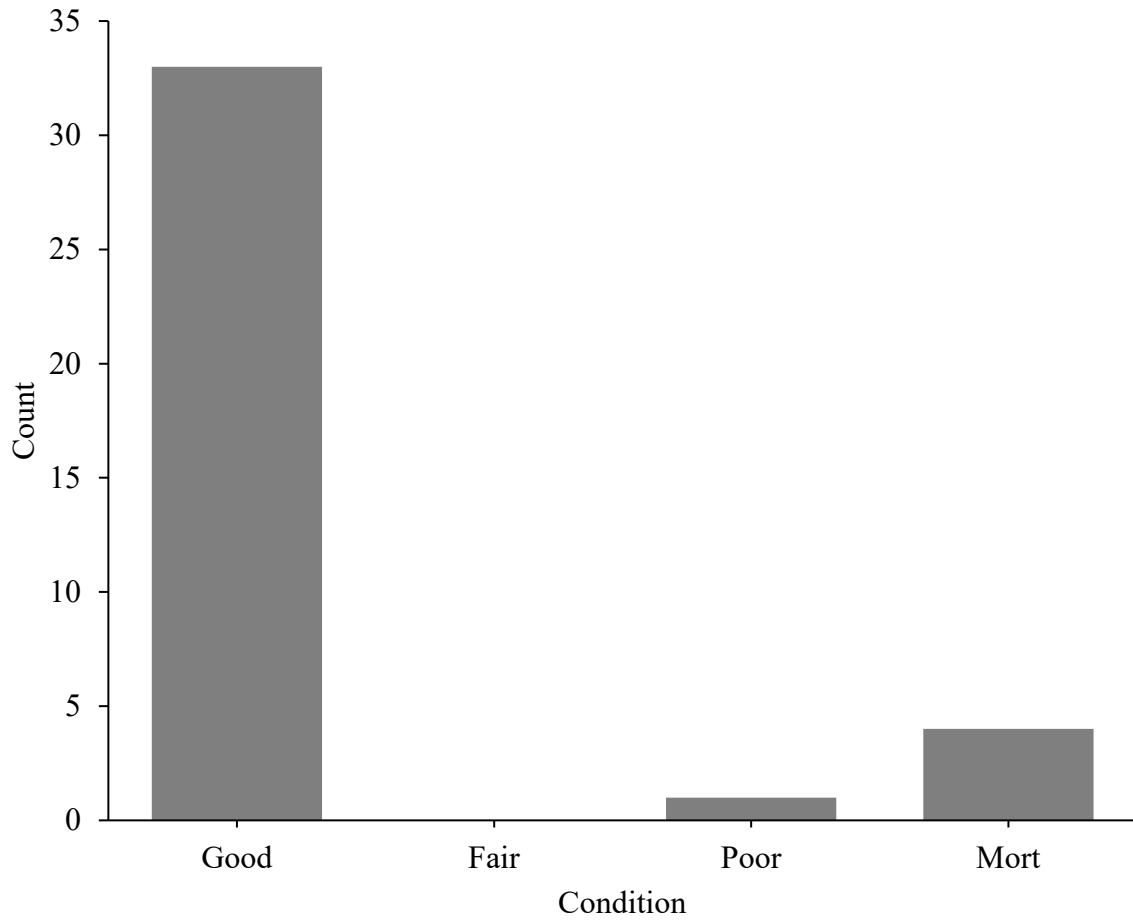
**Figure 9:** Walleye to Bull Trout catch ratios during the spring 2023 Walleye suppression netting.



**Figure 10:** Condition index of Bull Trout captured during spring 2023 Walleye suppression netting.



**Figure 11:** Condition index of Smallmouth Bass captured during spring 2023 Walleye suppression netting.



**Figure 12:** Condition index of Rainbow Trout captured during spring 2023 Walleye suppression netting.

**APPENDIX F. WALLEYE ANGLER INCENTIVE PROGRAM SUMMARY**

## 2023 LPO Walleye Angler Incentive Program Summary

Eric Geisthardt  
Rob Jakubowski

Total Walleye heads submitted = 3,194

Total unique anglers participating = 232

Table 1. Number of Walleyes removed through the Lake Pend Oreille Idaho, Angler Incentive Program (AIP), by month 2019–2023.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
2019	-	-	26	89	79	154	156	171	76	18	9	7	785
2020	12	17	60	53	71	121	137	206	130	25	14	14	860
2021	10	1	85	9	54	86	215	184	76	14	13	10	757
2022	21	23	14	34	82	90	471	278	117	78	27	12	1,247
2023	47	34	17	29	283	632	789	673	415	113	83	79	3,194

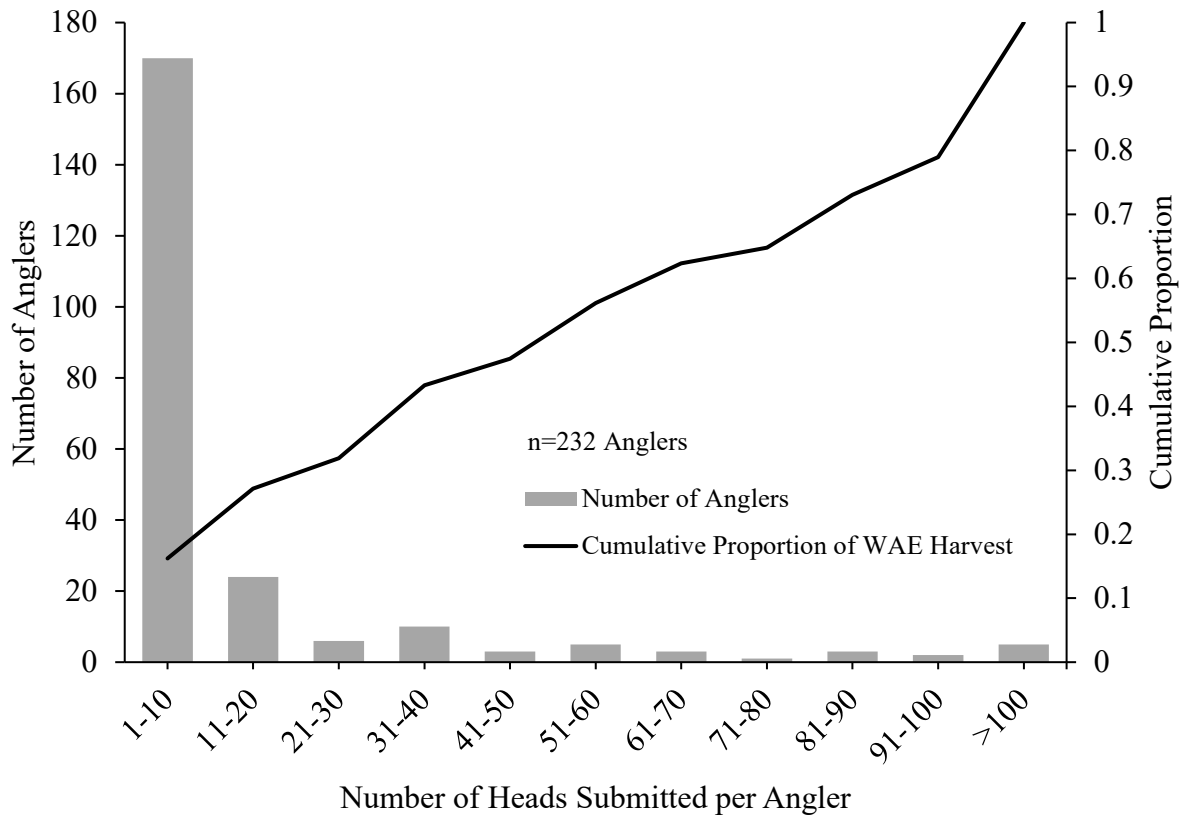


Figure 1. Total number and percent of anglers submitting heads, grouped by number of heads submitted per angler, through the Lake Pend Oreille Walleye AIP during 2023.



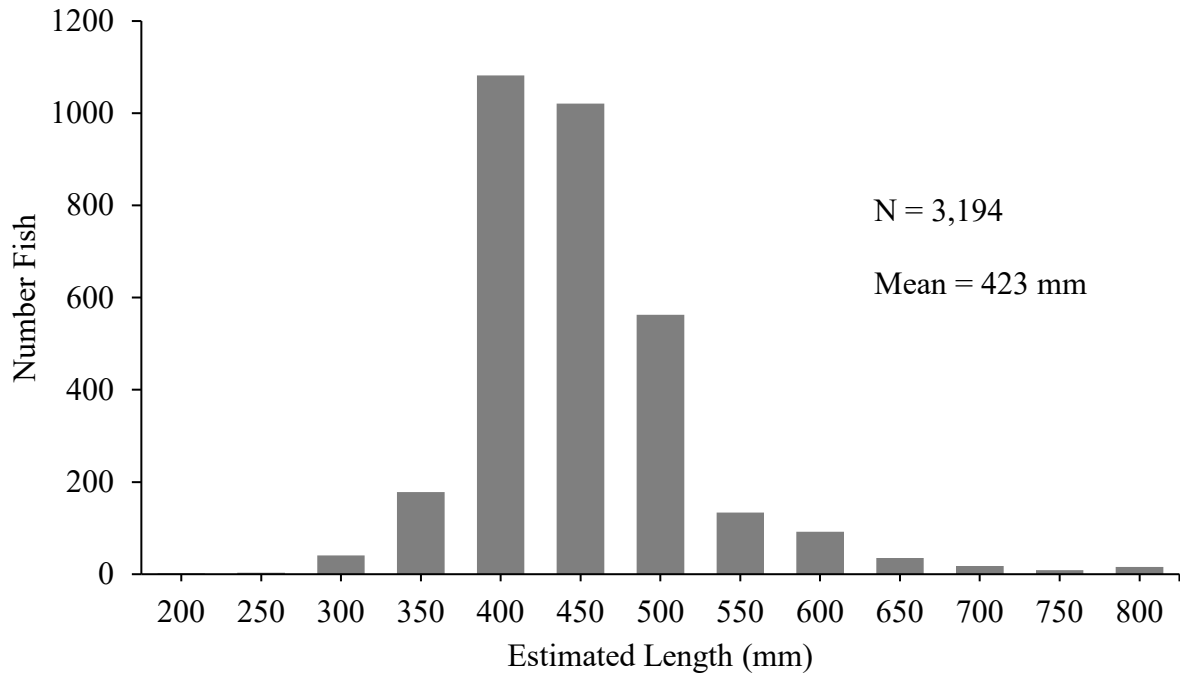


Figure 2. Length-frequency plot of Walleyes captured by anglers participating in the AIP during 2023 by estimated total length bins. Lengths were derived using a head length to total length regression formula, developed from Walleyes captured by the LPO Predator Suppression Program on Lake Pend Oreille.

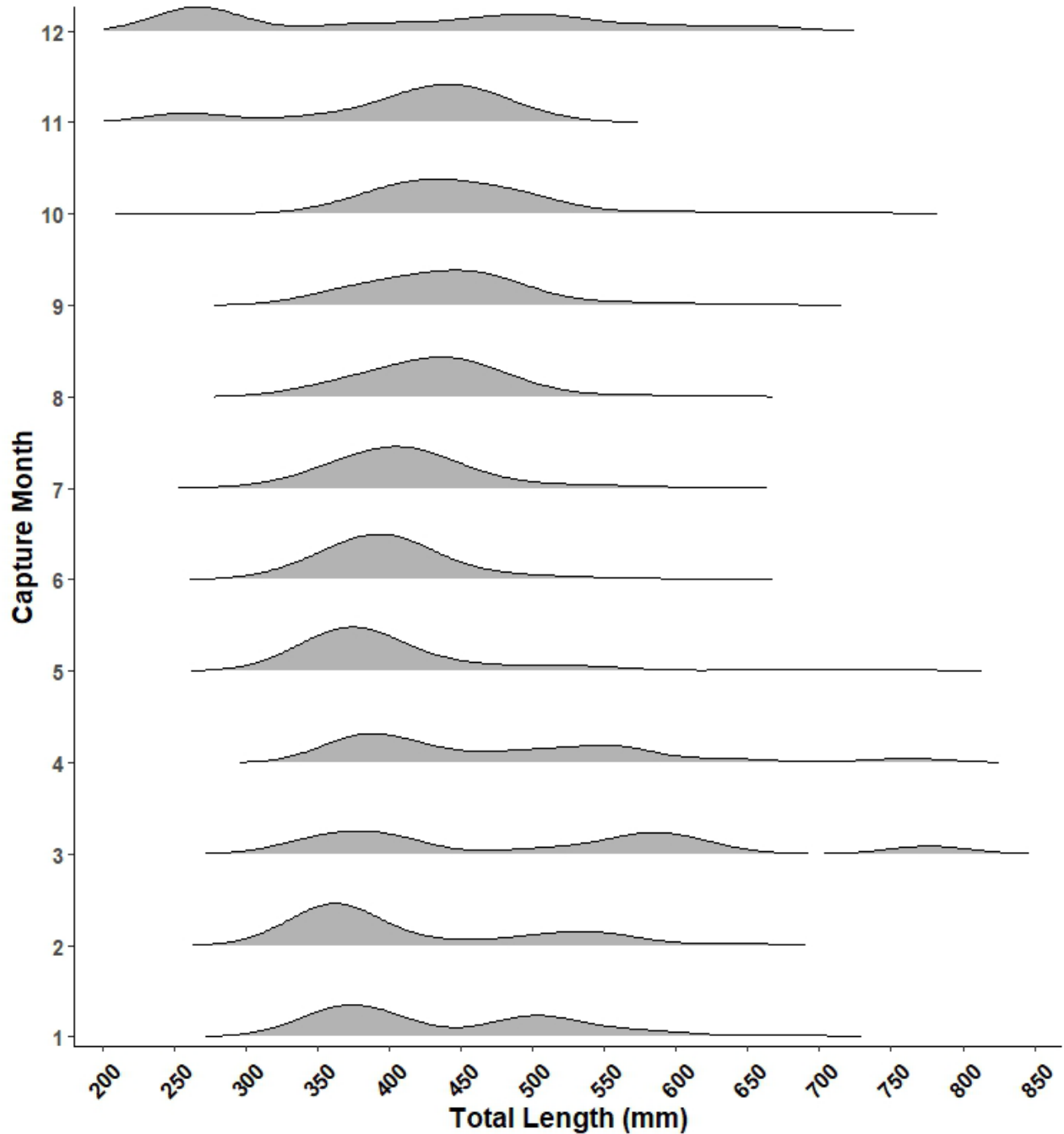


Figure 3. Density plots of the relative length frequencies distributions of Walleyes captured by anglers participating in the AIP during 2023. Lengths were derived using a head length to total length regression formula, developed from Walleyes captured by the LPO Predator Suppression Program on Lake Pend Oreille. Months are numbered 1–12 (January =1, February = 2, etc.).

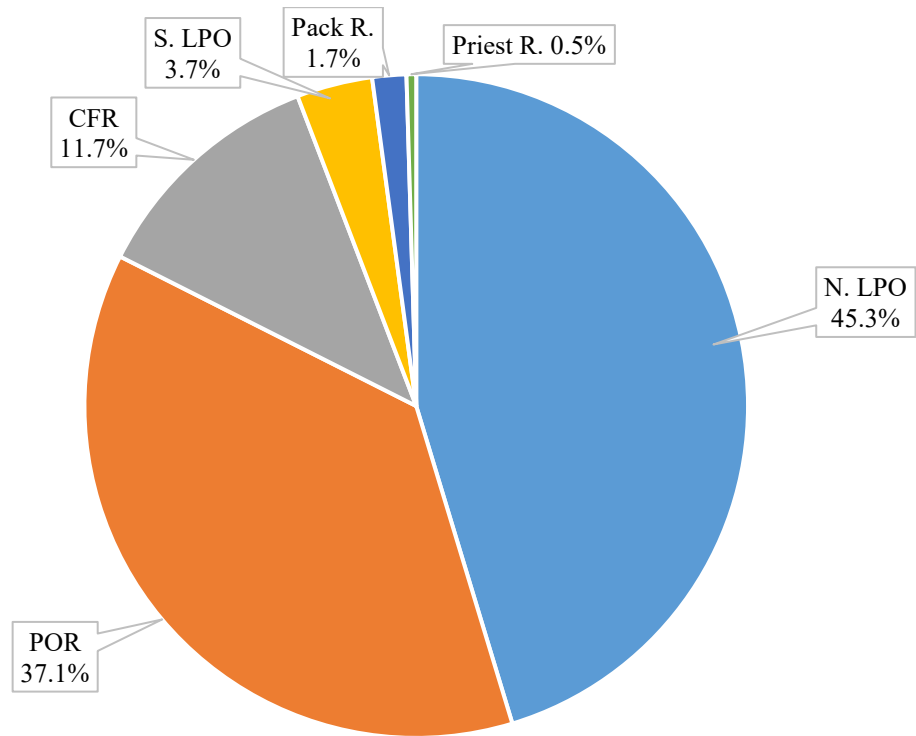


Figure 4. Locations (N. LPO: areas of LPO north of Windy Point; POR: Pend Oreille River; CFR: Clark Fork River, S. LPO: areas of LPO south of Windy Point; Priest R.; Pack R.) where Walleyes were reported to have been caught, as a percentage of the total, by anglers participating in the Walleye AIP, 2023.

**APPENDIX G. FALL WALLEYE INDEX NETTING SUMMARY**

Table 1. Catch data from the 2023 FWIN survey.

Species	Total Catch	Catch per Net	
		AVG	SD
Yellow Perch	872	18.2	24.3
Smallmouth Bass	331	6.9	10.6
Lake Whitefish	244	5.1	9.5
Walleye	217	4.5	6.0
Northern Pikeminnow	165	3.4	4.6
Largescale Sucker	93	1.9	2.3
Black Crappie	65	1.4	2.8
Tench	61	1.3	2.2
Peamouth	47	1.0	2.5
Brown Bullhead	34	0.7	1.5
Northern Pike	22	0.5	0.9
Longnose Sucker	20	0.4	0.8
Pumpkinseed	12	0.3	0.5
Kokanee	10	0.2	0.6
Brown Trout	6	0.1	0.3
Largemouth Bass	6	0.1	0.4
Mountain Whitefish	4	0.1	0.3
Westslope Cutthroat Trout	3	0.1	0.2
Lake Trout	1	0.0	0.1
Rainbow Trout	1	0.0	0.1

Table 2. Walleye information from the 2023 FWIN survey.

Indices - Walleye	Value
Catch	217
CPUE	4.52
CPUE SD	6.03
Min TL	132 mm
Max TL	773 mm
Mean TL	313 mm
Wr	89.3
PSD	91
Visceral Fat Index - Male	2.65
Visceral Fat Index - Female	2.86
Mean TL @ Age-2 - Male	445 mm
Mean TL @ Age-2 - Female	453 mm
Age @ 50% Maturity $A_{50}$ - Male	1.5
Age @ 50% Maturity $A_{50}$ - Female	2.9