Lake Pend Oreille Predator Management Program

Annual Project Update – 2022

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June 2023

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ABSTRACT

Beginning in 2006, predator suppression programs were implemented with the goal of reducing predatory fish abundance in Lake Pend Oreille (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 gillnet 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 2022 predator suppression programs on LPO. In 2022, 7,343 Lake Trout were captured, all but 37 were removed from LPO. A total of 1,171 Bull Trout *S. confluentus* were also caught, with 308 being direct mortalities (26%). Anglers turned in 2,682 Lake Trout heads through the AIP, with 16 incidental Bull Trout mortalities due to angler misidentification. In addition, 369 Walleye were removed through the Walleye netting project, with only six incidental Bull Trout mortalities. In 2022, 1,247 Walleye heads were turned in as part of the Walleye AIP, with six reward tags ($1,000 each) being returned.

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 yield fishery and are the main forage base for adfluvial Bull Trout. Westslope Cutthroat Trout *O. clarkii 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 kokanee harvests. The lake also supported an active commercial kokanee fishery. 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 20th 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 gillnet 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 Walleye 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 these downstream fisheries.

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Walleye were originally documented in LPO in the early 2000s (Schoby et al. 2007), and the population remained stable at a low density until 2011. Additionally, increasing numbers of Walleye were caught in Lake Trout netting efforts throughout the northern and southern basins of 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. 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 exists with Walleye. Lake Trout suppression programs were instituted to reduce predation risk when we began to observe rapid population increases, as we recently observed with Walleye. 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 fish tagged with coded wire tags (CWT's) for a high reward ($1,000 per fish). 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.

This report provides a timely summary of preliminary results from the 2022 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 gillnets during three weeks of assessment netting (January 3–January 21), 11 weeks in the spring netting season (January 24–April 8), nine weeks in the fall spawner netting season (September 6–November 4), and six weeks in the fall juvenile netting season (November 4–December 16).

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 gillnets 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 location around LPO (Figure 1). Suppression and spawner netting locations were chosen based on past catch history and available telemetry information. 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 and a summary of the 2019 results.

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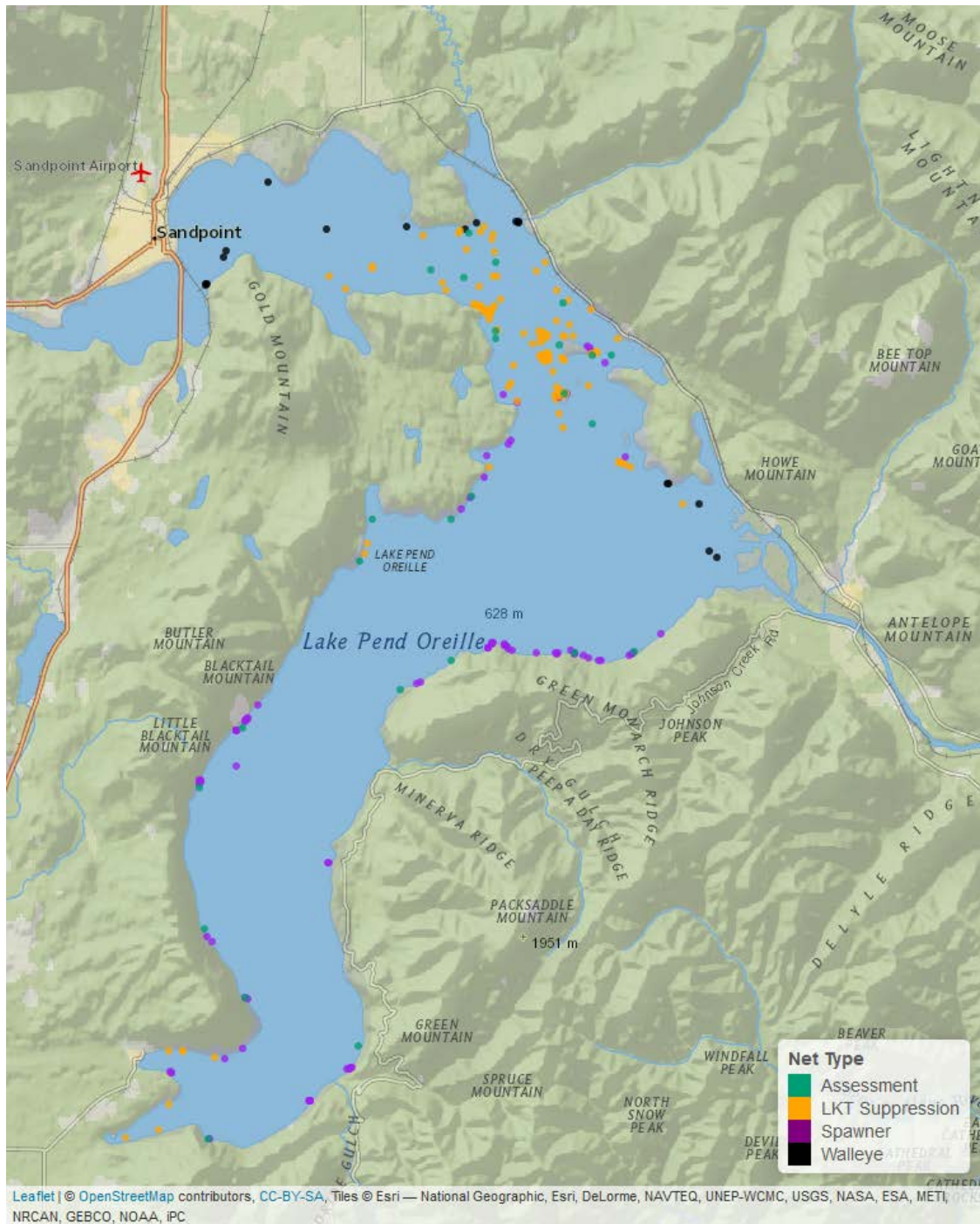
Figure 1. Netting locations in 2022 as part of the predator suppression program.

Except for spawning or recently spawned kokanee and Lake Whitefish *Coregonus clupeaformis*, all gamefish captured in gillnets 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 Walleye) 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, typically increasing the participation and resulting number of Lake Trout removed from the system.

WALLEYE

Telemetry

During 2022, Walleye greater than 515 mm (n = 4) in LPO were tagged using 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 77 walleye 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 41 walleye 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.
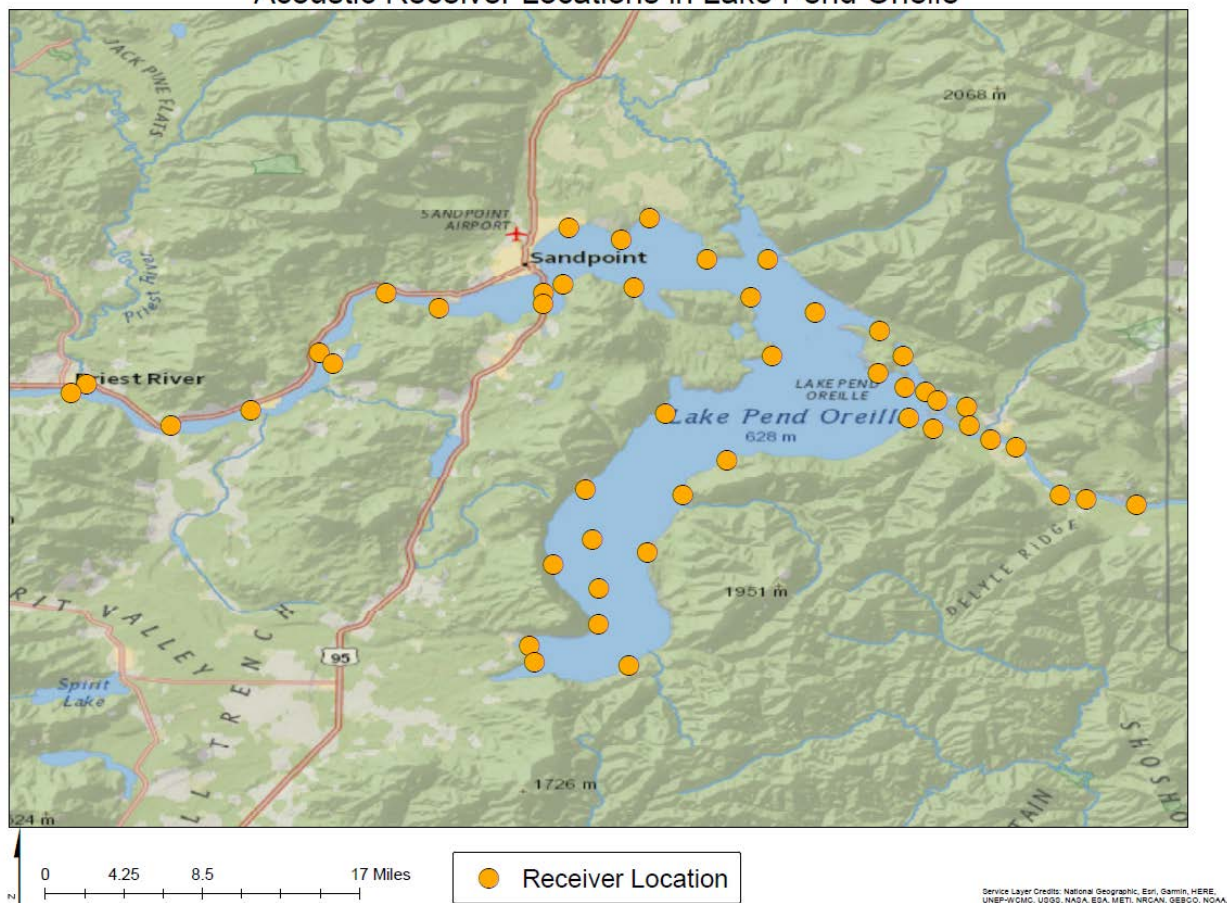

Figure 2. Acoustic receiver locations in Lake Pend Oreille.

Netting

Hickey Brothers Research, LLC was contracted to operate gillnets during three weeks in the spring of 2022 (April 11– 29) to target Walleye. This was done to evaluate their use as a tool to reduce Walleye abundance in LPO. Aided by telemetry data, gillnet effort was primarily focused on the following areas: Pack River delta, Fisherman's Island area, Sheepherder Point, immediately north of the Burlington Northern train bridge in Sandpoint, Kootenai Point, and adjacent to the mouth of the Clark Fork River delta (Figure 1).

Bottom-set gillnets 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. Gillnets were set just before dawn and retrieved mid-morning, typically after 4–6 hours fishing time. Except for

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Lake Whitefish (because of high abundances in the catch), all gamefish captured in gillnets were enumerated. Catch rates were calculated as the number of Walleye captured per 274 m box.

Captured Walleye were measured for total length and checked for existing tags or marks. Thirty-eight Walleye were implanted in the snout with CWTs during 2022 to maintain an adequate group of tagged fish for the AIP. To date, 188 Walleye have been implanted with CWTs, although we estimate about 53 are still at large due to known or estimated natural mortality. Remaining Walleye 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 Walleye from LPO had the option to turn the heads in 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 Walleye 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 7,343 Lake Trout were captured during 2022, all but 37 were removed from the lake. A total of 1,171 Bull Trout were also caught, with 308 of them being mortalities (26%). The number of Lake Trout removed by the netting program annually since suppression began in 2006 is shown in Figure 3.
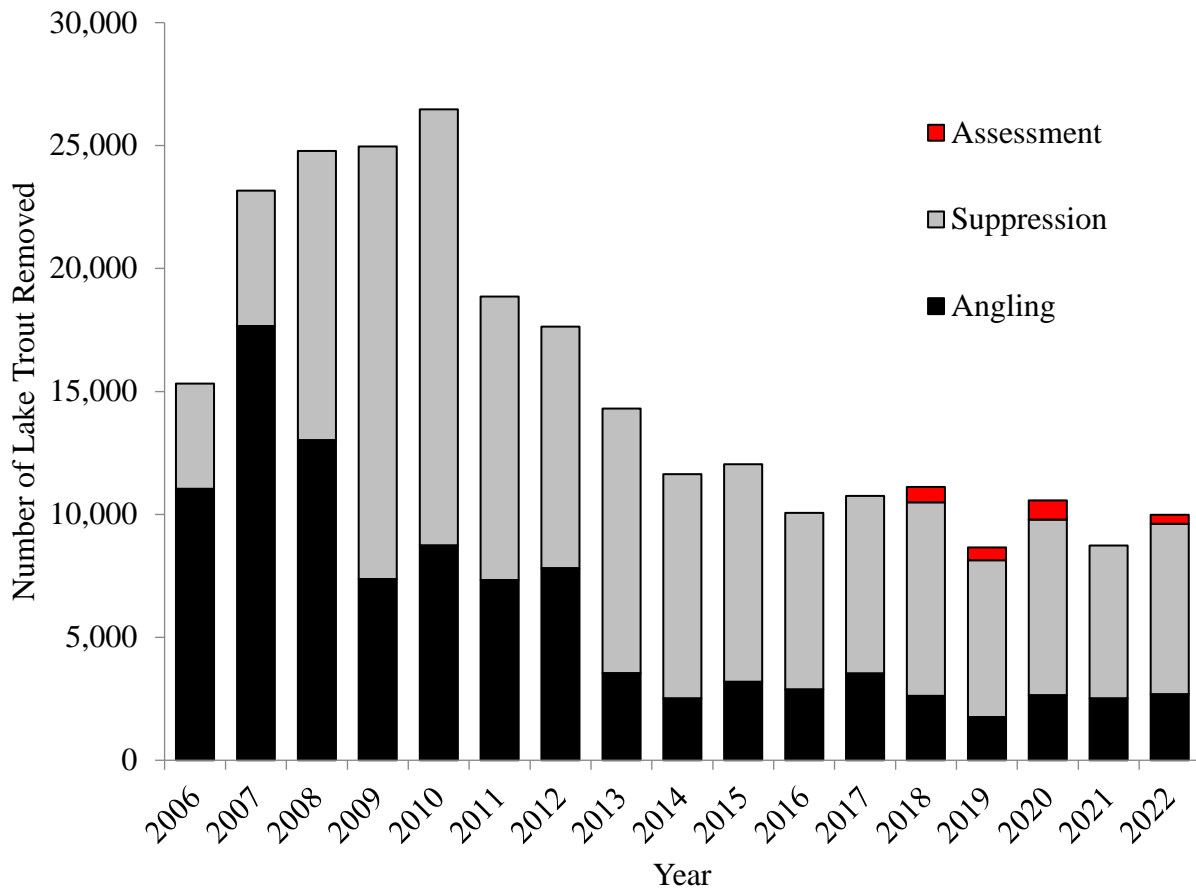
Figure 3. Number of Lake Trout removed during assessment netting, suppression netting, and by incentivized angling 2006–2022, Lake Pend Oreille, Idaho.

Data specific to the assessment netting data are listed in Appendix A, spring 2022 netting program are listed in Appendix B, and fall 2022 netting program data are listed in Appendix C.

Angler Incentive Program
Anglers turned in a total of 2,682 Lake Trout heads in 2022 (Figure 3). This represented 27% of the total LKT removed from LPO in 2022. A total of 224 different anglers participated in the program in 2022. Data were collected from all submitted heads to describe the size structure of the fish harvested under this program. Seven LPO derbies were recipients of sponsorship funding. These were the Lake Pend Oreille Idaho Club Spring (April 23–May 1), Members Only (September 24–25), and Thanksgiving derbies (November 19–27); the Lake Pend Oreille Anglers Club Fall (November 3–6) and Spring (May 20–22) derbies; the Captn's Table Halloween (October 29–30) derby; and the Oktoberfish derby (October 1–2). The entire $2,000 for each derby was dedicated towards Lake Trout prizes.

In 2022, 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 Bull Trout Protection and Public Education Program.

Data specific to the 2022 Lake Trout AIP are listed in Appendix D.

WALLEYE
Telemetry
From telemetry efforts, it was determined that Walleye 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. Walleye 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 Denton Slough, Oden Bay and Kootenai Bay, and downstream to near the Sandpoint Bridges and into the Pend Oreille River. Due to our increased receiver coverage in 2022, Walleye were documented moving to the south end of LPO in the fall for the first time, concurrent with kokanee forming spawning aggregations in that area. These data were regularly posted on the Idaho Department of Fish and Game (IDFG) website (https://idfg.idaho.gov/news/panhandle) and numerous anglers responded positively to this information.

Netting
Gillnetting proved to be an effective method for capturing Walleye during the pre-spawn period. Walleye were concentrated in relatively shallow water and catch rates were relatively high while bycatch was reasonably low. A total of 369 Walleye were removed (Figure 4), with six of twelve incidentally caught Bull Trout being mortalities (50%).

Data specific to the 2022 Walleye Netting Program are listed in Appendix E.
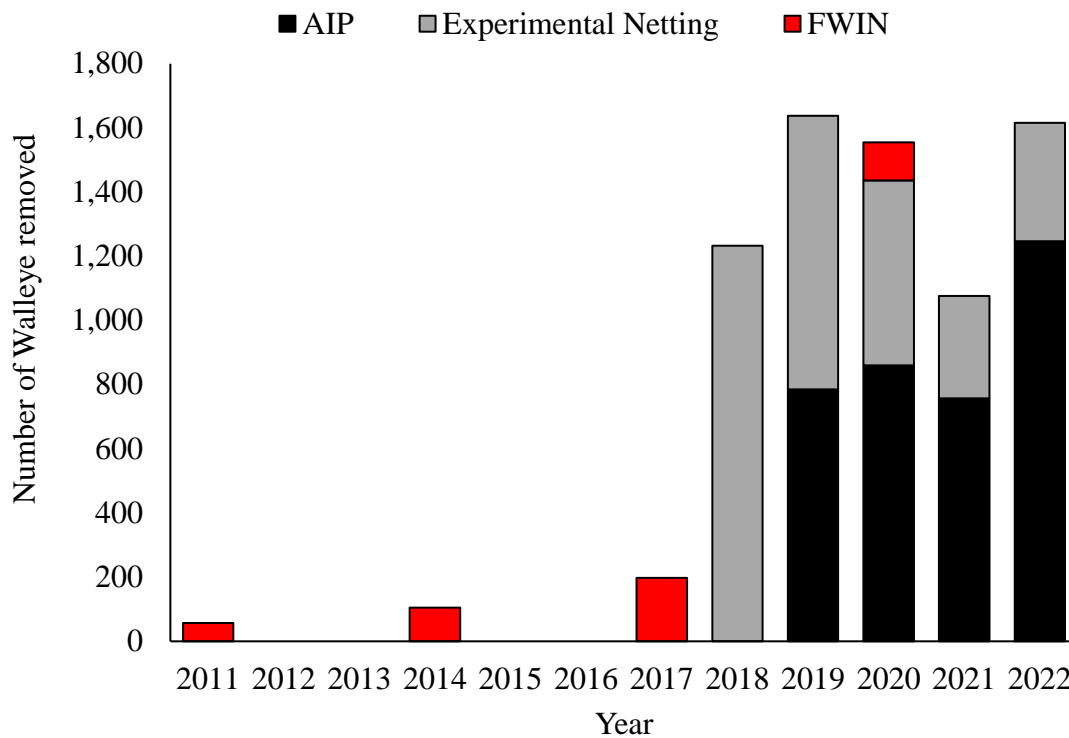
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Figure 4. Number of Walleye removed in the Lake Pend Oreille basin through the angler incentive program, experimental suppression netting, and fall Walleye index netting (FWIN) surveys, 2011 through 2022.

Angler Incentive Program
Anglers submitted 1,247 Walleye heads in 2022 (Figure 4). Six of the heads contained a coded wire tag. A total of 157 unique anglers participated in this program in 2022.

Data specific to the 2022 Walleye AIP are listed in Appendix F.

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 investigating the use of netting to suppress the Walleye population
5. Continue investigating the Walleye AIP as a tool to suppress the Walleye population

review of previous versions of this report. We would also like to thank Avista employees Nate Hall, Monica Ott, Heide Evans, Ceil Orr, and Paul Kusnierz for their administrative support. These projects were funded through Appendix F5 of the Clark Fork Settlement Agreement and the U.S. Department of Energy, Bonneville Power Administration.

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APPENDIX A. 2022 LPO ASSESSMENT NETTING SUMMARY

2022 Lake Pend Oreille Assessment Netting Summary
1/3/2022–1/21/2022
Jeff Strait
02/23/2022

Overview

During randomized assessment netting in 2022 (hereafter, LKT assessment netting), we set gillnets 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 gillnets were constructed of 300 ft (91.4 m) panels of translucent stretch mesh ranging from 1.5 (38.1 mm) to 5.5 (139.7 mm) inches. Each panel contained a single size (in) mesh (i.e., 1.5, 1.75, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5) and panels were strung together to create 900 ft (274.3 m) "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 (900 ft) of each mesh size (listed above). This stratified random netting effort is hereafter referred to as LKT assessment netting.

A total of 402 Lake Trout (*Salvelinus namaycush*) ranging from 105 mm to 813 mm were captured using an effort of 234,000 ft (71,323.2 m) of net. Of the total captured, we removed 375 Lake Trout, and implanted 27 acoustic transmitters in Lake Trout to inform future suppression efforts. During this sampling, we collected otoliths from Lake Trout for aging purposes from fish throughout the lake. Lake Trout were separated into 50 mm length bins with a goal of 10 otoliths per bin. We collected 101 otoliths from 18 of 26 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 300-ft net of each mesh size. We counted and measured a total of 3,408 Lake Whitefish ranging from 160 mm to 510 mm in 99,000 ft (30,175.2 m) of net.

As part of the bycatch during these efforts, 13 different species were captured including ESA threatened Bull Trout (*Salvelinus confluentus*). A total of 121 Bull Trout were captured during the assessment netting efforts with an average direct mortality rate of 27.27%. We PIT tagged 69 and recaptured 32 previously tagged Bull Trout. Bull trout condition was broken down as following:
- Good = 78
- Fair = 6
- Poor = 4
- Not Reported = 0
- Mortalities = 33 (mort recaps = 13)

In addition to tagging Bull Trout, we collected tissue samples for genetic analysis from 72 of the released Bull Trout.

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To maximize the netting efforts, we used the instances of bycatch to tag Smallmouth Bass (*Micropterus dolomeiu*) and Gerrard Rainbow Trout (*Oncorhynchus mykiss*) with reward and non-reward Floy T-bar anchor tags when possible.. We tagged a total of 1 Smallmouth Bass with a reward tag, and recaptured 0 Smallmouth Bass. No Rainbow Trout were encountered.

The following tables and figures provide summary information on catch and bycatch from gillnet efforts during the randomized Lake Trout (LKT) assessment netting 2022.

Sample Sites
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Figure 1: Map of Lake Pend Oreille showing the number of Lake Trout captured at the randomly selected sites during LKT assessment netting in 2022.

Figure 2: Map of Lake Pend Oreille showing the number of Lake Whitefish captured at randomly selected subsample of sites during LKT assessment netting in 2022.

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Tables

Table 1: Summary of the 2022 LKT assessment gillnetting sets. For each species encountered, statistics include the number captured (Captured), released alive (Released), tagged with PIT tags (Tagged), recaptured PIT-tagged individuals (Recaptured), and the number removed (Removed) from LPO. 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	Tagged	Recaptured	Removed
Lake Whitefish	3,408	3,408	0	0	0
Lake Trout	402	27	27	0	375
Kokanee	264	256	0	0	8
Bull Trout	121	88	69	32	33
Walleye	26	0	0	0	26
Smallmouth Bass	23	23	1	0	0
Brown Trout	18	14	0	0	4
Northern Pike	12	0	0	0	12
Mountain Whitefish	11	11	0	0	0
Yellow Perch	7	7	0	0	0
Westslope Cutthroat Trout	3	2	0	0	1
Pygmy Whitefish	2	2	0	0	0

Table 2: Summary of length (mm) data for Lake Trout, Bull Trout, Bull Trout mortalities, and Lake Whitefish captured in gillnets during the fall 2022 LKT assessment netting on LPO.

Species	Mean TL	SE	Max TL	Min TL
Lake Trout	406.2	7.1	813	105
Bull Trout	471.1	11.4	721	216
Bull Trout Mortalities	525.8	18.3	792	268
Lake Whitefish	349.8	1.4	510	160

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 gillnets during the 2022 LKT assessment netting efforts on LPO.

Mesh Size (in)	LKT CPUE	LKT SE	BLT CPUE	BLT SE	BLT Mort CPUE	BLT Mort SE	BLT Mort Rate	LWF CPUE	LWF SE
1.5	1.12	0.49	0.08	0.05	0.00	0.00	0.00	40.64	23.83
1.75	2.35	1.00	0.31	0.11	0.00	0.00	0.00	38.18	24.01
2	2.00	0.78	0.08	0.05	0.12	0.06	0.62	44.73	28.94
2.5	2.69	0.60	0.31	0.12	0.27	0.09	0.52	39.55	20.04
3	1.50	0.43	0.62	0.19	0.23	0.12	0.22	47.27	13.89
3.5	2.50	0.78	0.58	0.19	0.31	0.11	0.41	53.09	11.62
4	1.65	0.54	0.35	0.10	0.04	0.04	0.06	30.73	5.58
4.5	1.54	0.42	0.54	0.19	0.15	0.07	0.30	14.00	2.88
5	0.54	0.19	0.42	0.22	0.12	0.06	0.37	1.64	0.53
5.5	0.62	0.24	0.12	0.06	0.04	0.04	0.25	0.00	0.00
Mean	1.65	0.55	0.34	0.13	0.13	0.06	0.28	30.983	13.132

Table 4: Catch statistics for Lake Trout (LKT), Bull Trout (BLT), and Lake Whitefish (LWF) during the randomized assessment netting from 2018–2022 on LPO. This includes the total number of each species caught (n), mean catch per unit effort (CPUE, # fish / 274m of net), and the standard error (SE).

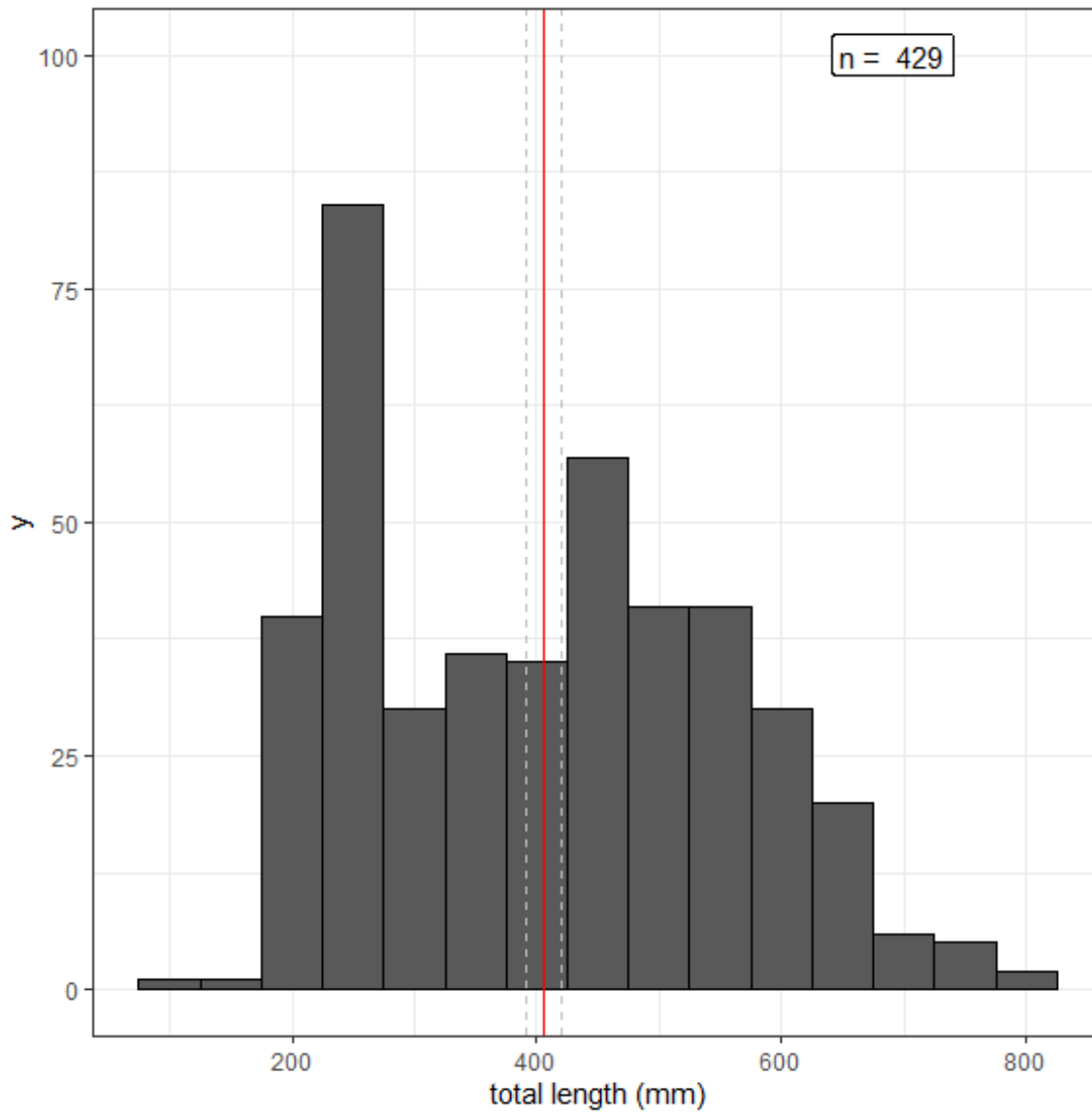| Year	n.LKT	CPUE.LKT	SE.LKT	n.BLT	CPUE.BLT	SE.BLT	n.LWF	CPUE.LWF	SE.LWF
2018	628	2.18	0.26	241	0.84	0.08	3,126	10.85	2.18
2019	516	2.15	0.21	327	1.36	0.13	3,436	14.32	2.91
2020	777	3.24	0.32	212	0.88	0.09	4,759	19.83	3.81
2022	429	1.65	0.19	121	0.47	0.06	3,408	13.11	2.44

Figures

Figure 3: Length frequency distribution of Lake Trout captured in gillnets during the 2022 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.
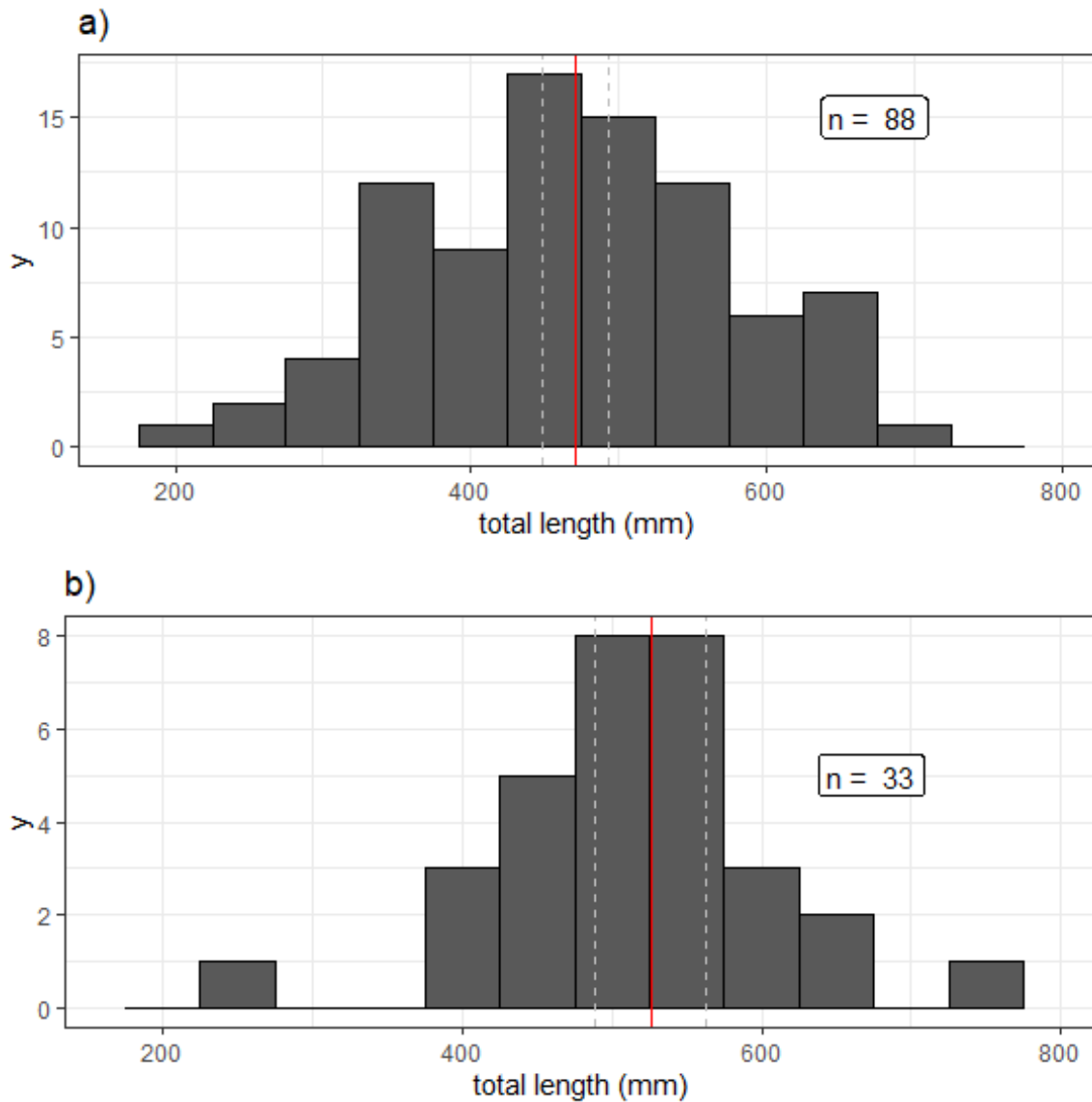
a)

b)

Figure 4: Length frequency distributions of Bull Trout captured in gillnets during the 2022 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.
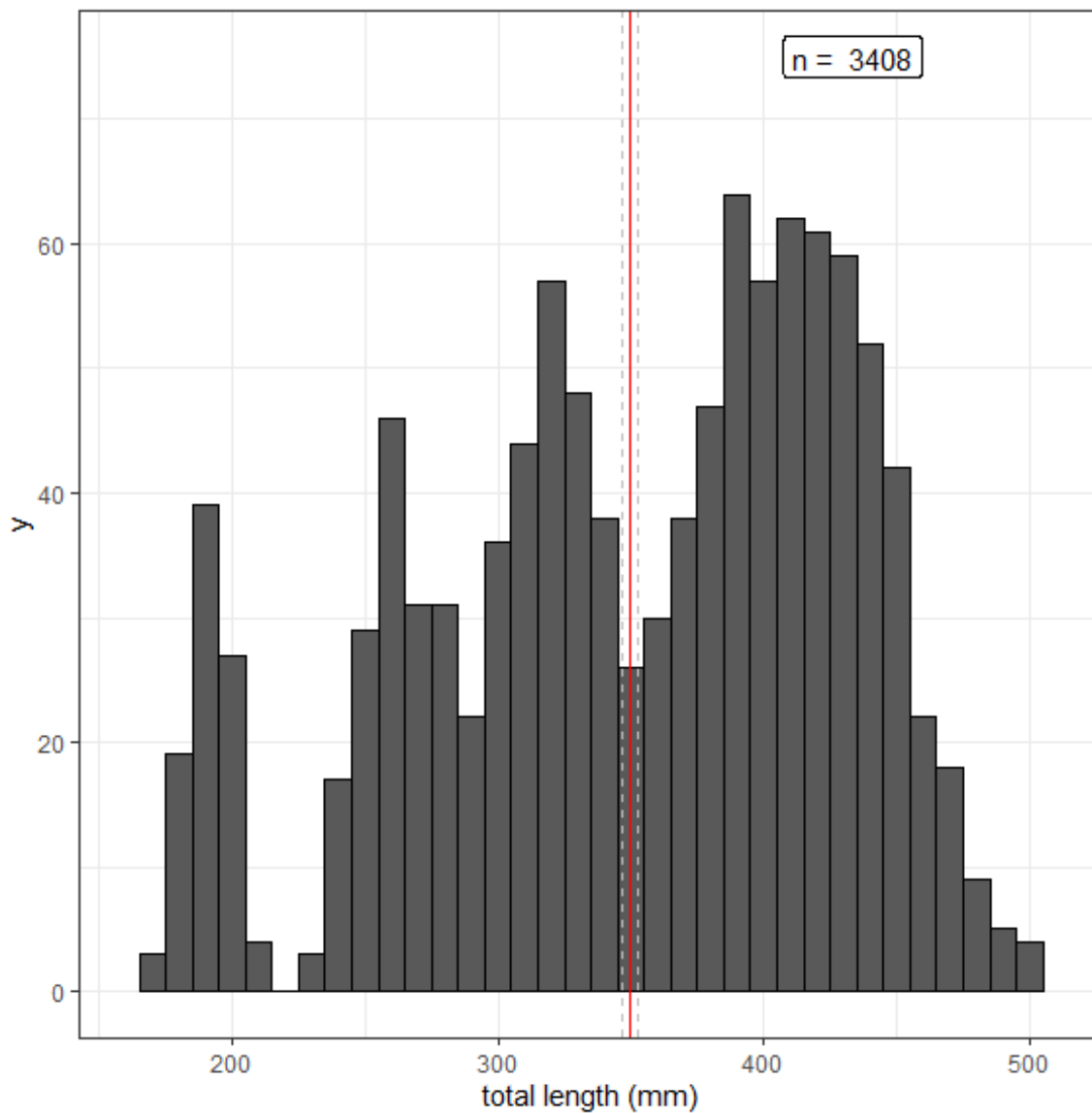
Figure 5: Length frequency distribution of Lake Whitefish captured and measured from a subset of the 2022 LKT assessment nets on LPO. The vertical red line represents the mean total length (mm) and the dashed grey lines represent two standard errors above and below the sample mean.
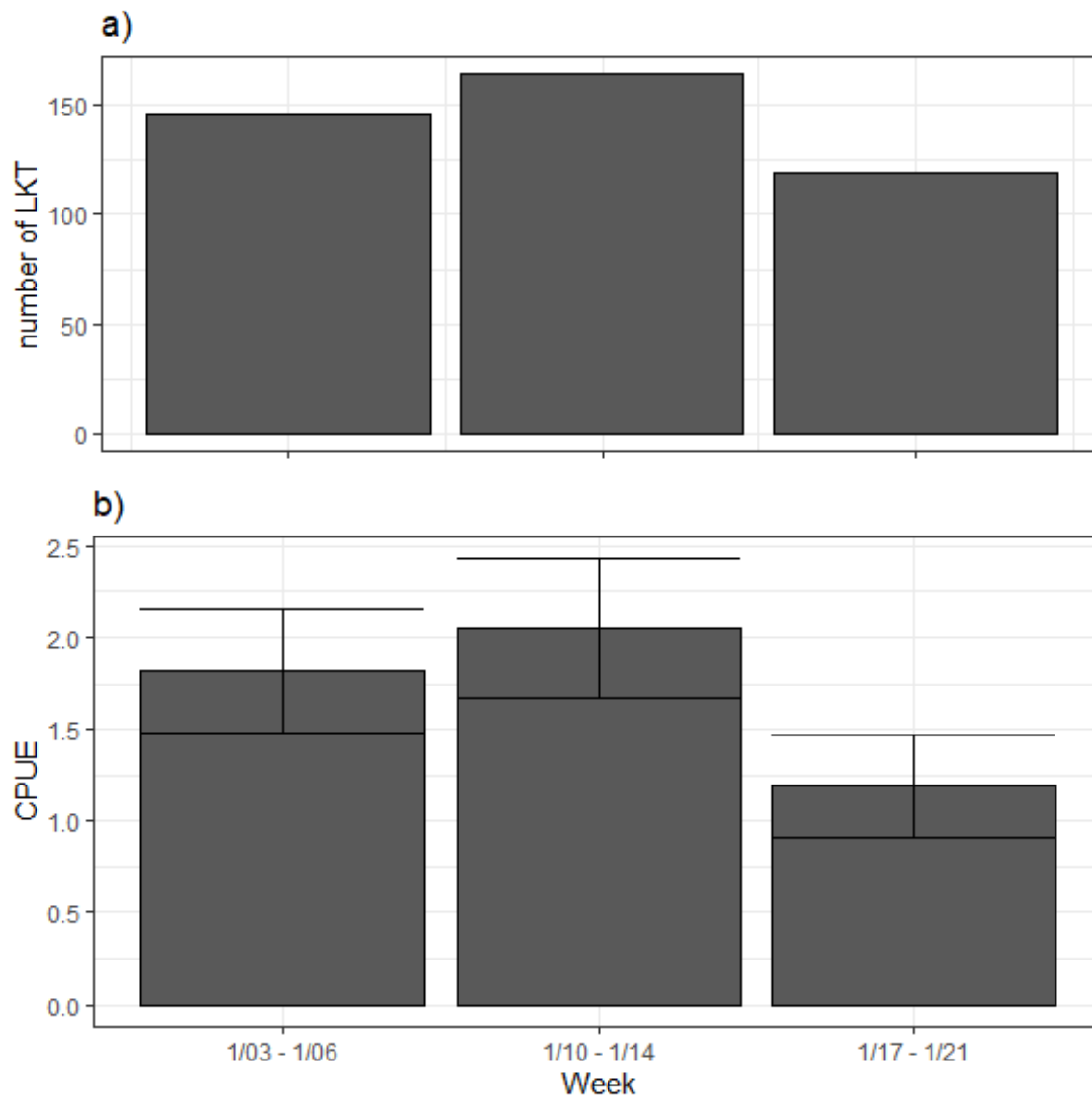
24

Figure 6: Total weekly catch (a) and mean and standard error of weekly catch per unit effort (b, # fish per 274 m of gillnet) of Lake Trout captured in gillnets during the 2022 LKT assessment netting efforts on LPO.
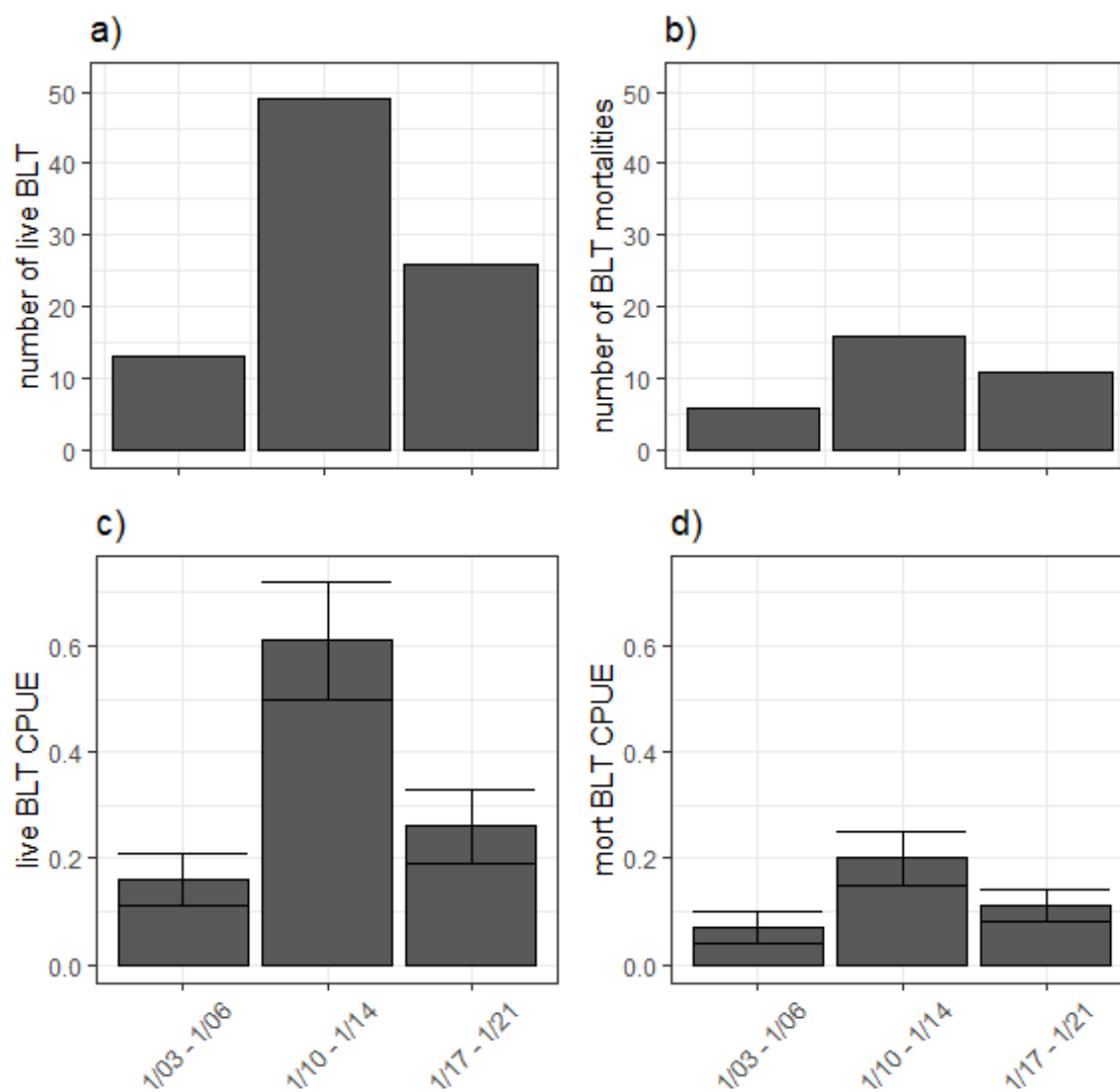
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Figure 7: Total weekly catch of Bull Trout released alive (a) and direct mortalities (b), and the mean and standard error of weekly catch per unit effort (# fish per 274 m of gillnet) of Bull Trout captured and released alive (c) and direct mortalities (d) from gillnets during the 2022 LKT assessment netting efforts on LPO.
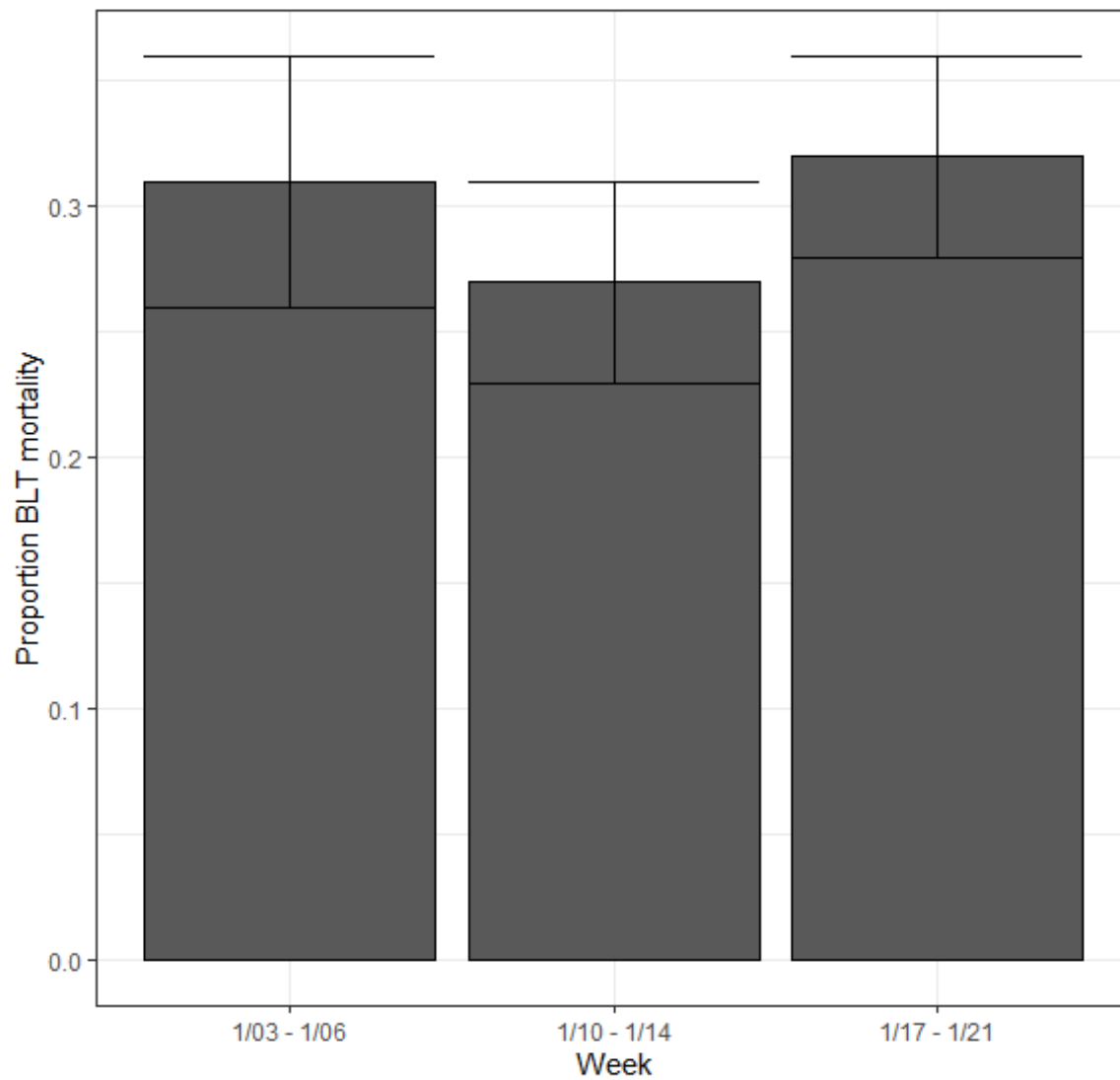
26

Figure 8: The mean and standard error of proportion of Bull Trout bycatch resulting in direct mortality during each week of the 2022 LKT assessment netting efforts on LPO.
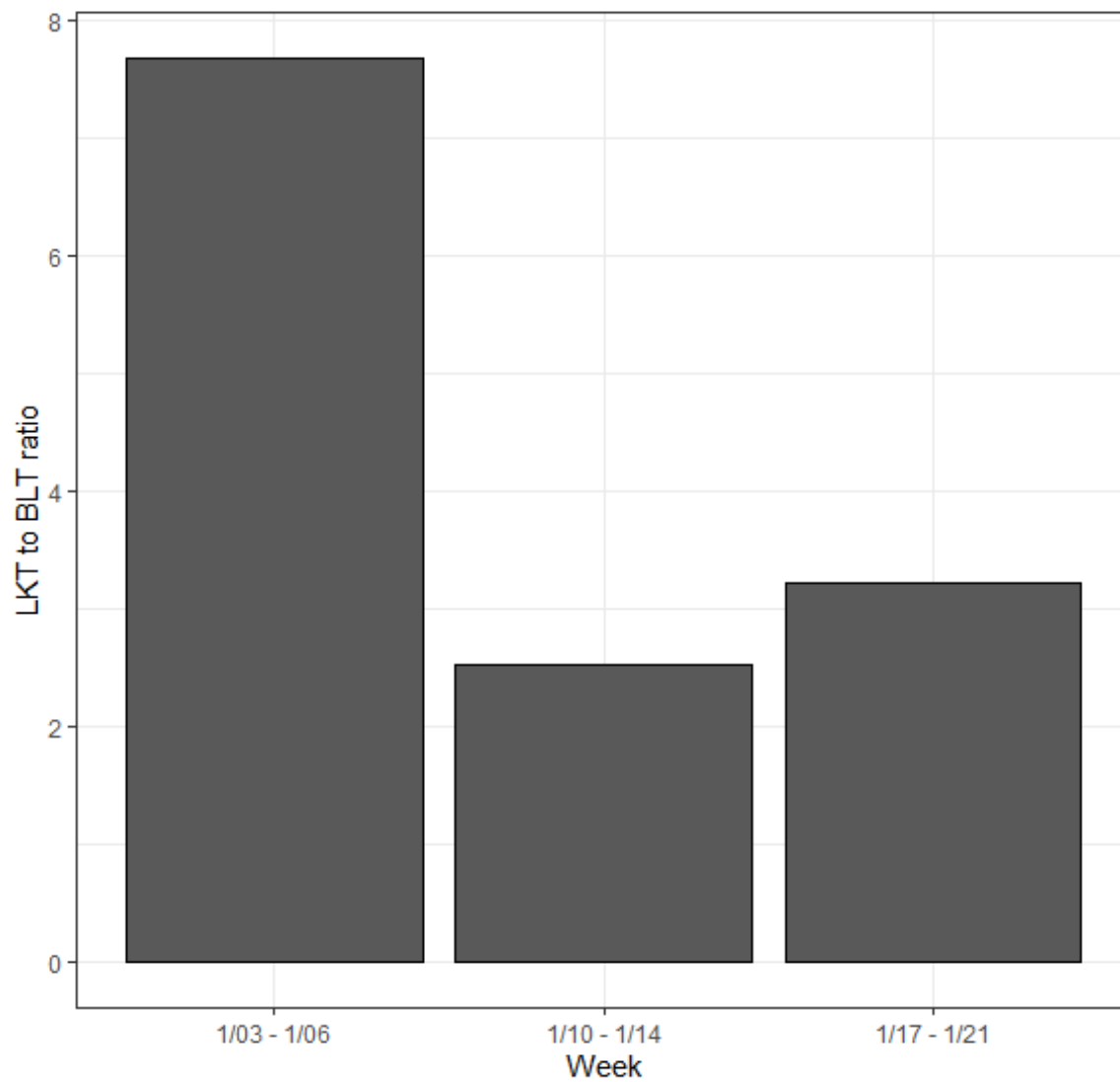
Figure 9: Mean weekly Lake Trout to Bull Trout catch ratios during the 2022 LKT assessment netting efforts on LPO.
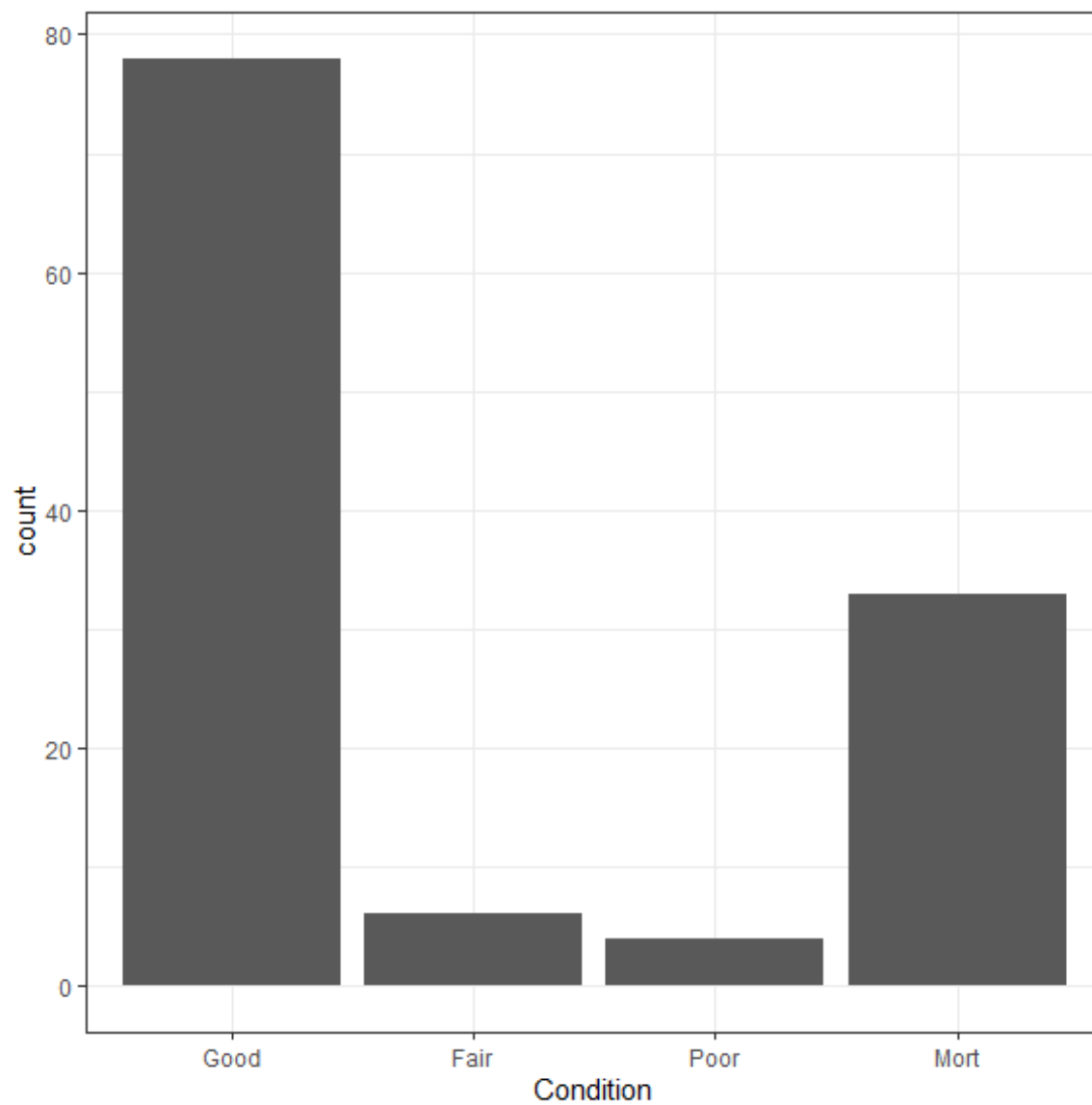
Figure 10: Condition index of Bull Trout captured during the 2022 LKT assessment netting efforts on LPO.
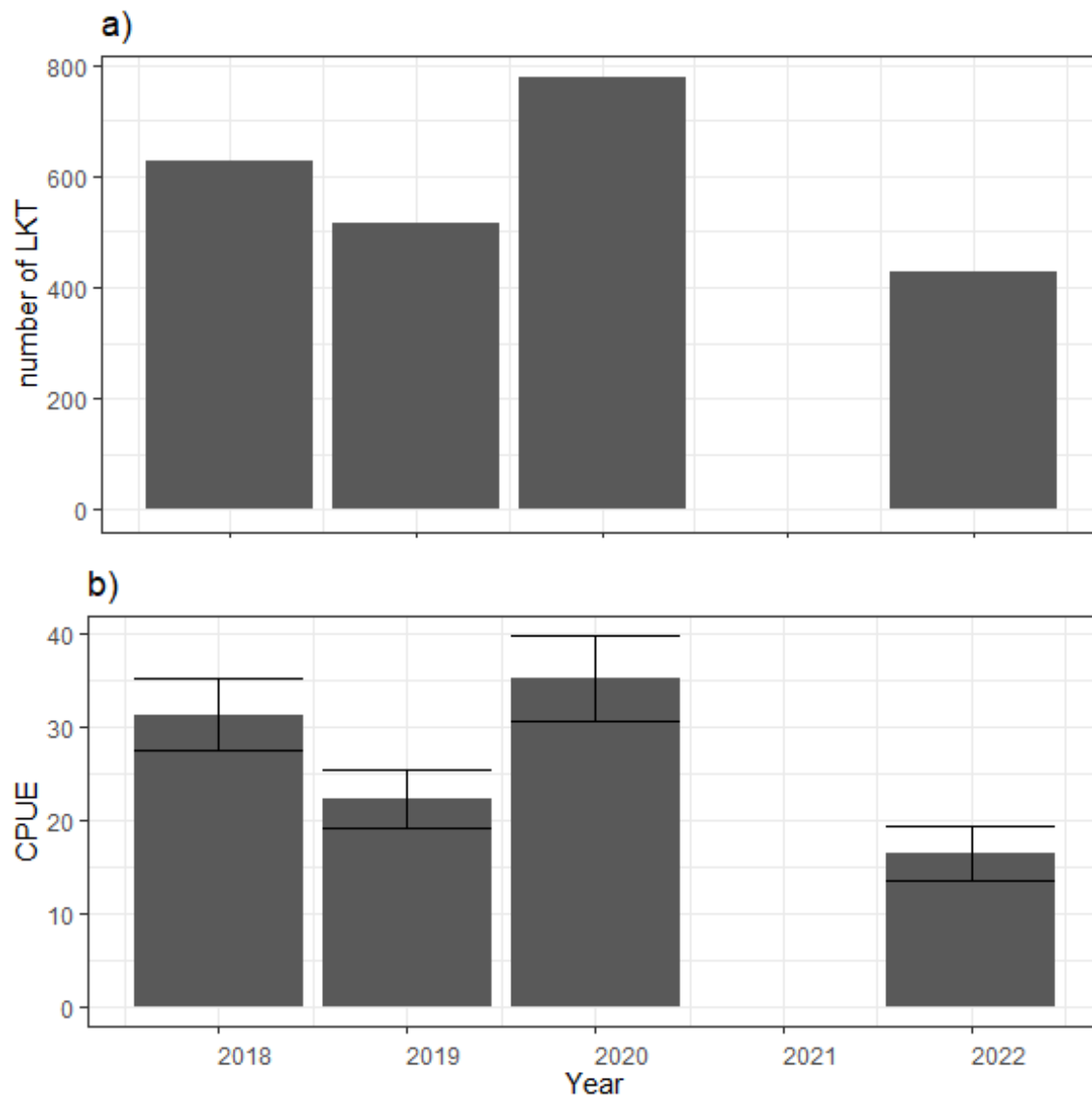
Figure 11: Annual catch (a) and mean and standard error of catch per unit effort (b, # fish per 274 m of gillnet) of Lake Trout during the designated LKT assessment netting efforts from 2018–2022 on LPO. Note: During the 2021–2022 netting year we moved assessment netting from December to January - there was no gap in data collection, only a two-week shift in start date.
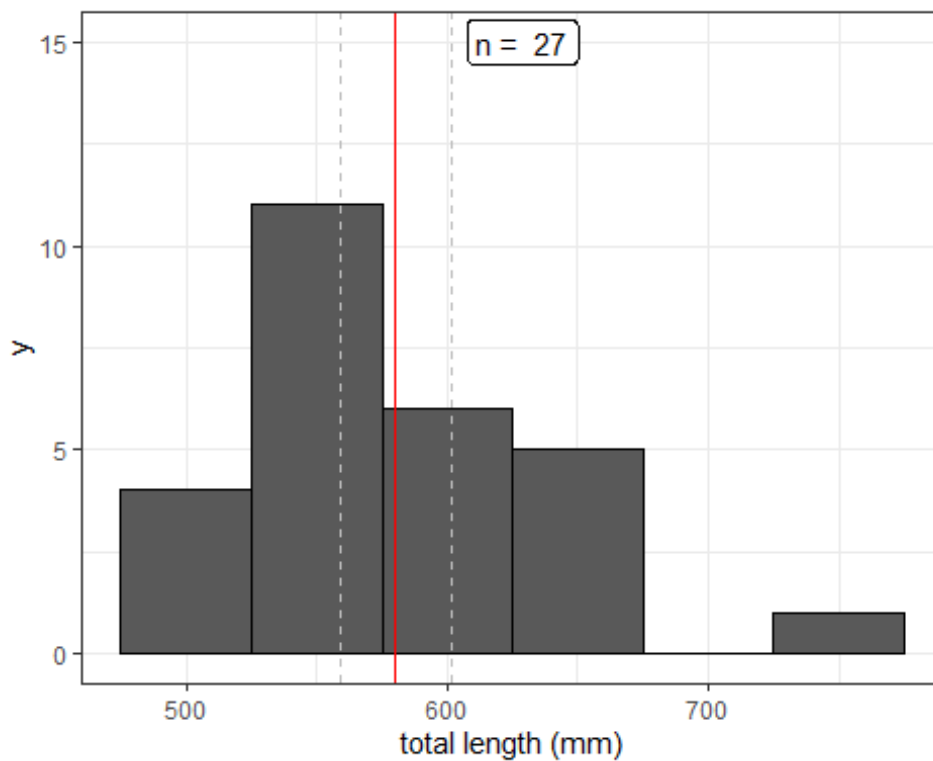
Figure 12: Length frequency distribution of Lake Trout tagged with Vemco acoustic transmitters during the 2022 LKT assessment netting efforts on LPO. The vertical red line represents the mean total length (mm) and the dashed grey lines represent two standard errors above and below the sample mean.

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APPENDIX B. SPRING 2022 LPO LAKE TROUT NETTING SUMMARY

Spring 2022 LPO Lake Trout Netting Summary
1/24/2022–4/08/2022
Jeff Strait
05/03/2022
Overview

During spring 2022, gillnetting effort was divided into two categories based on mesh sizes fished and the primary target. We fished a combination of 2.0, 2.5, and 3.0 inch (50.8, 63.5, and 76.2 mm) mesh gillnets to target juvenile Lake Trout (*Salvelinus namaycush*, hereafter, Small Mesh) and 5.0 and 5.5 inch (127 and 139.7mm) mesh gillnets to target adult Lake Trout (hereafter, Large Mesh). A grand total of 3,399 Lake Trout were removed using a total effort of 913,500 ft (278,434.8 m) of net during the spring 2022 netting season. In the Small Mesh sets, a total of 2,913 Lake Trout were removed ranging from 216 mm to 785 mm total length using an effort of 466,200 ft (142,097.8 m) of net. In the Large Mesh sets, a total of 486 Lake Trout were removed ranging from 316 mm to 906 mm total length using an effort of 447,300 ft (136,337 m) of net.

As part of the bycatch during these efforts, sixteen different species were captured including ESA Threatened Bull Trout (*S. confluentus*). A total of 145 Bull Trout were captured during the Lake Trout suppression efforts with an average direct mortality rate of 22.07%. We PIT tagged 69 and recaptured 48 previously tagged Bull Trout. Bull trout condition was broken down as following:

- Good = 93
- Fair = 14
- Poor = 6
- Not Reported = 0
- Mortalities = 32 (mort recaps = 0)

In addition to the mark-recapture data collection for Bull Trout, we also collected 80 genetic samples from tagged and released Bull Trout.

The following tables and figures provide summary information on catch and bycatch from gillnet efforts during the complete spring 2022 netting season.

Tables

Table 1: Summary of the spring 2022 gillnetting from Large Mesh and Small Mesh sets. For each species, we include the number of fish captured (Captured), released alive (Released), tagged with PIT, T-bar, or acoustic tags (Tagged), recaptured previously-tagged 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	486	1	0	1	485
	Bull Trout	47	44	27	18	3
	Smallmouth Bass	29	29	8	1	0
	Brown Trout	12	11	0	0	1
	Walleye	5	0	0	0	5
	Northern Pike	2	0	0	0	2
	Black Crappie	1	1	0	0	0
	Rainbow Trout	1	0	0	0	1
	Rainbow X Cutthroat Trout	1	0	0	0	1
	Yellow Perch	1	1	0	0	0
Small Mesh	Lake Trout	2,913	1	0	0	2,912
	Bull Trout	98	69	42	30	29
	Kokanee	26	22	0	0	4
	Northern Pike	19	0	0	0	19
	Walleye	13	0	0	0	13
	Yellow Perch	11	11	0	0	0
	Brown Trout	8	6	0	0	2
	Westslope Cutthroat Trout	7	5	0	0	2
	Pygmy Whitefish	2	2	0	0	0
	Rainbow Trout	2	2	2	0	0
	Largemouth Bass	1	1	0	0	0
	Mountain Whitefish	1	1	0	0	0
	Smallmouth Bass	1	1	1	0	0

Table 2: Totals of the spring 2022 gillnetting statistics for both Large Mesh and Small Mesh netting combined. For each species, we include the number of fish captured (Captured), released alive (Released), tagged with PIT, T-bar, or acoustic tags (Tagged), recaptured previously-tagged 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	3,399	2	0	1	3,397
Bull Trout	145	113	69	48	32
Smallmouth Bass	30	30	9	1	0
Kokanee	26	22	0	0	4
Northern Pike	21	0	0	0	21
Brown Trout	20	17	0	0	3
Walleye	18	0	0	0	18
Yellow Perch	12	12	0	0	0
Westslope Cutthroat Trout	7	5	0	0	2
Rainbow Trout	3	2	2	0	1
Pygmy Whitefish	2	2	0	0	0
Black Crappie	1	1	0	0	0
Largemouth Bass	1	1	0	0	0
Mountain Whitefish	1	1	0	0	0
Rainbow X Cutthroat Trout	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 gillnets during the spring 2022.

Set Type	Species	Mean TL	SE	Max TL	Min TL
Large Mesh	BLT	600.3	10.5	778	491
	BLT Mortalities	527.7	55.7	625	432
	LKT	604.3	3.7	906	316
Small Mesh	BLT	432.6	12.7	682	249
	BLT Mortalities	416.9	15.1	642	296
	LKT	310.1	1.6	785	216

Table 4: Catch data for Lake Trout, Bull Trout, and Bull Trout mortalities from Large Mesh, Small Mesh, and all gillnets combined (S22 All Nets) during the spring 2022. 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).

	LKT	BLT	BLT Morts	LKT:BLT	LKT:BLT Morts	Prop Morts
Large Mesh	486	44	3	11.05	162.00	0.06
Small Mesh	2913	69	29	42.22	100.45	0.30
S22 All Nets	3399	113	32	30.08	106.22	0.22

Table 5: Catch per unit effort statistics for Lake Trout, Bull Trout, and Bull Trout mortalities from Large Mesh, Small Mesh, and all gillnets combined (S22 All Nets) during the spring 2022. These statistics include the total number of 274 m gillnet 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).

	Effort	LKT CPUE	LKT SE	BLT CPUE	BLT SE	BLT Mort CPUE	BLT Mort SE
Large Mesh	497	0.99	0.11	0.10	0.02	0.01	0.01
Small Mesh	518	5.13	0.53	0.13	0.02	0.06	0.01
S22 All Nets	1015	3.41	0.34	0.12	0.02	0.04	0.01

Table 6: Catch data for Lake Trout, Bull Trout, and Bull Trout mortalities for each gillnet mesh size (inches) fished during the spring 2022. 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	259	17	0	15.24	NA	0.00
5.0	227	27	3	8.41	75.67	0.10
3.0	281	12	5	23.42	56.20	0.29
2.5	699	33	16	21.18	43.69	0.33
2.0	1933	24	8	80.54	241.62	0.33

Table 7: Catch per unit effort statistics for Lake Trout, Bull Trout, and Bull Trout mortalities for each gillnet mesh size (inches) fished during the spring 2022. These statistics include the total number of 274m gillnet panels fished (Effort), and the Mean and SE of daily catch per unit effort (# fish / 274m 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).

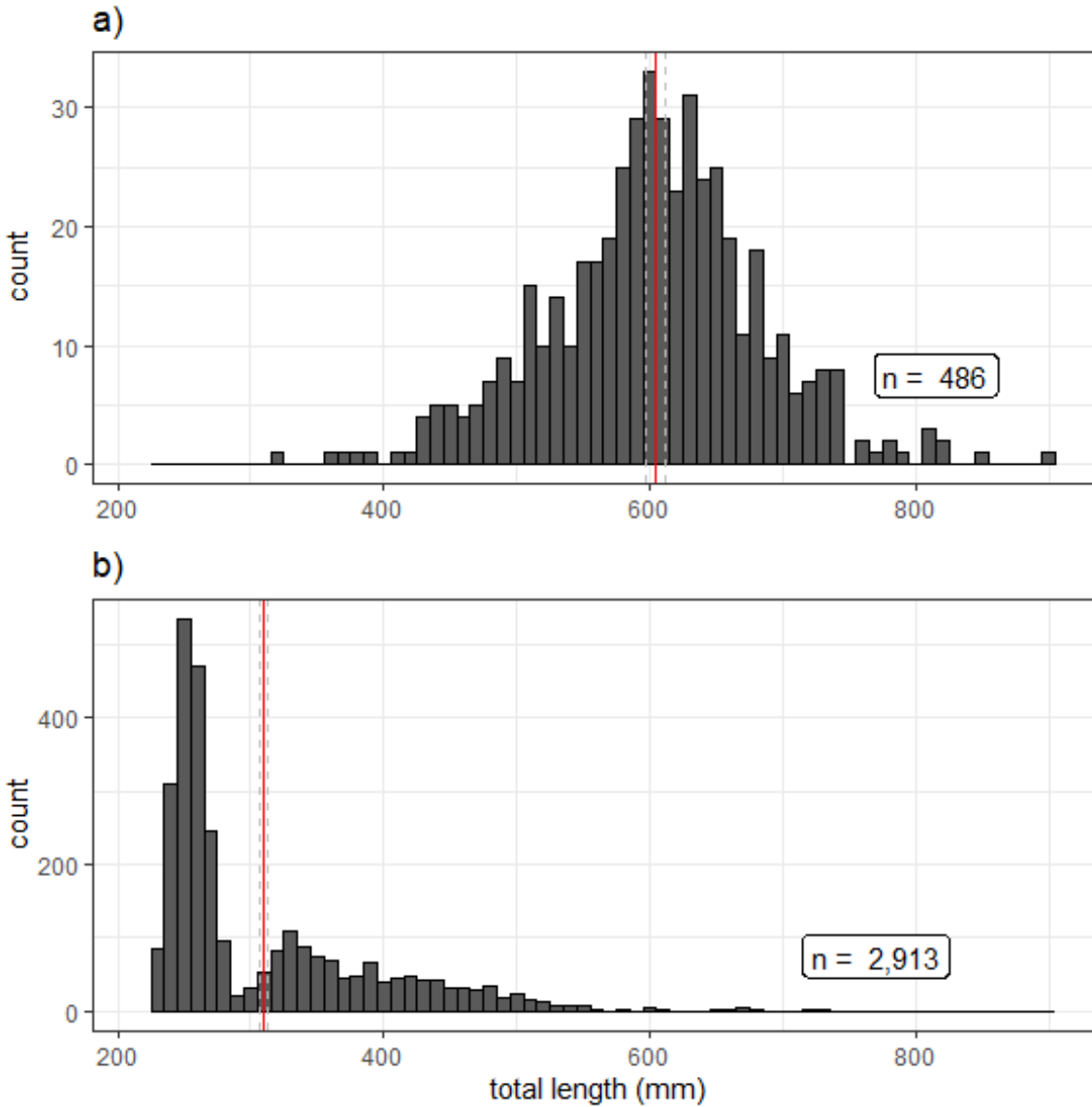| Mesh Size (in)	Effort	LKT CPUE	LKT SE	BLT CPUE	BLT SE	BLT Mort CPUE	BLT Mort SE
5.5	304	0.84	0.14	0.05	0.02	0.00	0.00
5.0	193	1.15	0.18	0.14	0.04	0.03	0.02
3.0	82	3.44	0.39	0.14	0.05	0.06	0.03
2.5	217	3.21	0.38	0.14	0.03	0.07	0.02
2.0	219	8.45	1.29	0.11	0.02	0.04	0.02

Figures

Figure 1: Length frequencies of Lake Trout captured in gillnets during spring 2022 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.
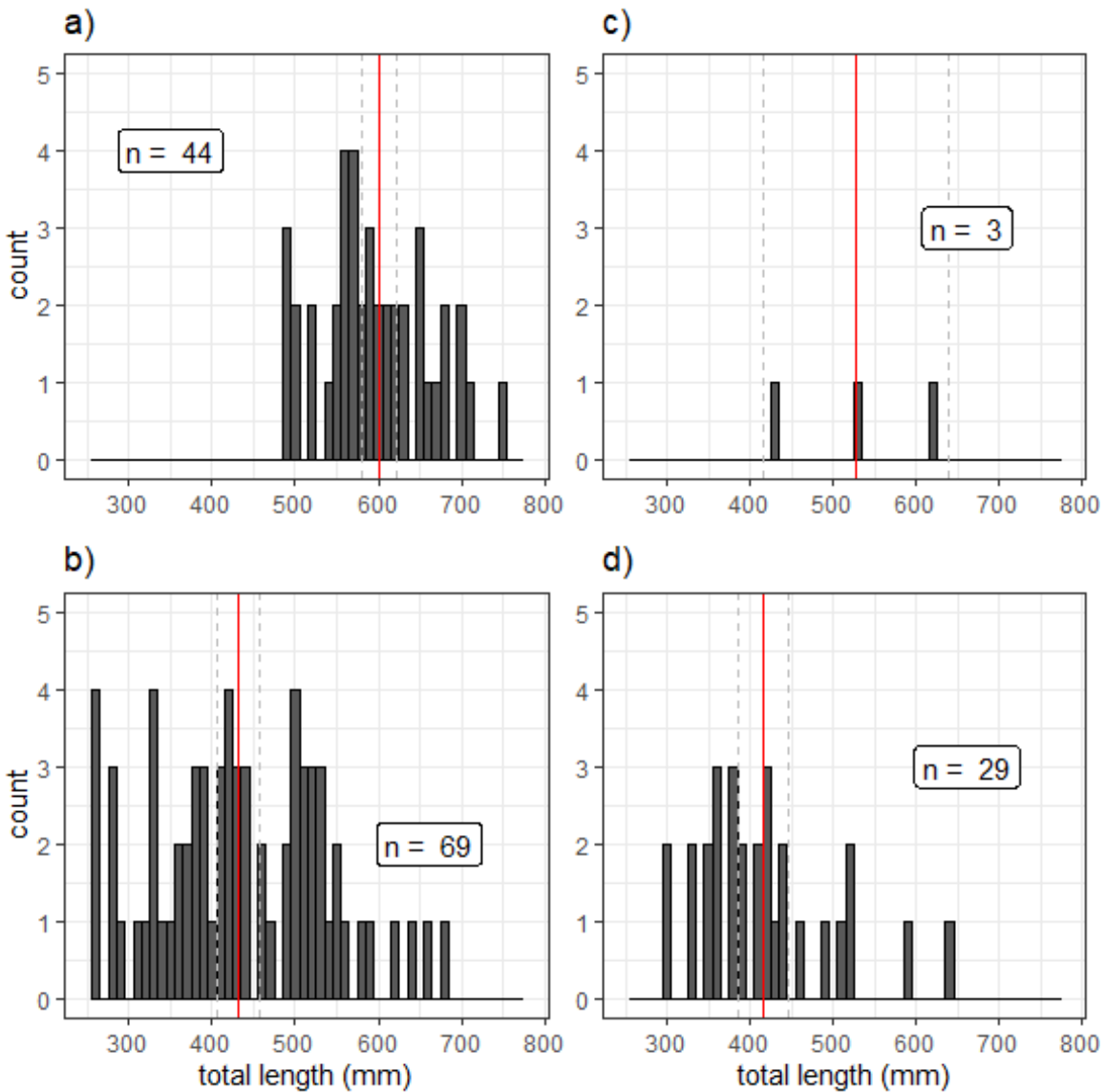
Figure 2: Length frequencies of Bull Trout captured in gillnets during spring 2022 netting efforts. Panels a) and b) are the length frequencies of Bull Trout released alive in the Large Mesh and Small Mesh netting efforts, respectively. Panels c) and d) are the length frequencies of Bull Trout mortalities 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.

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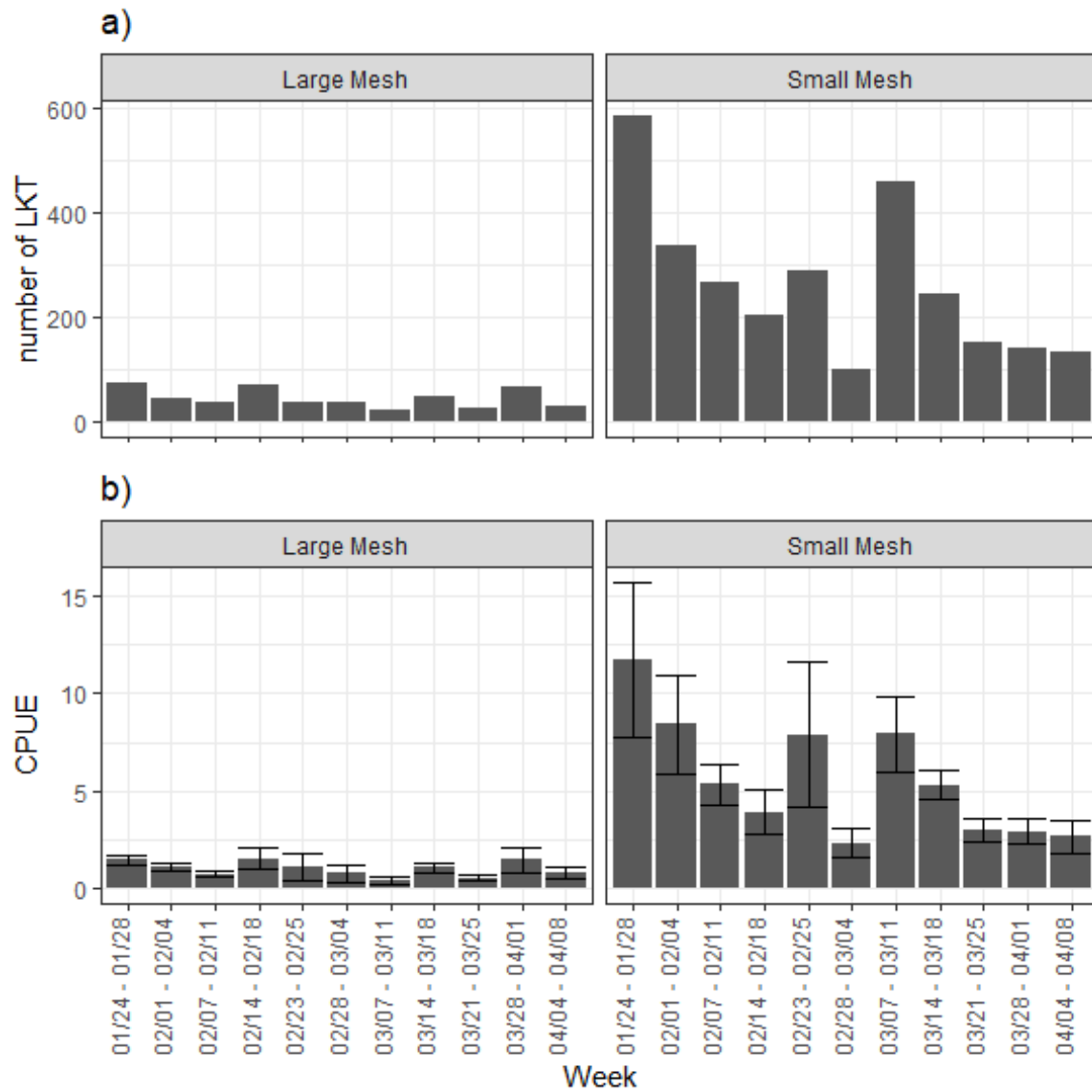
Figure 3: Weekly catch (a) and mean weekly CPUE (b, with SE bars) of Lake Trout captured during the spring 2022 gillnetting efforts.
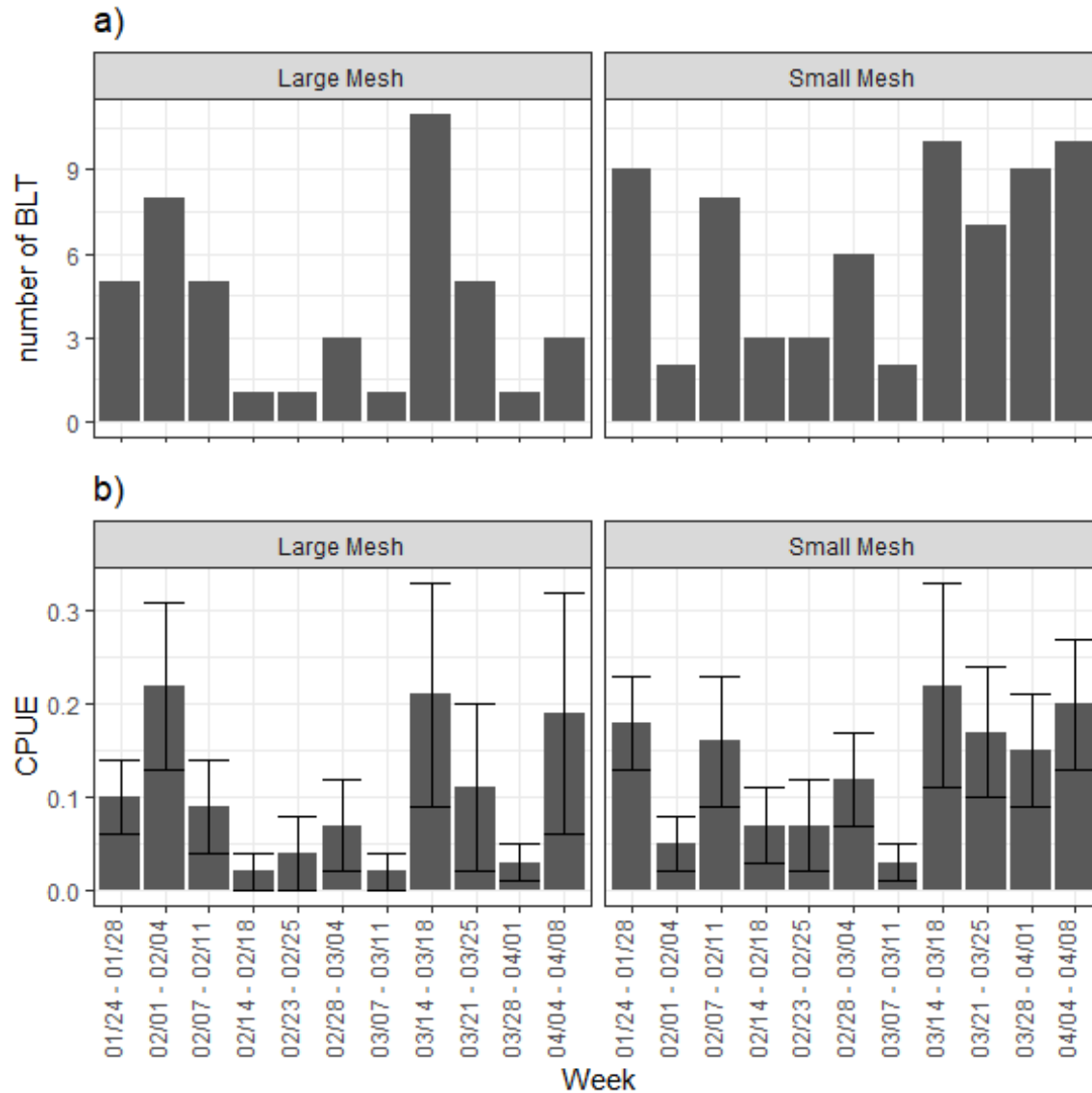
Figure 4: Weekly catch (a) and mean weekly CPUE (b, with SE bars) of Bull Trout captured and released alive during the spring 2022 gillnetting efforts.
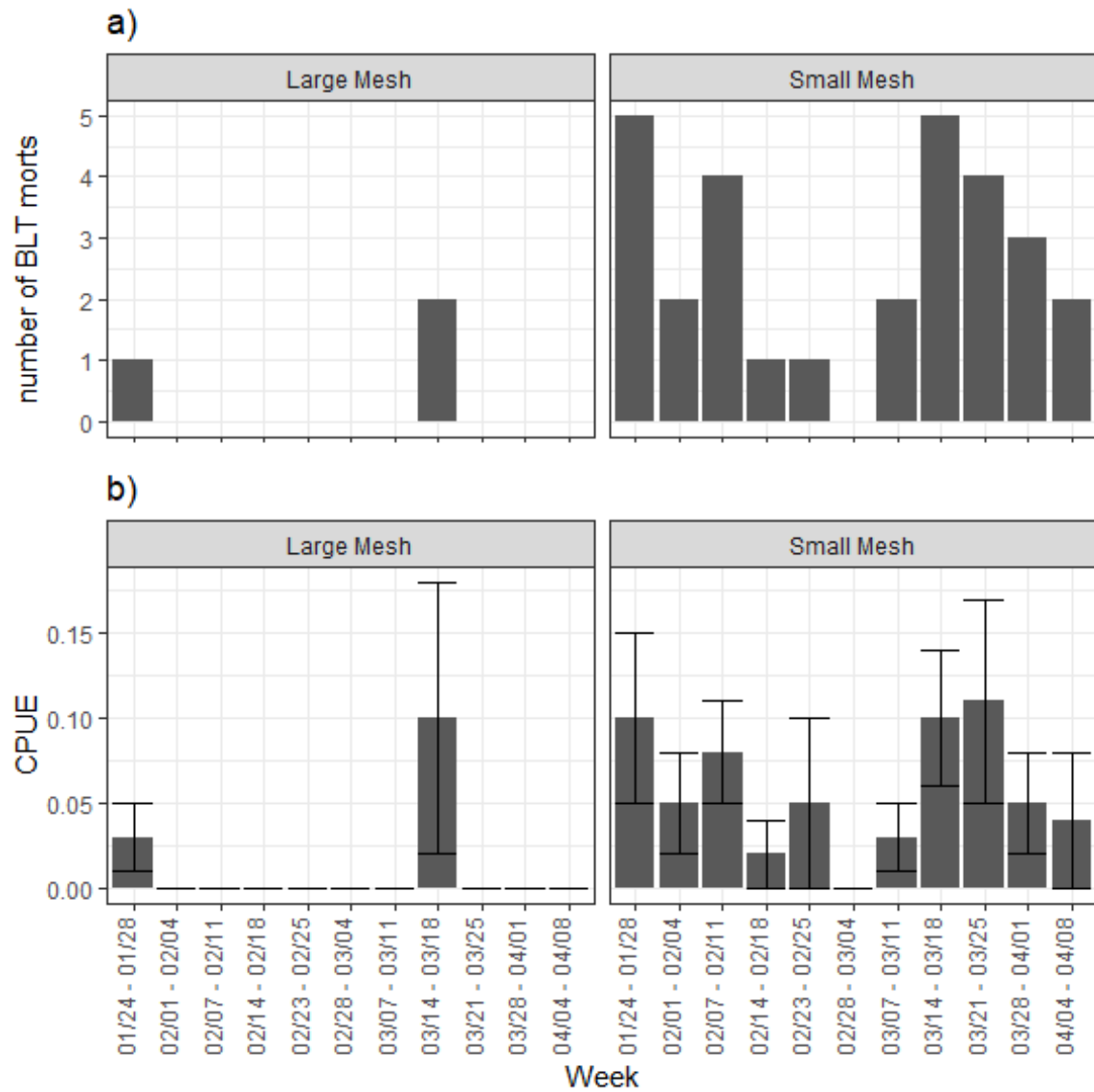
Figure 5: Weekly catch (a) and mean weekly CPUE (b, with SE bars) of direct Bull Trout mortalities during the spring 2022 gillnetting efforts.
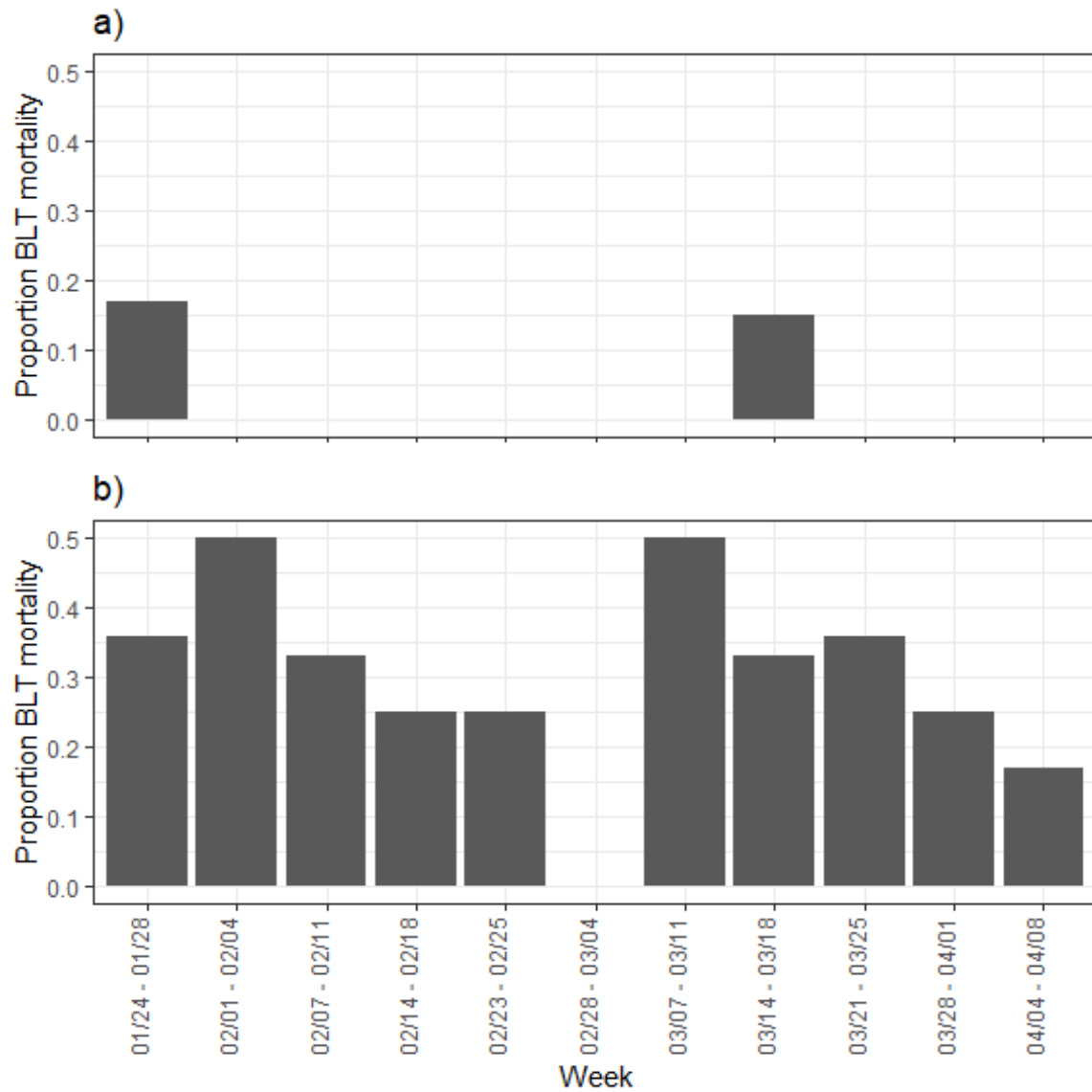
Figure 6: Proportion bycatch resulting in direct mortalities for Bull Trout captured in Large Mesh (a) and Small Mesh (b) netting during the spring 2022 gillnetting efforts.
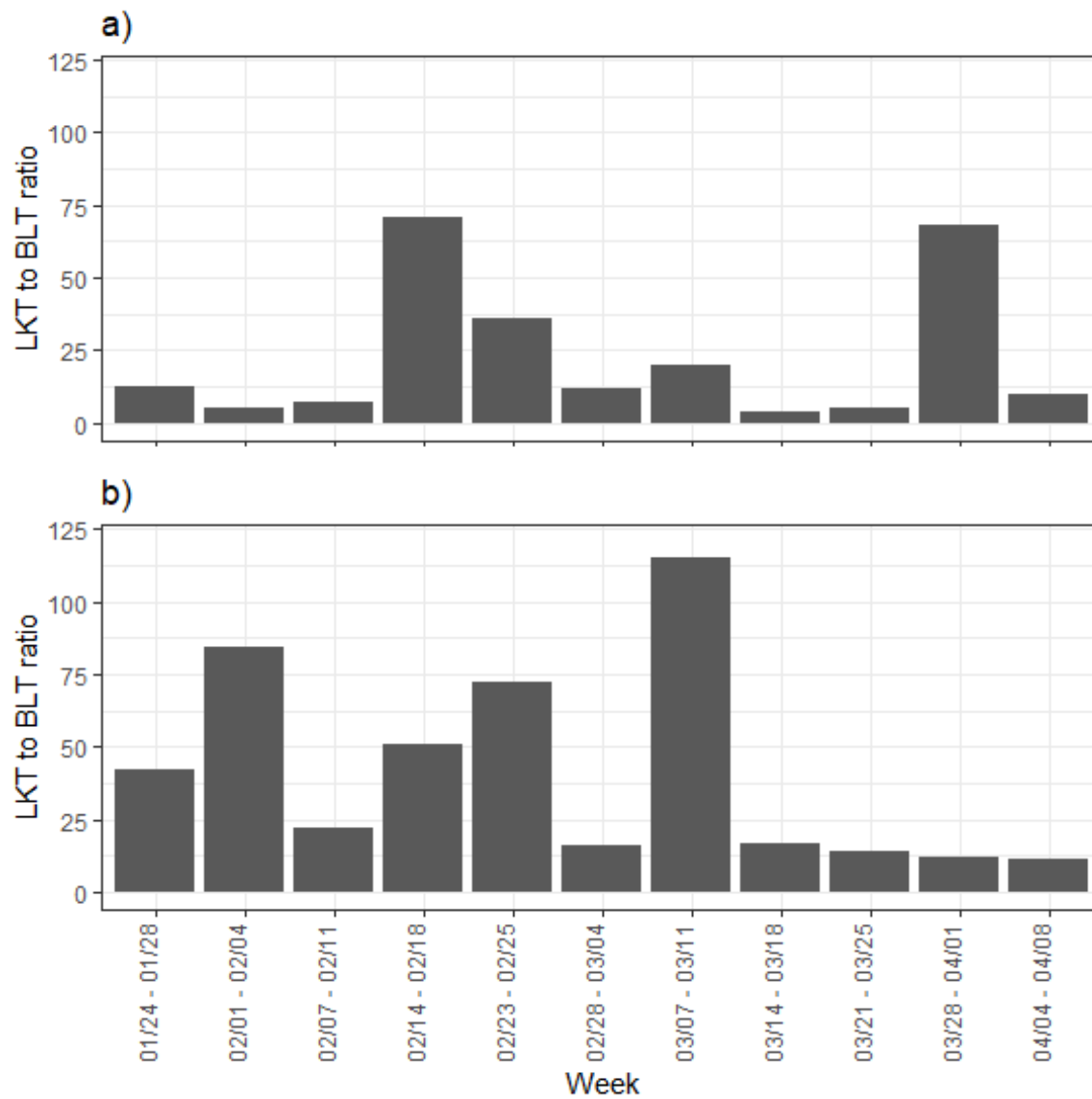
43

Figure 7: Lake Trout to Bull Trout catch ratios in Large Mesh (a) and Small Mesh (b) netting during the spring 2022 gillnetting efforts.
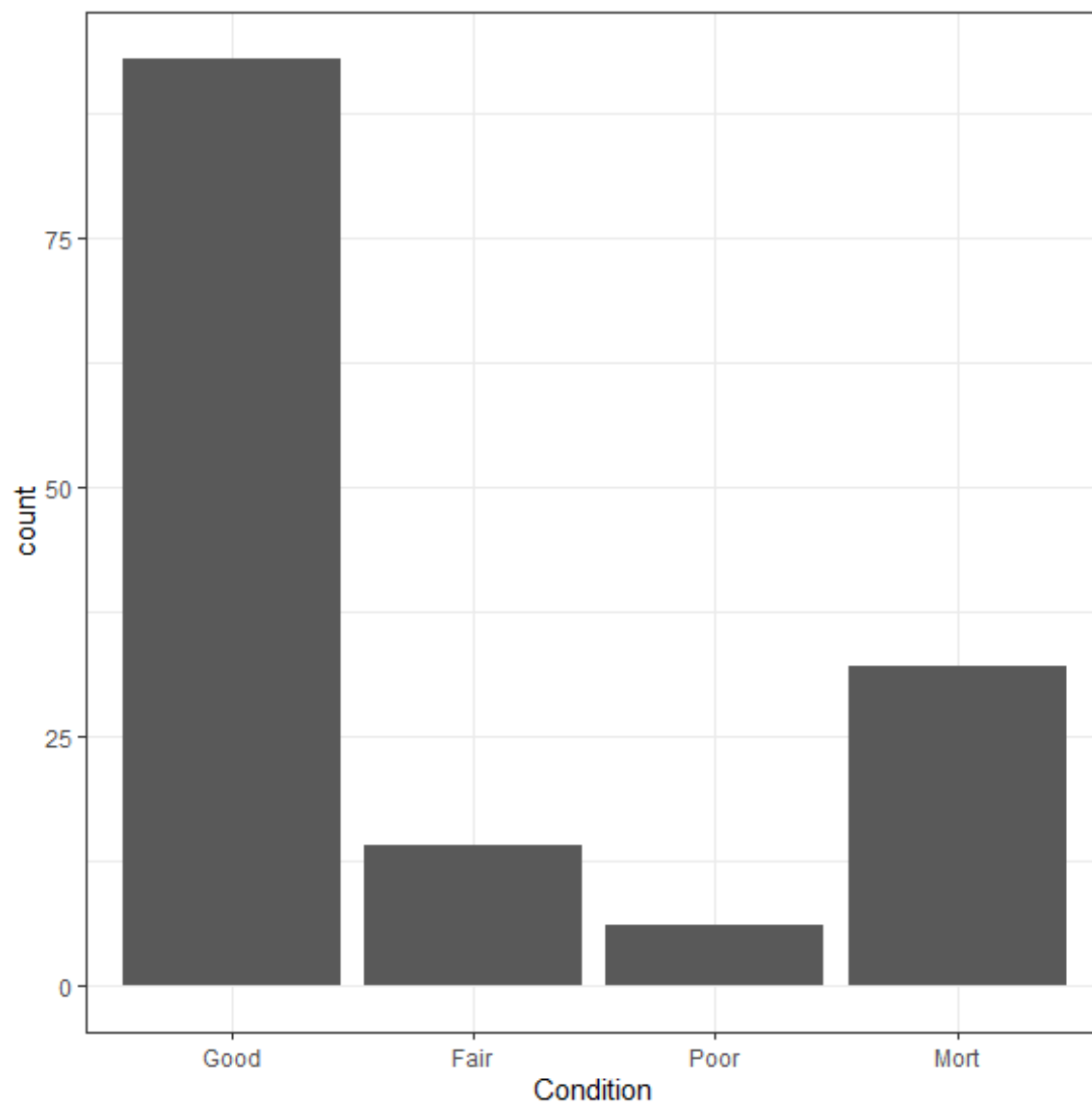
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Figure 8: Condition index of Bull Trout captured during spring 2022 netting efforts.
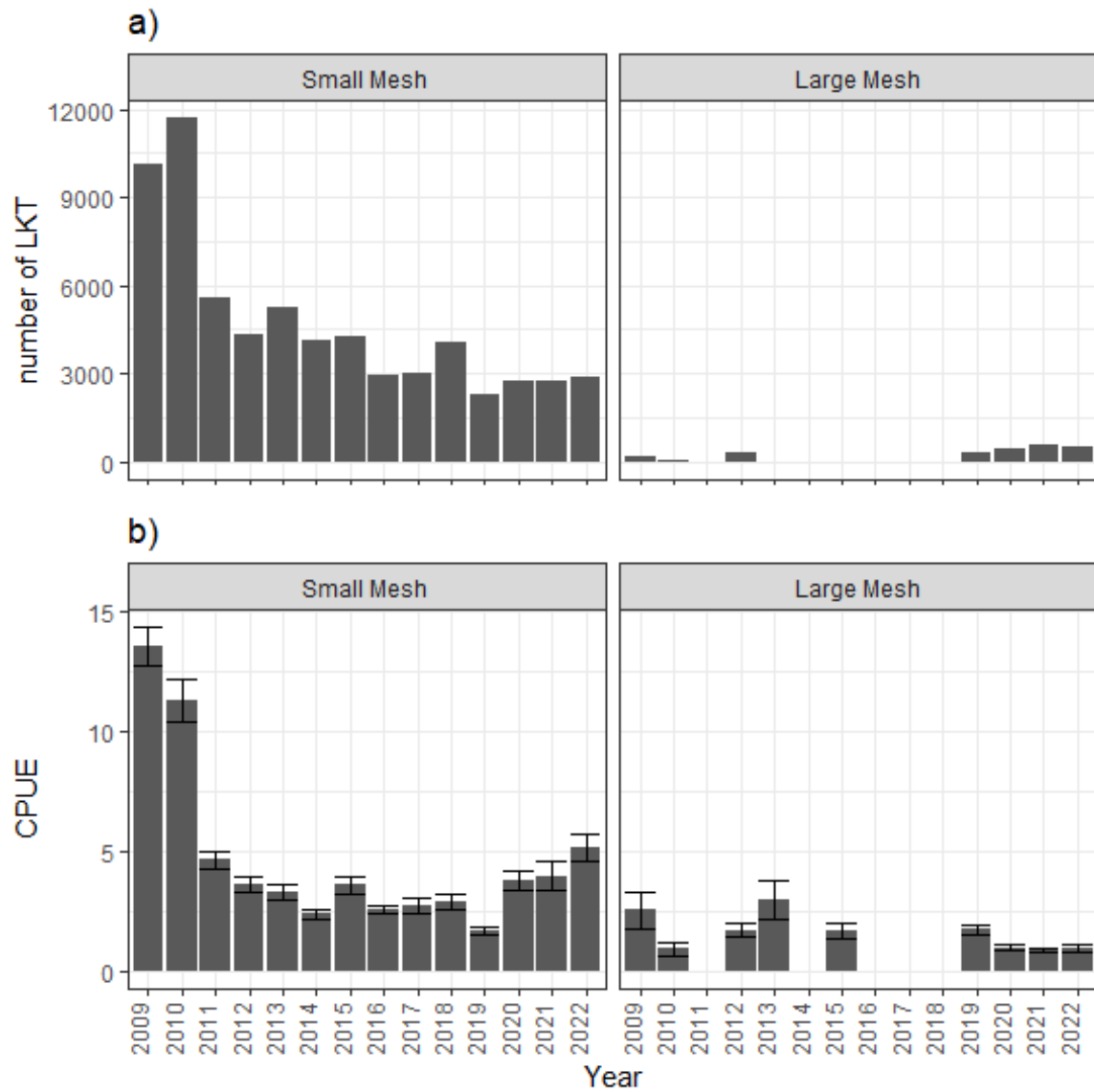
Figure 9: Annual catch (a) and mean CPUE (b) of Lake Trout in large and small mesh gillnetting efforts during the designated spring netting season from 2009-present.

APPENDIX C. FALL 2022 LPO LAKE TROUT NETTING SUMMARY

Overview

During the fall of 2022, gillnet effort was divided into two categories based on the primary life history stage targeted and the mesh sizes fished. From 09/06 to 11/02 we targeted spawning adult Lake Trout (*Salvelinus namaycush*) using 5.5 and 5.0 inch (139.7 mm and 127 mm) mesh gillnets (hereafter, Spawner). In the Spawner gillnet sets, a total of 1,793 Lake Trout were removed ranging from 281 mm to 1,100 mm total length using an effort of 733,500 ft (223,570.8 m) of net.

From 11/03 to 12/16 we fished 1.5, 2.0, 2.5, and 3.0 inch (38.1, 63.5, 50.8, and 76.2 mm) mesh gillnets to target juvenile Lake Trout in the nurseries (hereafter, LKT Suppression - Small Mesh). In the LKT suppression gillnet sets a total of 1,749 Lake Trout were removed ranging from 180 mm to 779 mm total length using an effort of 465,300 ft (141,823.4 m) of net. A grand total of 3,542 Lake Trout were removed during the fall 2022 netting season. We also recaptured 15 Lake Trout with acoustic tags at spawning locations.

As part of the bycatch during these efforts, thirteen different species were captured including ESA Threatened Bull Trout (*S. confluentus*). A total of 905 Bull Trout were captured during the Lake Trout suppression efforts with an average direct mortality rate of 26.63%. We PIT tagged 496 and recaptured 179 previously tagged Bull Trout. Of the recaptured Bull Trout 44 were direct mortalities. We also began deploying acoustic tags in Bull Trout this fall to evaluate seasonal movements and habitat use, and tagged 8 (ranging from 457 to 603 mm). Bull Trout release condition was qualitatively graded as "Good", "Fair", or "Poor" immediately prior to release, and is broken down below:
- Good = 292
- Fair = 314
- Poor = 56
- Not Reported = 2
- Mortalities = 241

In addition to marking Bull Trout with PIT tags, we collected tissue samples for genetic analysis from 578 of the released Bull Trout.

We use the high instances of bycatch to tag Smallmouth Bass (*Micropterus dolomeiu*) and Gerrard-strain Rainbow Trout (*Oncorhynchus mykiss*) with Floy T-bar tags. Each fish was double tagged with one reward value and one non-reward T-Bar tag. We tagged a total of 38 Smallmouth Bass and recaptured 2 previously tagged Smallmouth Bass. We tagged a total of 69 Rainbow Trout and recaptured 1 previously tagged Rainbow Trout.

The following tables and figures provide summary information on catch and bycatch from gillnet efforts during the complete fall 2022 netting season.

Tables

Table 1: Summary of the fall 2022 Spawner and LKT Suppression gillnet sets. For each species, statistics include the number captured (Captured), released alive (Released), tagged with PIT, T-Bar, or acoustic tags (Tagged), recaptured previously-tagged fish (Recaptured), and removed from LPO (Removed). For species other than Lake Trout, Walleye, and Northern Pike, the number of individuals removed represents fish that were "dead on capture".

Project	Species	Captured	Released	Tagged	Recaptured	Removed
Spawner	Lake Trout	1,793	8	0	15	1,785
Spawner	Bull Trout	450	355	236	111	95
Spawner	Rainbow Trout	130	82	69	1	48
Spawner	Kokanee	57	20	0	0	37
Spawner	Smallmouth Bass	43	43	38	2	0
Spawner	Brown Trout	20	14	0	0	6
Spawner	Westslope Cutthroat Trout	20	10	0	0	10
Spawner	Walleye	18	0	0	2	18
Spawner	Mountain Whitefish	5	2	0	0	3
Small Mesh	Lake Trout	1,749	0	0	0	1,749
Small Mesh	Bull Trout	455	307	260	68	148
Small Mesh	Walleye	84	0	0	0	84
Small Mesh	Kokanee	50	41	0	0	9
Small Mesh	Yellow Perch	35	31	0	0	4
Small Mesh	Pygmy Whitefish	6	3	0	0	3
Small Mesh	Northern Pike	2	0	0	0	2
Small Mesh	Westslope Cutthroat Trout	2	2	0	0	0
Small Mesh	Brown Trout	1	1	0	0	0

Table 2: Combined totals of the fall 2022 Spawner and LKT Suppression gillnet sets. For each species, statistics include the number captured (Captured), released alive (Released), tagged with PIT, T-Bar, or acoustic tags (Tagged), recaptured previously-tagged fish (Recaptured), and removed from LPO (Removed). 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	Tagged	Recaptured	Removed
Lake Trout	3,542	8	0	15	3,534
Bull Trout	905	662	496	179	243
Rainbow Trout	130	82	69	1	48
Kokanee	107	61	0	0	46
Walleye	102	0	0	2	102
Smallmouth Bass	43	43	38	2	0
Yellow Perch	35	31	0	0	4
Westslope Cutthroat Trout	22	12	0	0	10
Brown Trout	21	15	0	0	6
Pygmy Whitefish	6	3	0	0	3
Mountain Whitefish	5	2	0	0	3
Northern Pike	2	0	0	0	2

Table 3: Summary of length (mm) data for Lake Trout, Bull Trout, and Bull Trout direct mortalities captured during the fall 2022 Spawner and Small Mesh (1.5, 2.0, 2.5, and 3.0 inch mesh) LKT Suppression gillnet sets.

Project	Species	Mean TL	SE	Max TL	Min TL
Spawner	BLT	526.7	5.5	860	245
Spawner	BLT Mortalities	537.9	11.1	856	285
Spawner	LKT	639.2	2.3	1,100	281
Small Mesh	BLT	381.7	5.4	740	210
Small Mesh	BLT Mortalities	372.6	5.1	560	235
Small Mesh	LKT	322.5	1.5	779	180

Table 4: The total number of Lake Trout (LKT), live Bull Trout (BLT), Bull Trout direct 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) from Spawner, 1.5, 2.0, 2.5, and 3.0 inch mesh LKT Suppression ("Small Mesh"), 5.0 and 5.5 inch mesh LKT Suppression ("Large Mesh"), and all gillnets combined (All Nets) during the fall 2022.

Project	LKT	BLT	BLT Morts	LKT:BLT	LKT:BLT Morts	Prop Morts
Spawner	1,793	355	95	5.05	18.87	0.21
Small Mesh	1,749	307	147	5.70	11.90	0.32
All Nets	3,542	662	242	5.35	14.64	0.27

Table 5: The total number of 274m gillnet 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 direct mortalities (BLT Mort CPUE, BLT Mort SE) from Spawner, Small Mesh (1.5, 2.0, 2.5, and 3.0 inch mesh) LKT Suppression, and all gillnets combined (All Nets) during the fall 2022.

Project	Effort	LKT CPUE	LKT SE	BLT CPUE	BLT SE	BLT Mort CPUE	BLT Mort SE
Spawner	815	2.27	0.19	0.43	0.03	0.11	0.01
Small Mesh	517	3.11	0.40	0.53	0.07	0.23	0.03
All Nets	1,332	2.56	0.19	0.47	0.03	0.15	0.02

Table 6: 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) from each mesh size (inches) fished during the fall 2022.

Mesh Size (in)	LKT	BLT	BLT Morts	LKT:BLT	LKT:BLT Morts	Prop Morts
5.5	858	178	37	4.82	23.19	0.17
5	935	177	58	5.28	16.12	0.25
3	20	15	6	1.33	3.33	0.29
2.5	964	199	85	4.84	11.34	0.30
2	666	89	56	7.48	11.89	0.39
1.5	99	4	0	24.75		0.00

Table 7: The total number of 274 m gillnet 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 direct mortalities (BLT Mort CPUE, BLT Mort SE) for each mesh size (inches) fished during the fall 2022.

Mesh Size (in)	Effort	LKT CPUE	LKT SE	BLT CPUE	BLT SE	BLT Mort CPUE	BLT MORT SE
5.5	408	2.12	0.23	0.42	0.04	0.08	0.02
5	407	2.42	0.30	0.44	0.05	0.15	0.02
3	18	1.11	0.35	0.83	0.26	0.33	0.14
2.5	234	4.23	0.64	0.84	0.10	0.36	0.04
2	234	2.94	0.51	0.38	0.06	0.24	0.06
1.5	31	3.52	1.19	0.14	0.07	0.00	0.00

53
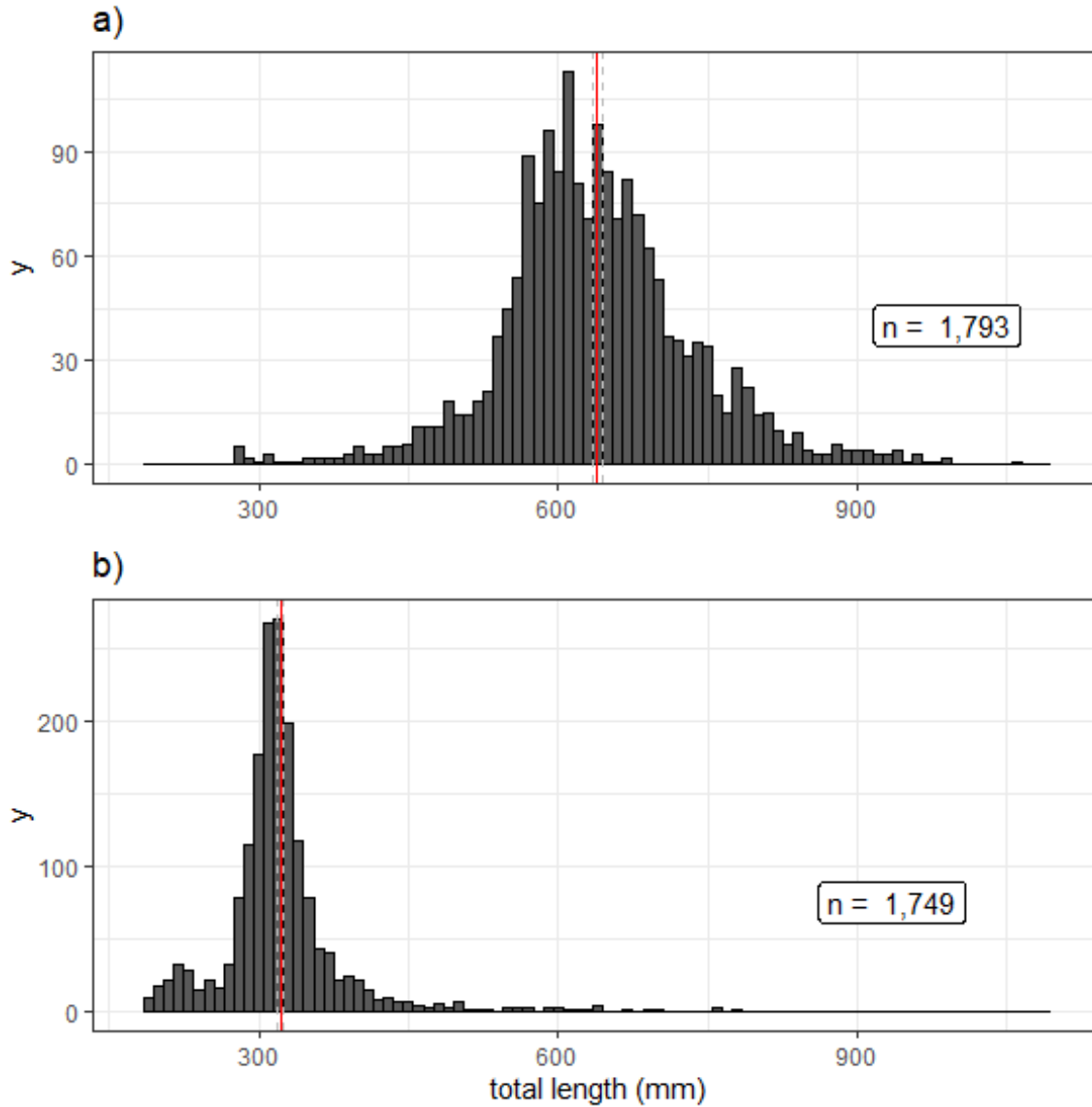
Figures

Figure 1: Length frequency distributions of Lake Trout captured in (a) large (5.0 and 5.5 inch) and (b) small mesh gillnets (1.5, 2.0, 2.5, and 3.0 inch) during fall 2022 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.
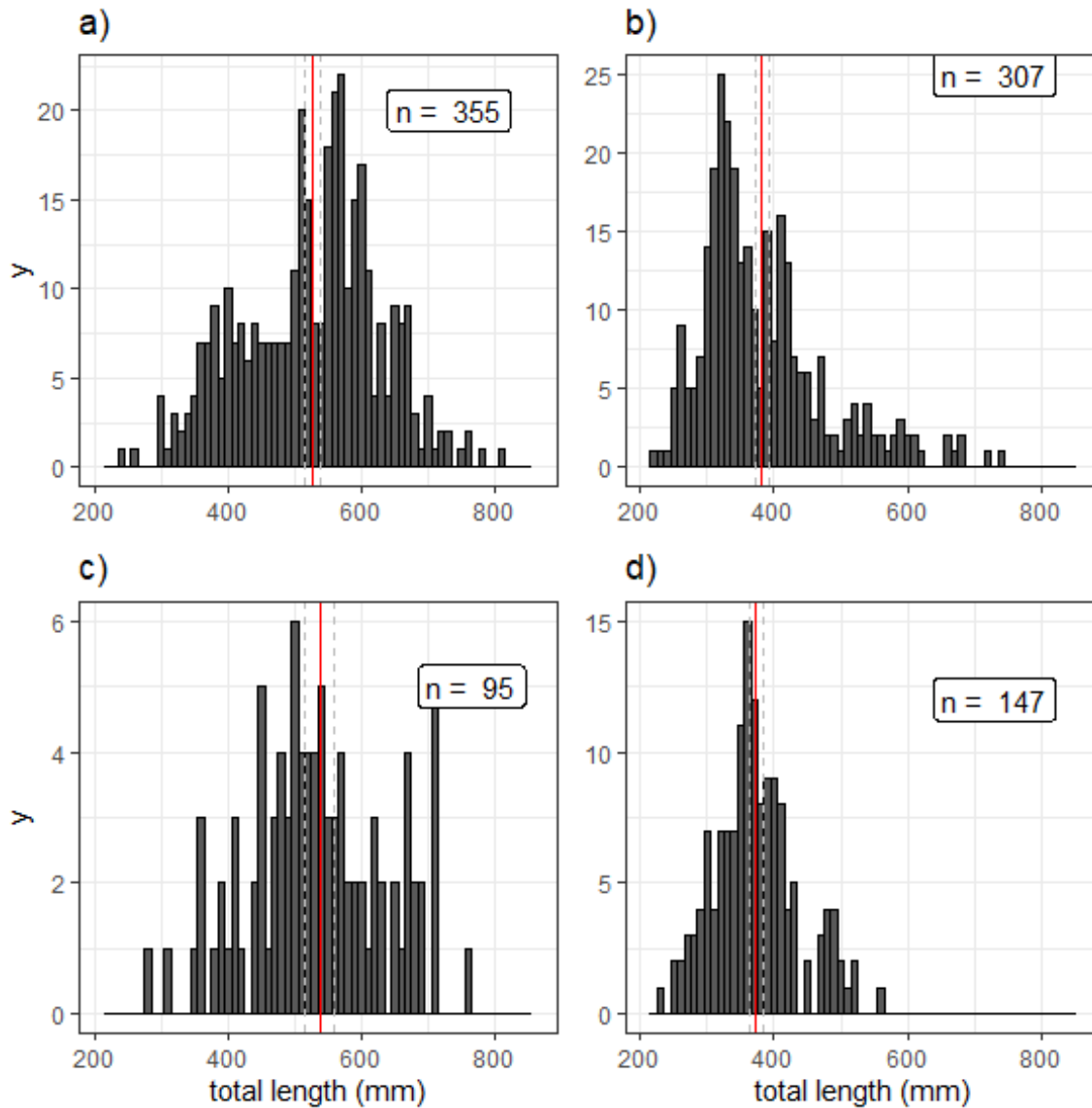
Figure 2: Length frequency distributions of Bull Trout captured in gillnets during fall 2022 netting efforts. Panels a) and c) are the length frequencies of Bull Trout released alive and those resulting in direct mortalities from large mesh (5.0 and 5.5 inch) gillnet sets, respectively. Panels b) and d) are the length frequencies of Bull Trout released alive and those resulting in direct mortalities from the small mesh (1.5, 2.0, 2.5, and 3.0 inch) LKT Suppression 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.

55
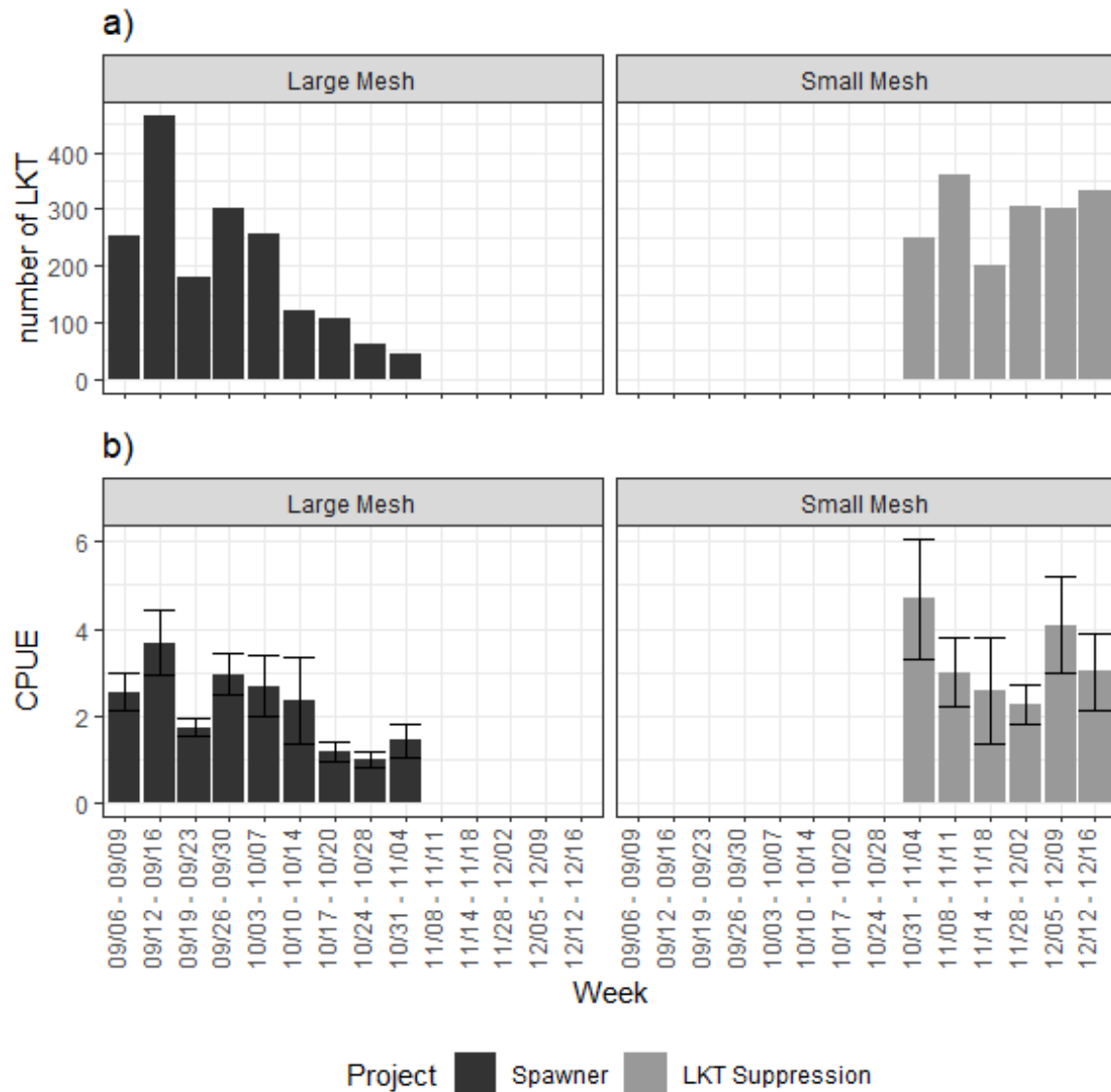
Figure 3: Total catch (a) and mean daily catch per unit effort with standard error bars (b, number of LKT per 274m of gillnet) of Lake Trout captured during each week of the fall 2022 gillnet sets. Large mesh sets include 5.0 and 5.5 inch mesh, and small mesh includes 1.5, 2.0, 2.5, and 3.0 inch mesh.
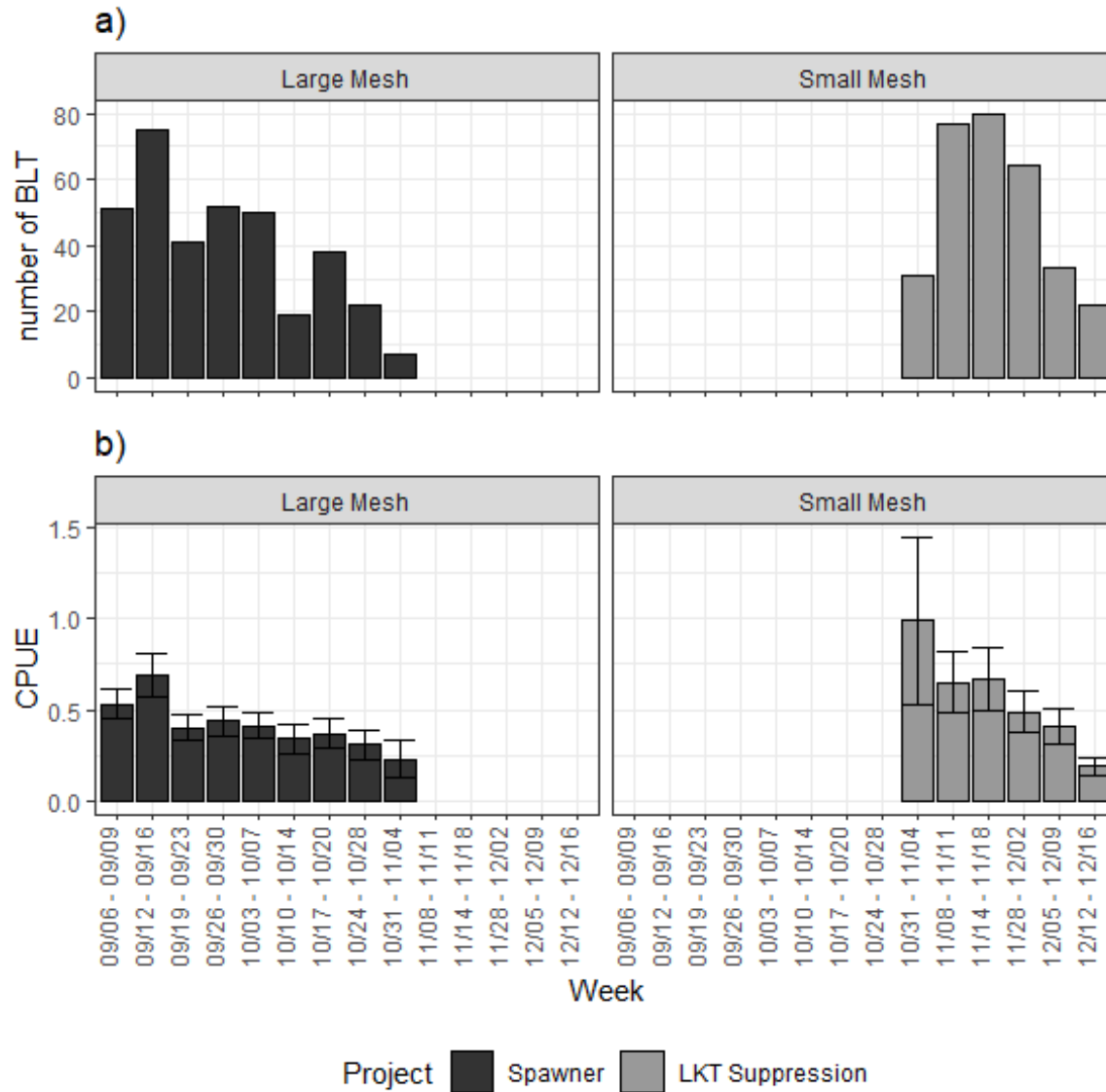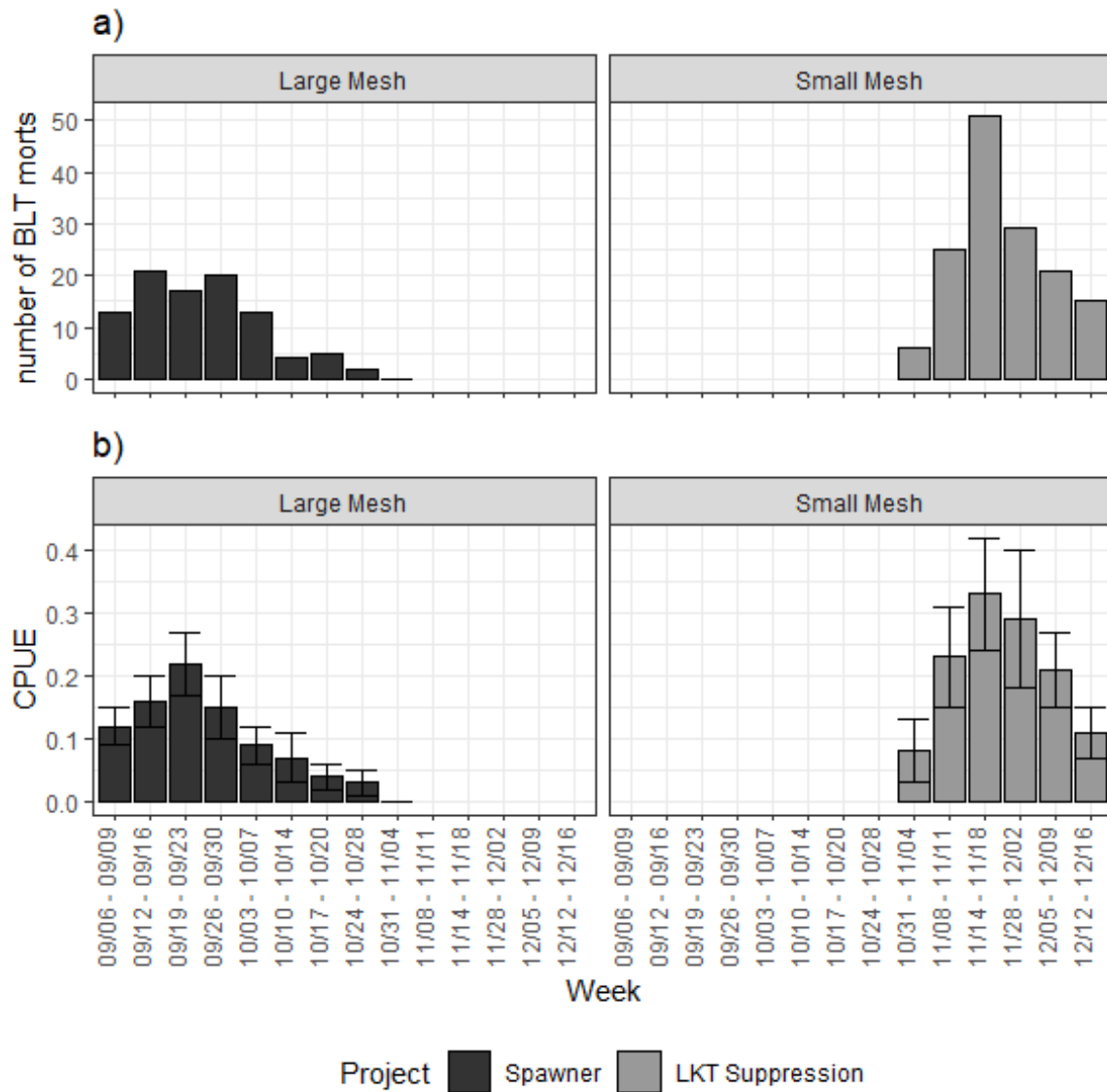
Figure 4: Total catch (a) and mean daily catch per unit effort with standard error bars (b, number of BLT per 274m of gillnet) of Bull Trout captured and released alive during each week of the fall 2022 gillnet sets. Large mesh sets include 5.0 and 5.5 inch mesh, and small mesh includes 1.5, 2.0, 2.5, 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 274m of gillnet) of Bull Trout direct mortalities during each week of the fall 2022 gillnet sets. Large mesh sets include 5.0 and 5.5 inch mesh, and small mesh includes 1.5, 2.0, 2.5, and 3.0 inch mesh.
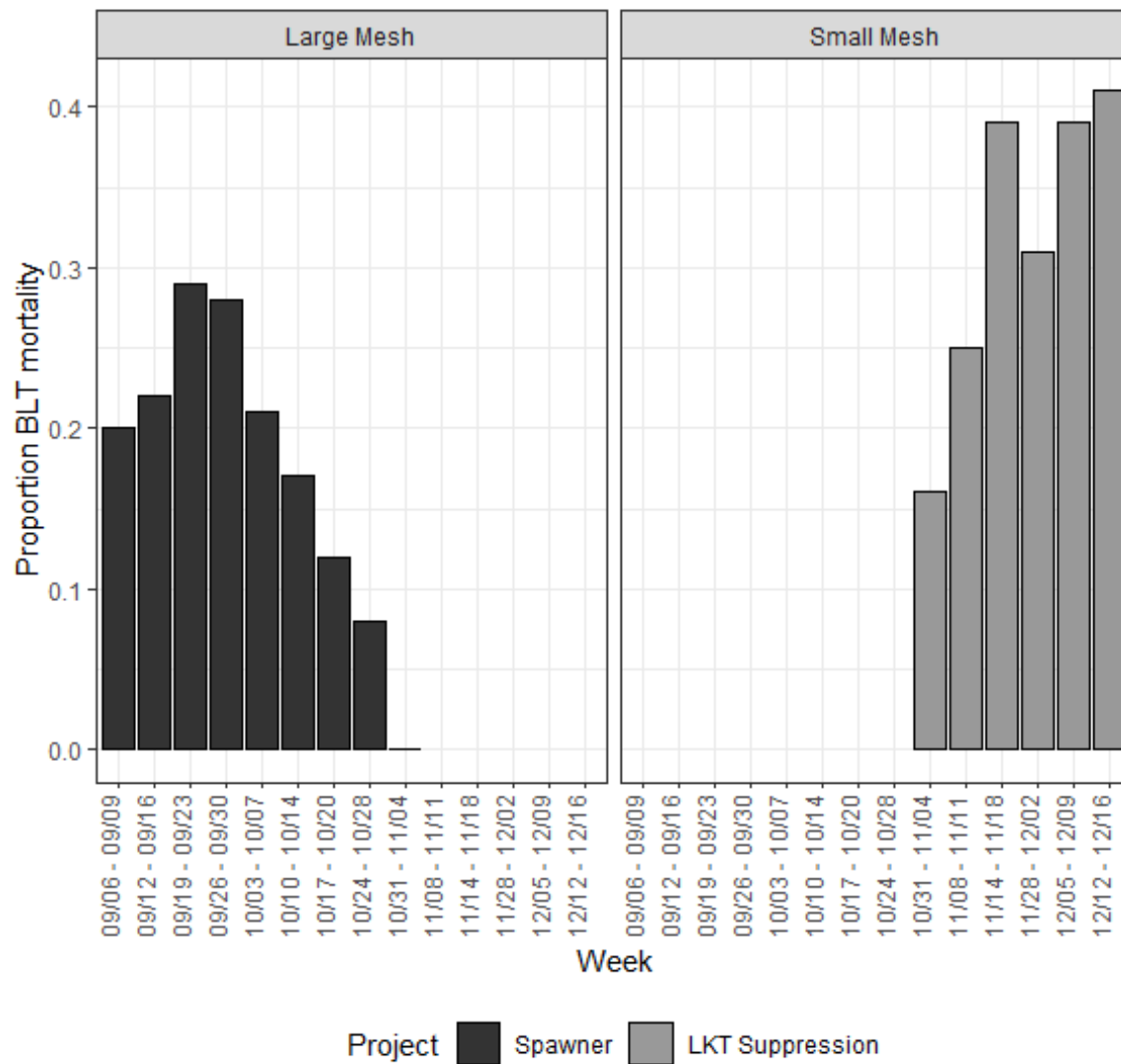
Figure 6: The mean daily proportion of Bull Trout bycatch resulting in direct mortality from large (5.0 and 5.5 inch) and small mesh (1.5, 2.0, 2.5, and 3.0 inch) in the Spawner and LKT Suppression gillnet sets during each week of the fall 2022.

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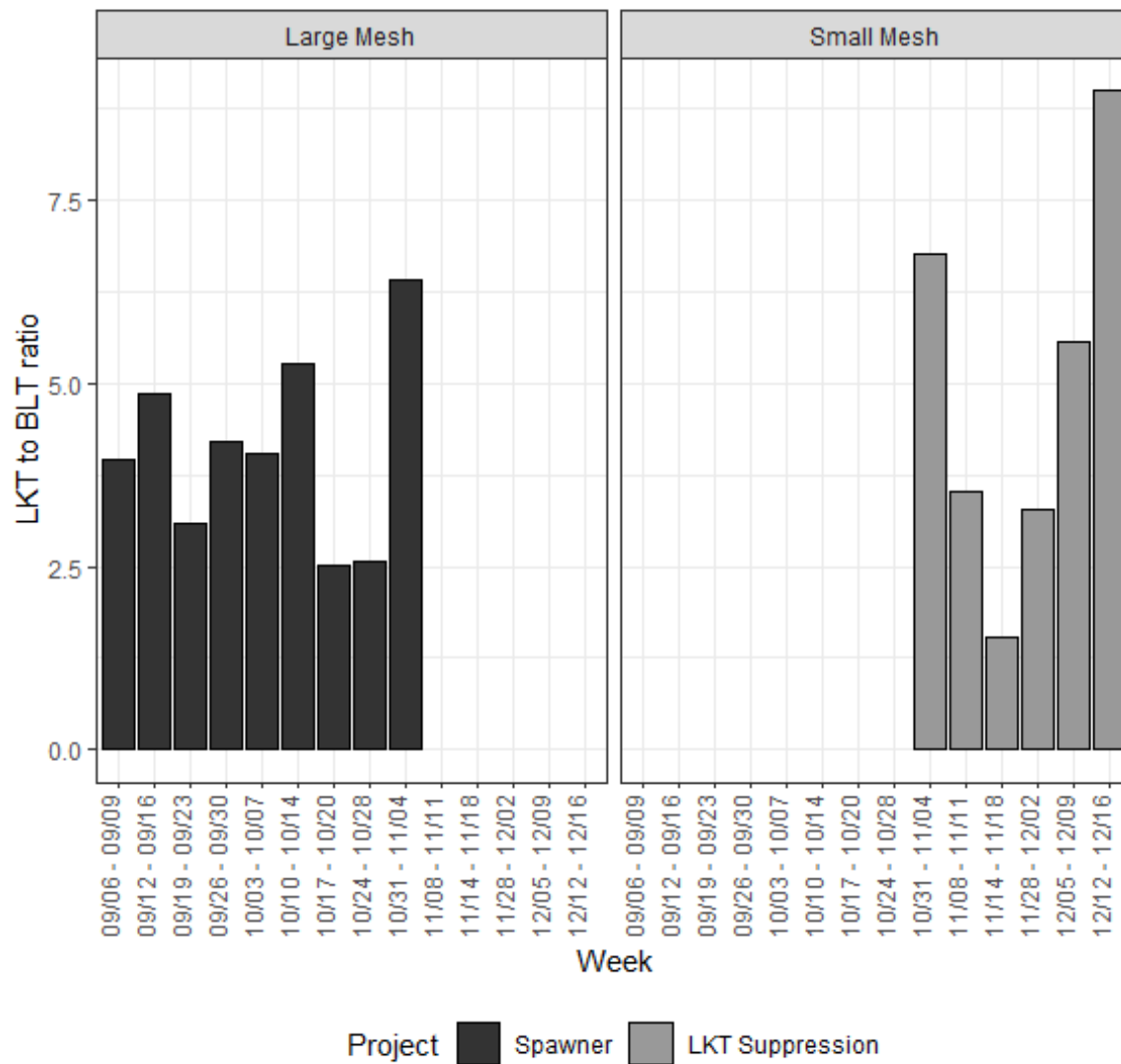
Figure 7: The mean daily Lake Trout to Bull Trout catch ratios from large (5.0 and 5.5 inch) and small mesh (1.5, 2.0, 2.5, and 3.0 inch) in the Spawner and LKT Suppression gillnet sets during each week of the fall 2022.
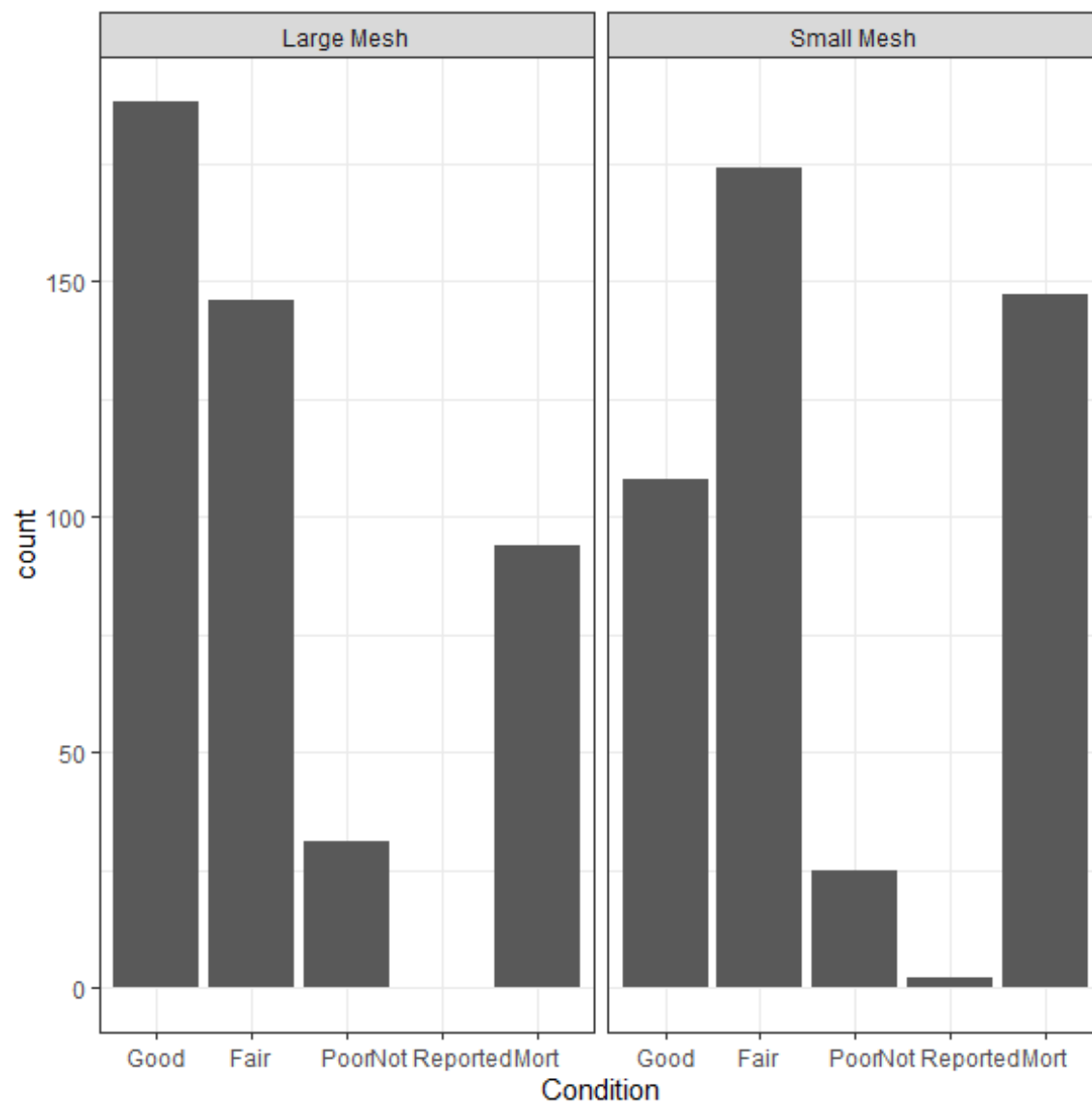
Figure 8: Condition index of Bull Trout captured in large (5.0 and 5.5 inch) and small mesh (1.5, 2.0, 2.5, and 3.0 inch) in the Spawner and LKT Suppression gillnet sets during the fall 2022.
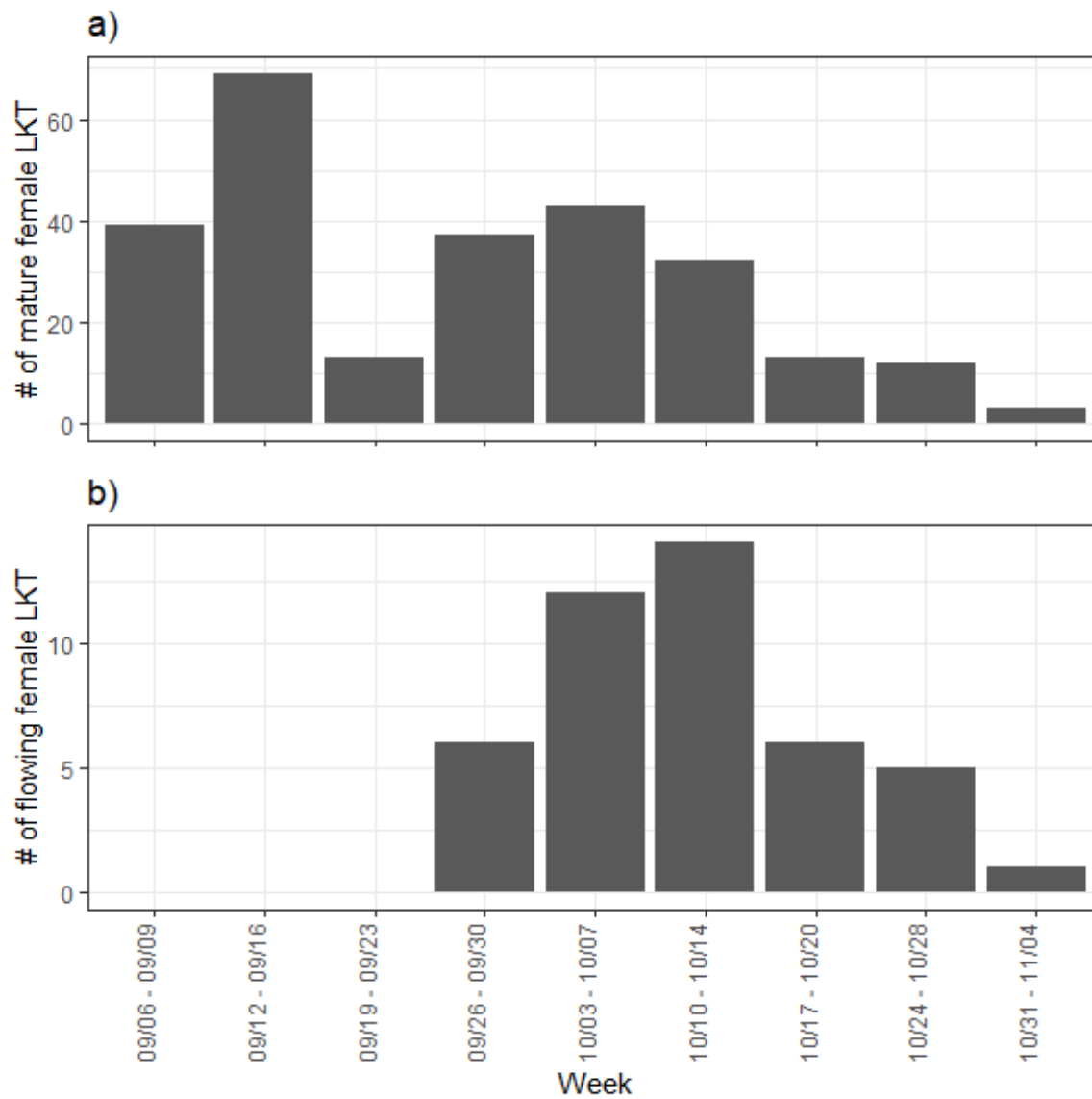
Figure 9: The total catch of mature female Lake Trout (a) and mature female Lake Trout that were flowing at time of capture (b) during each week of the fall 2022 Spawner gillnet sets.
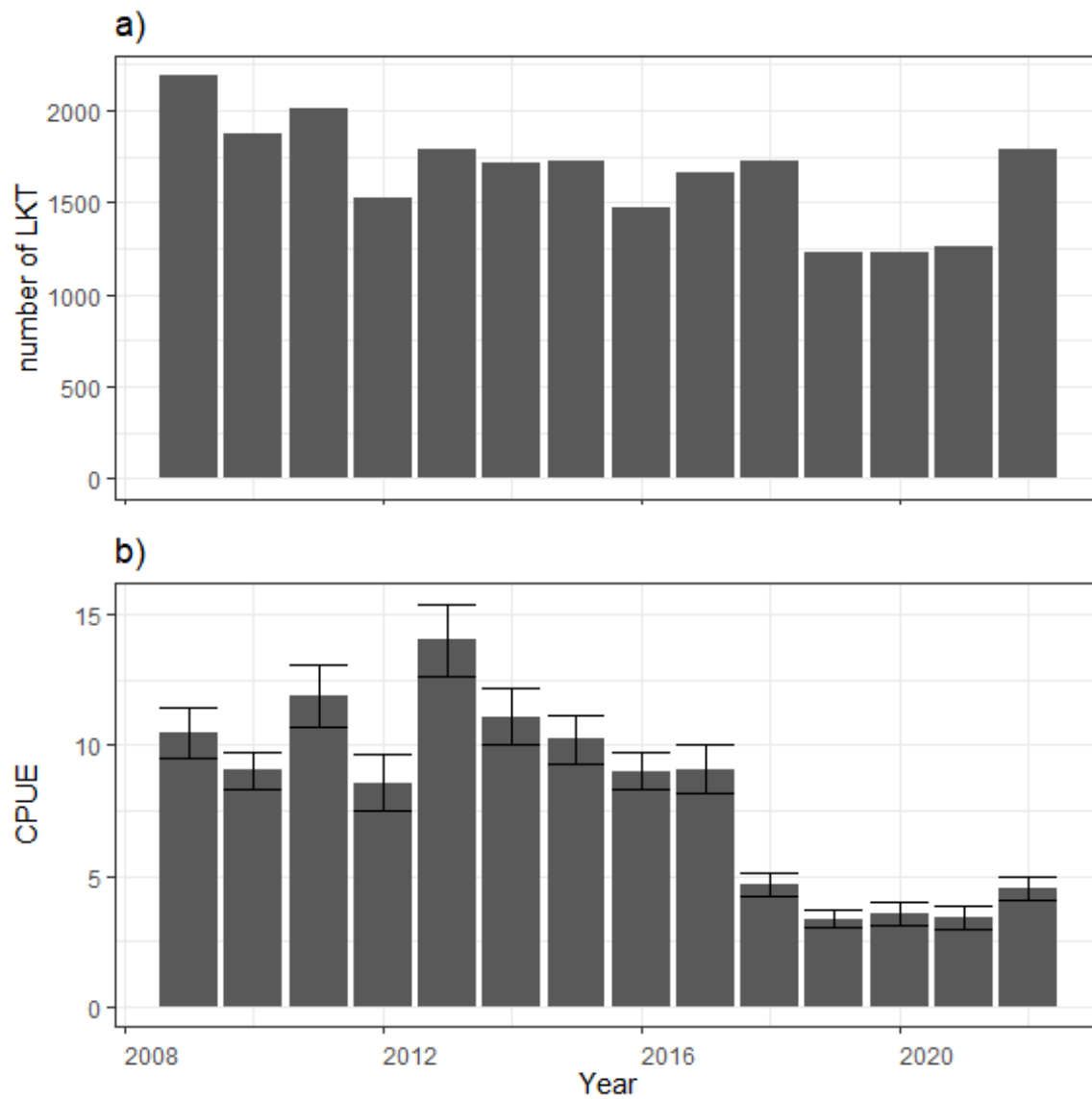
Figure 10: Annual catch (a) and mean daily catch per unit effort with standard error bars (b, number of LKT per 274 m of gillnet) of Lake Trout during the designated fall Spawner gillnet sets from 2009–2022.
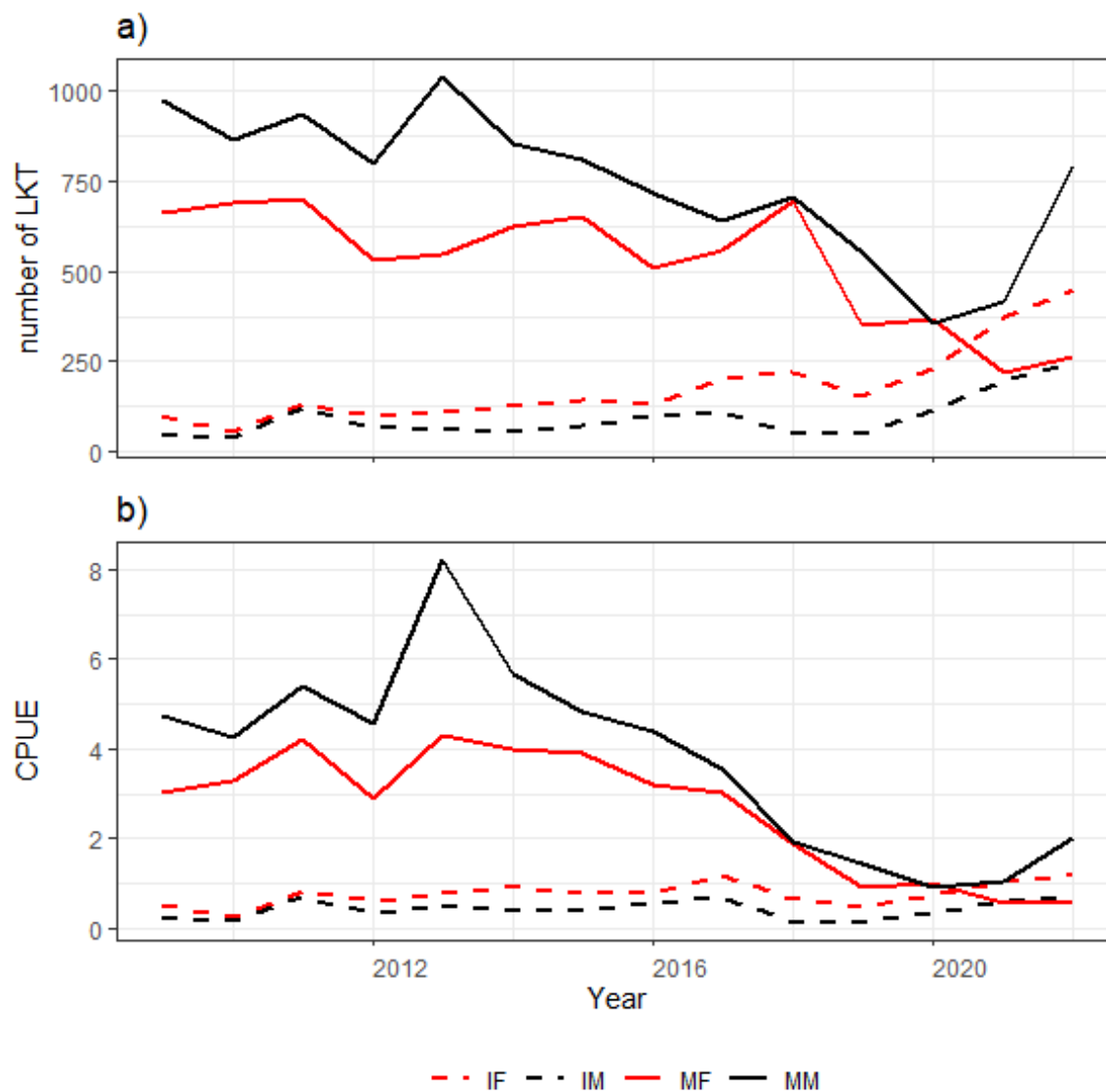
Figure 11: Annual catch (a) and mean daily catch per unit effort with standard error bars (b, number of LKT per 274 m of gillnet) of Lake Trout during the designated fall Spawner gillnet sets from 2009–2022. Each line represents distinct sex and maturity classifications - immature females (IF), immature males (IM), mature females (MF), and mature males (MM).

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APPENDIX D. LAKE TROUT ANGLER INCENTIVE PROGRAM SUMMARY

2022 LPO Lake Trout Angler Incentive Program Summary

Ken Bouwens
Rob Jakubowski

Total Lake Trout heads submitted = 2,682

Total Bull Trout heads submitted = 16

Total unique anglers participating = 224

Tables

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

| Year	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
Total													100,838

Figures
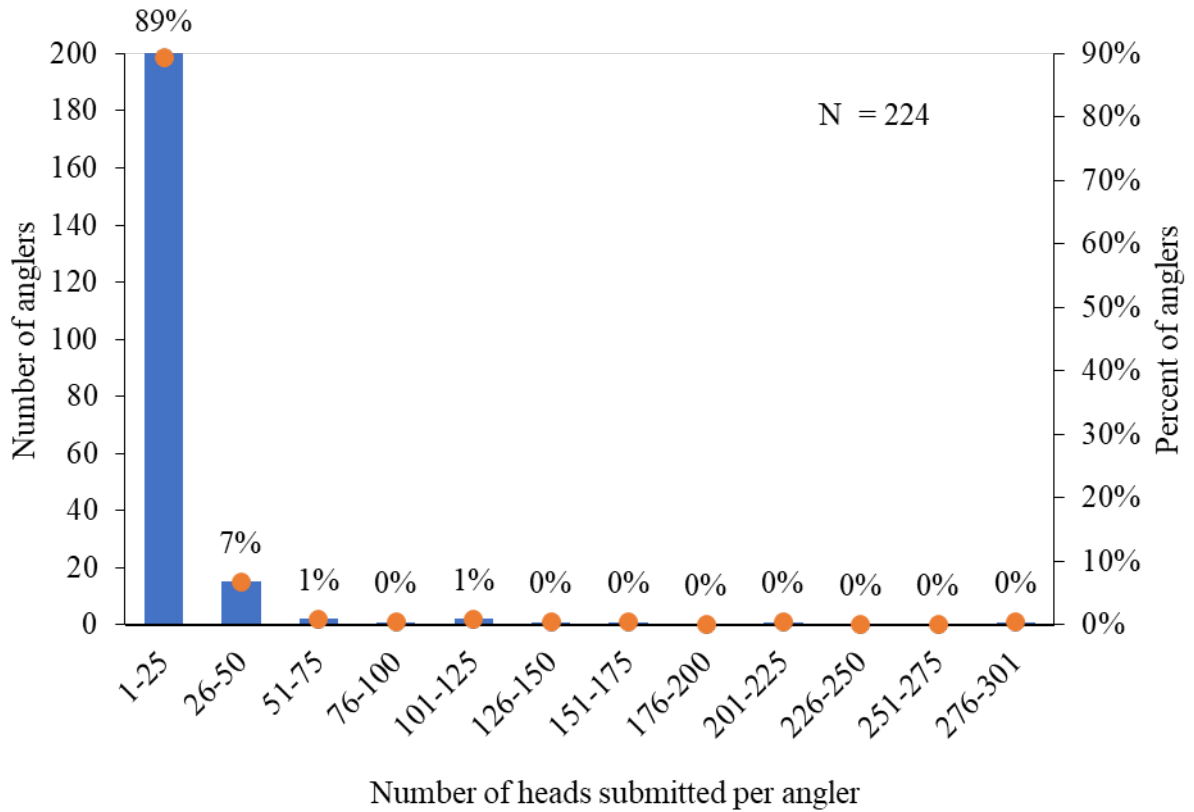
Figure 1. Total number and percent of anglers submitting heads, grouped by number of heads submitted per angler, through the Lake Pend Oreille Lake Trout AIP during 2022.
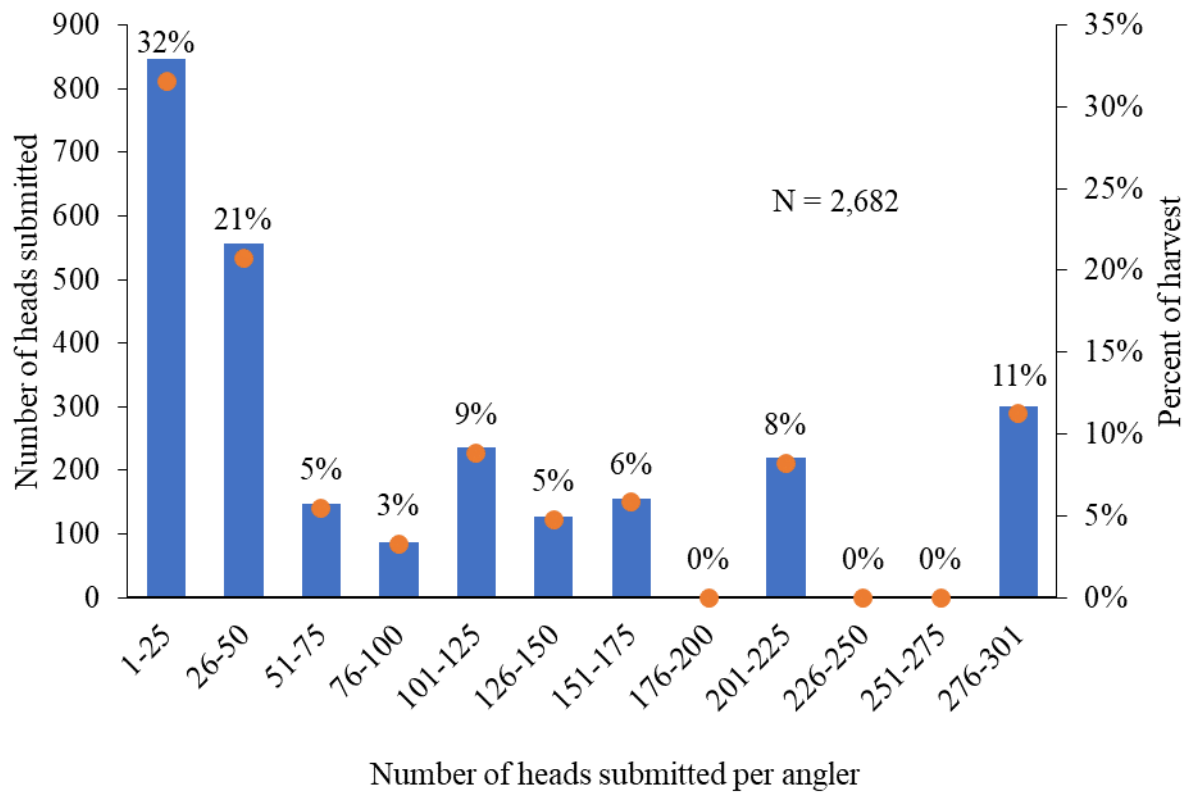
Figure 2. Number and percent of AIP harvest, grouped by number of heads submitted per angler, through the Lake Pend Oreille Walleye AIP during 2022.
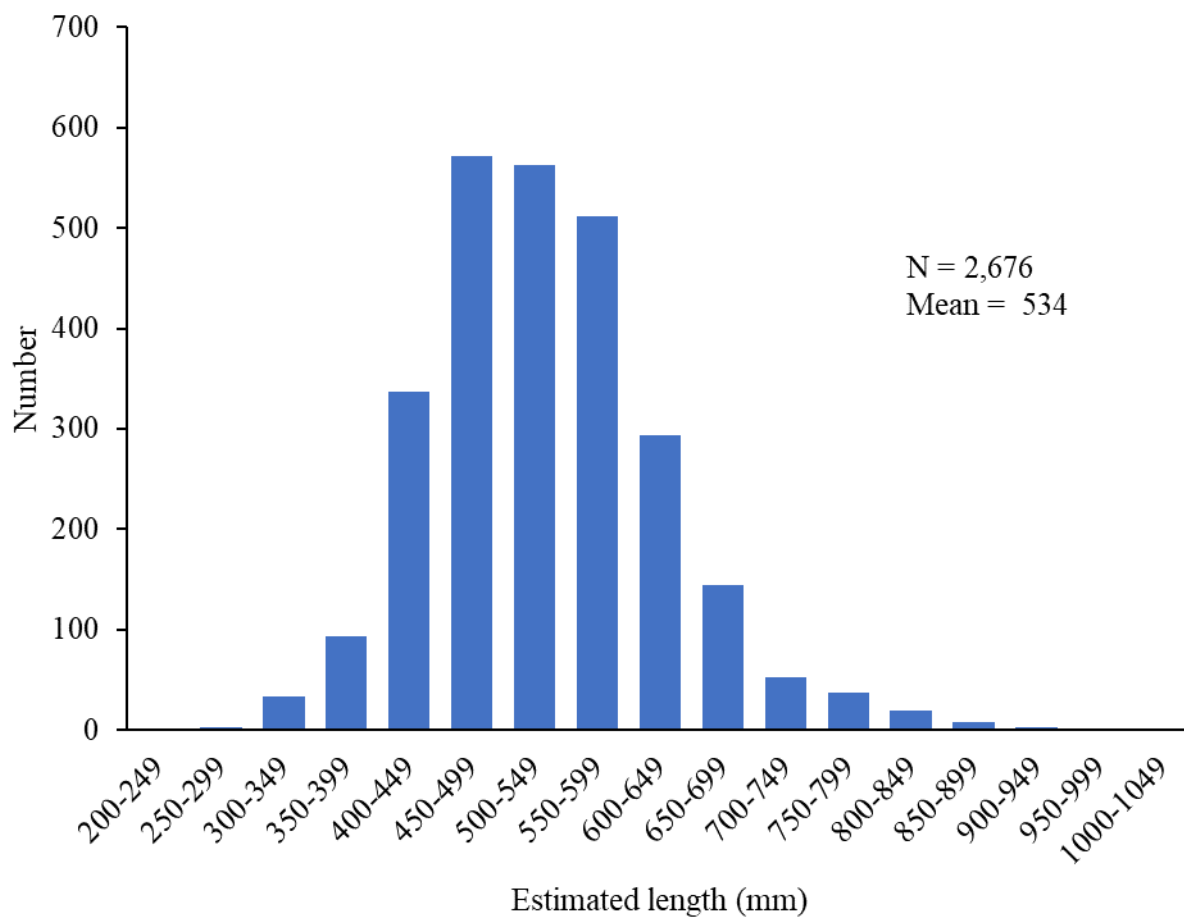
Figure 3. Length-frequency plot of Lake Trout captured by anglers participating in the AIP during 2022 by estimated total length bins. Lengths were derived using a head length to total length regression formula, developed from Lake Trout captured by the LPO Predator Suppression Program on Lake Pend Oreille.

APPENDIX E. 2022 LPO WALLEYE NETTING PROGRAM SUMMARY

Spring 2022 LPO Walleye Netting Summary
4/11/2022 - 4/29/2022
Jeff Strait
06/14/2022

Overview

During spring 2022 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 gillnets to target Walleye (*Sander vitreus*) in Lake Pend Oreille, Idaho. A total of 414 Walleye were captured and 369 were removed (198 mm to 800 mm total length) using 153,900 ft (46,908.72 m) of net. We also tagged 1 Walleye with acoustic telemetry tags (Innovasea Inc.) and 32 Walleye using coded-wire tags to add to the Angler Incentive Program (AIP). Of the recaptures (n = 6), 6 were previously implanted with acoustic telemetry tags, and 4 were previously implanted with coded-wire tags.

As part of the bycatch during these efforts, twenty different species were captured including 12 ESA Threatened Bull Trout (*Salvelinus confluentus*). The average direct mortality rate of Bull Trout was 50%. We PIT tagged 3 and recaptured 5 previously tagged Bull Trout and condition was broken down as following:

- Good = 6
- Fair = 0
- Poor = 0
- Not Reported = 0
- Mortalities = 6 (2 were previously tagged)

In addition to the mark-recapture data collection for Bull Trout, we also collected 5 genetic samples from tagged and 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 8 Northern Pike (*Esox lucius*) with acoustic telemetry tags and recaptured 0 Northern Pike with previously implanted acoustic tags. We also tagged Smallmouth Bass (*Micropterus dolomeiu*) and Gerrard-strain Rainbow Trout (*Oncorhynchus mykiss*) with non-reward and reward T-bar tags. A total of 529 Smallmouth Bass were tagged in this effort including 129 with reward tags. We recaptured 36 Smallmouth Bass during the three-week netting period. We also tagged a total of 17 Rainbow Trout with reward tags. We recaptured 2 Rainbow Trout during the three week netting period. In addition to T-bar tags, we also implanted 1 Rainbow Trout with an acoustic tag.

- NPK acoustic tags = 8
- NPK recaps = 0
- SMB T-bar tagged = 529
- SMB T-bar reward tags = 129
- SMB T-bar recaps = 36
- RBT T-bar tagged = 17
- RBT T-bar reward tags = 17
- RBT T-bar recaps = 2
- RBT acoustic tags = 1

The following tables and figures provide summary information on catch and bycatch from gill net efforts during the complete spring 2022 netting season.

Tables

Table 1: Summary of the Walleye suppression gillnetting during the spring 2022. 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 Smallmouth Bass with T-bar tags, Northern Pike received a combination of T-bar and acoustic telemetry tags, and Walleye received either a combination of T-bar and acoustic telemetry tags or a coded-wire tag. Lake Trout, Walleye, and Northern Pike removed intentionally; for all other species, "removed" represents fish that were "dead on capture".

Species	Captured	Released	Tagged	Recaptured	Removed
Smallmouth Bass	623	623	529	36	0
Walleye	414	45	34	12	369
Northern Pike	104	9	8	2	95
Brown Trout	89	63	0	0	26
Yellow Perch	86	83	0	0	3
Westslope Cutthroat Trout	43	34	0	0	9
Rainbow Trout	30	20	17	2	10
Lake Trout	26	0	0	0	26
Bull Trout	12	6	3	5	6
Rainbow X Cutthroat Trout	11	10	0	0	1
Black Crappie	7	7	0	0	0
Mountain Whitefish	7	7	0	0	0
Largemouth Bass	1	1	0	0	0

Table 2: Total catch of each species by location during the spring 2022 Walleye suppression gillnetting. 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 Cuttroat Trout hybrids (RBT X WCT), Smallmouth Bass (SMB), Walleye (WAE), Westslope Cutthroat Trout (WCT), and Yellow Perch (YEP).

	BCR	BRT	BLT	LKT	LMB	MWF	NPK	RBT	RBTx WCT	SMB	WAE	WCT	YEP
Clark Fork Delta	0	13	3	7	0	1	5	2	1	104	17	3	1
Fisherman's Island	0	1	0	2	0	0	9	2	0	10	3	0	1
Fisherman Island to Hawkins Point	3	8	3	3	1	4	9	2	0	124	50	8	11
Hawkins Point	0	0	0	0	0	0	5	0	0	33	5	0	0
Kootenai Point	0	3	0	0	0	0	16	1	0	10	2	0	25
Outside Train Trestle	0	1	0	0	0	0	0	0	0	7	18	0	10
Pack River Delta	4	25	3	2	0	1	43	15	9	231	130	22	9
Sheepherder Point	0	29	0	3	0	1	13	6	1	22	10	5	0
Train Trestle	0	9	3	9	0	0	4	2	0	82	179	5	29

Table 3: Summary of length data for Walleye, Bull Trout, and Bull Trout mortalities captured in gillnets during the spring 2022 Walleye suppression netting.

Species	Mean TL	SE	Max TL	Min TL
BLT	515.2	17.1	558	445
BLT Mortalities	542.8	30.8	665	466
WAE	488.4	4.3	800	198

Table 4: Catch data for Walleye, Bull Trout, and Bull Trout mortalities during the spring 2022 Walleye suppression netting. These statistics include the total number of Walleye (WAE), live Bull Trout (BLT), Bull Trout mortalities (BLT Morts), the mean catch ratios of Walleye to live Bull Trout (WAE:BLT), Walleye 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	94	4	0	23.5	NA	0.0
4	168	1	1	168.0	168.00	0.5
3.5	149	1	4	149.0	37.25	0.8
3	3	0	1	NA	3.00	1.0

Table 5: Catch per unit effort statistics for Walleye, Bull Trout, and Bull Trout mortalities during the spring 2022 Walleye suppression netting. These statistics include the total number of 274 m gillnet panels fished (Effort), and the Mean and SE of daily catch per unit effort (# fish / 274 m of net) for Walleye (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	56	1.46	0.33	0.11	0.06	0.00	0.00
4	56	2.85	0.64	0.01	0.01	0.01	0.01
3.5	56	2.40	0.58	0.01	0.01	0.07	0.03
3	3	1.00	0.58	0.00	0.00	0.33	0.33
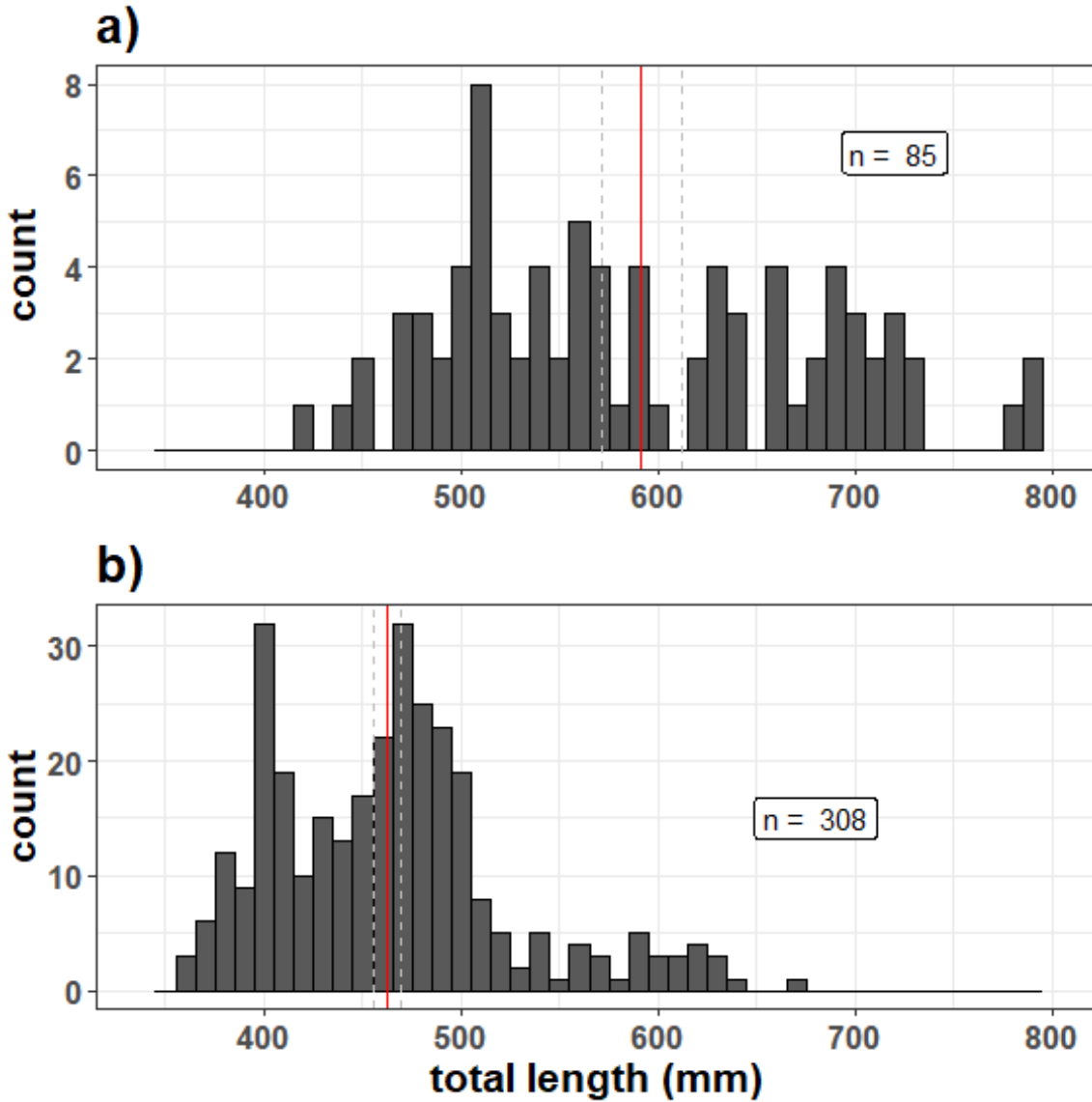
Figure 1: Length frequencies of female (a) and male (b) Walleye captured in gillnets during spring 2022 Walleye suppression netting. Vertical red lines represent the sample mean length for each group and the dashed grey lines represent two standard errors above and below the sample mean.
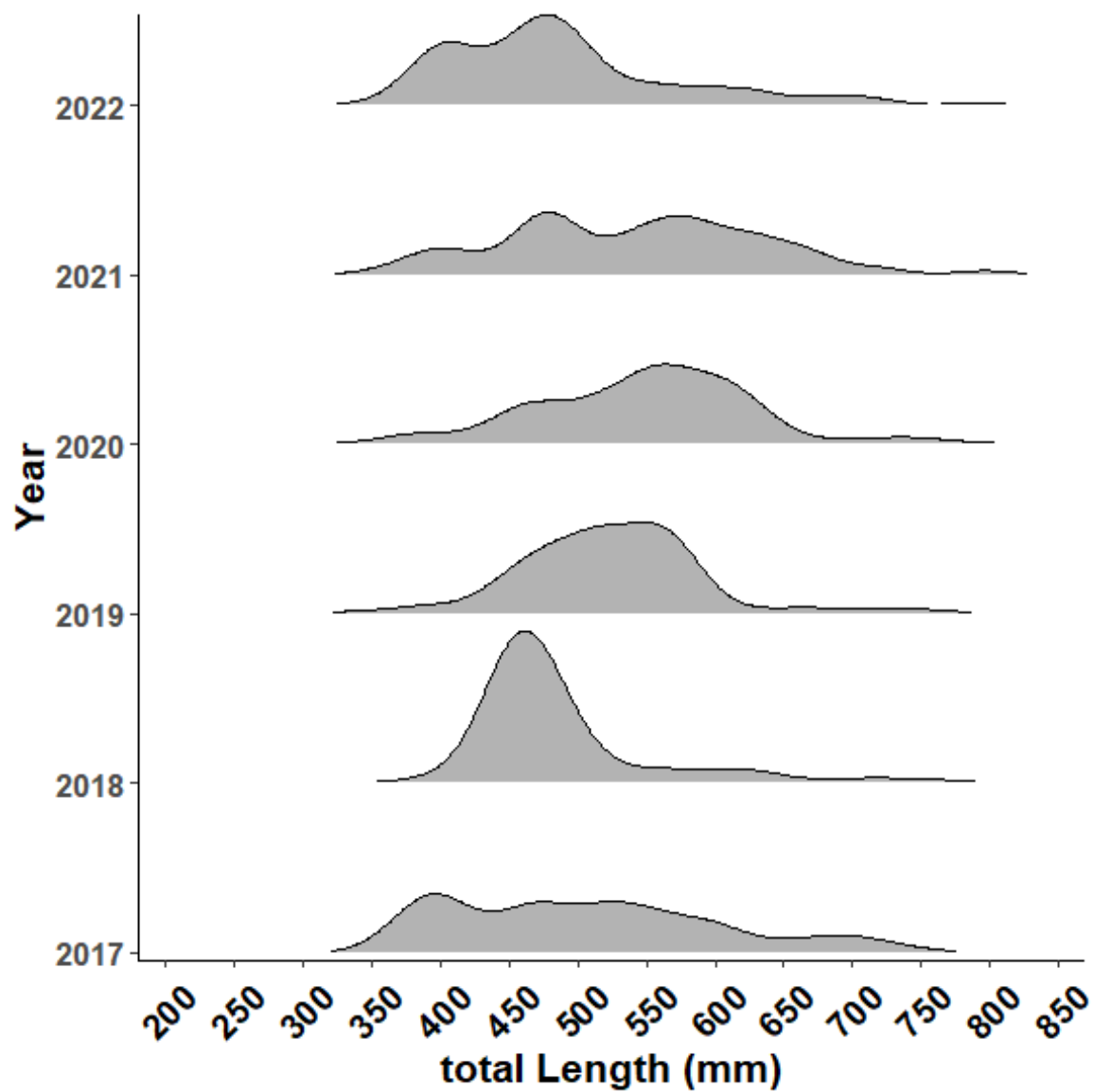
Figure 2: Density plots of the relative length frequencies distributions of Walleye captured during the designated spring gillnetting efforts from 2017–present.
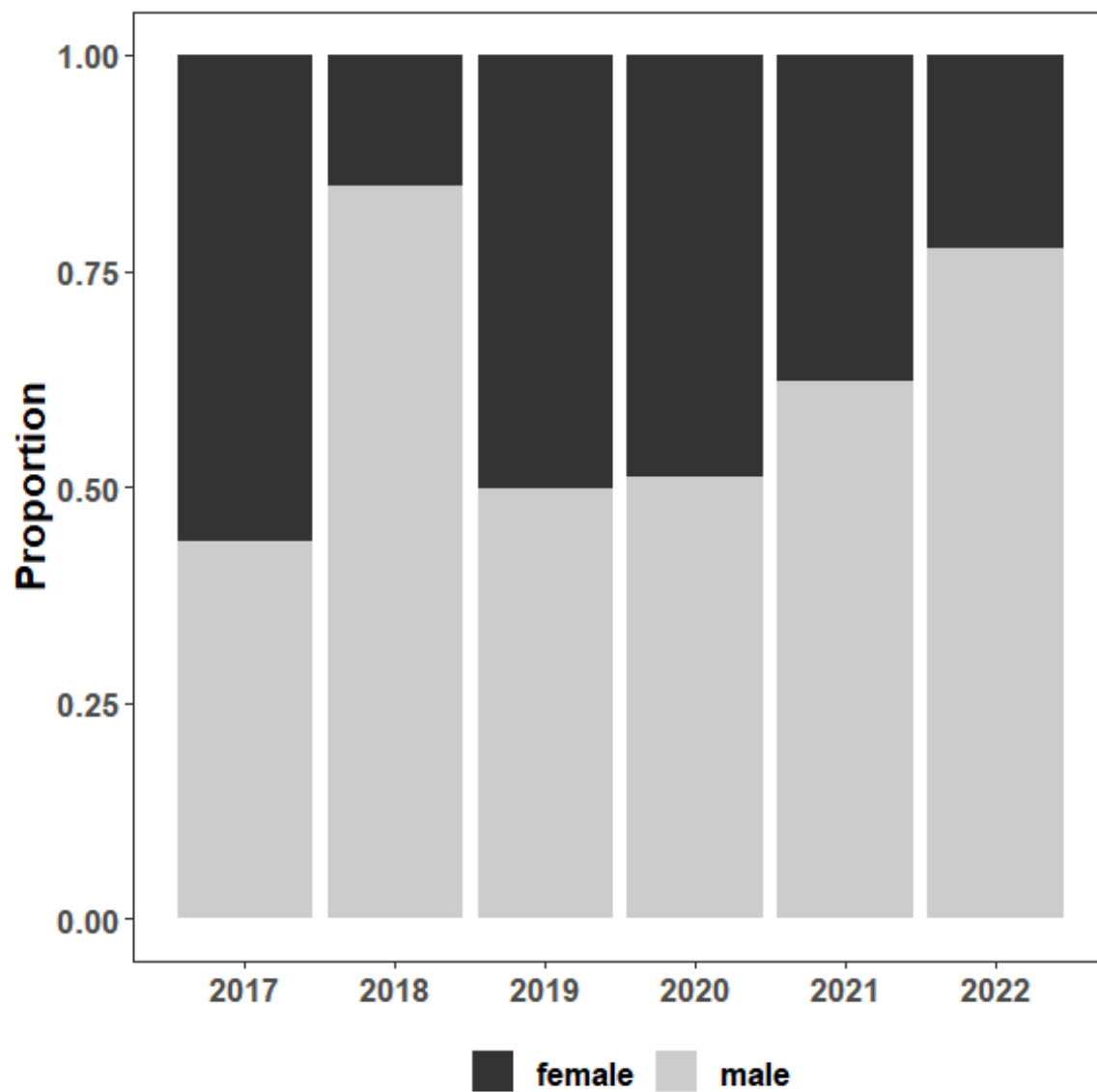
Figure 3: Sex ratios of Walleye captured during the designated spring gillnetting efforts from 2017–present.
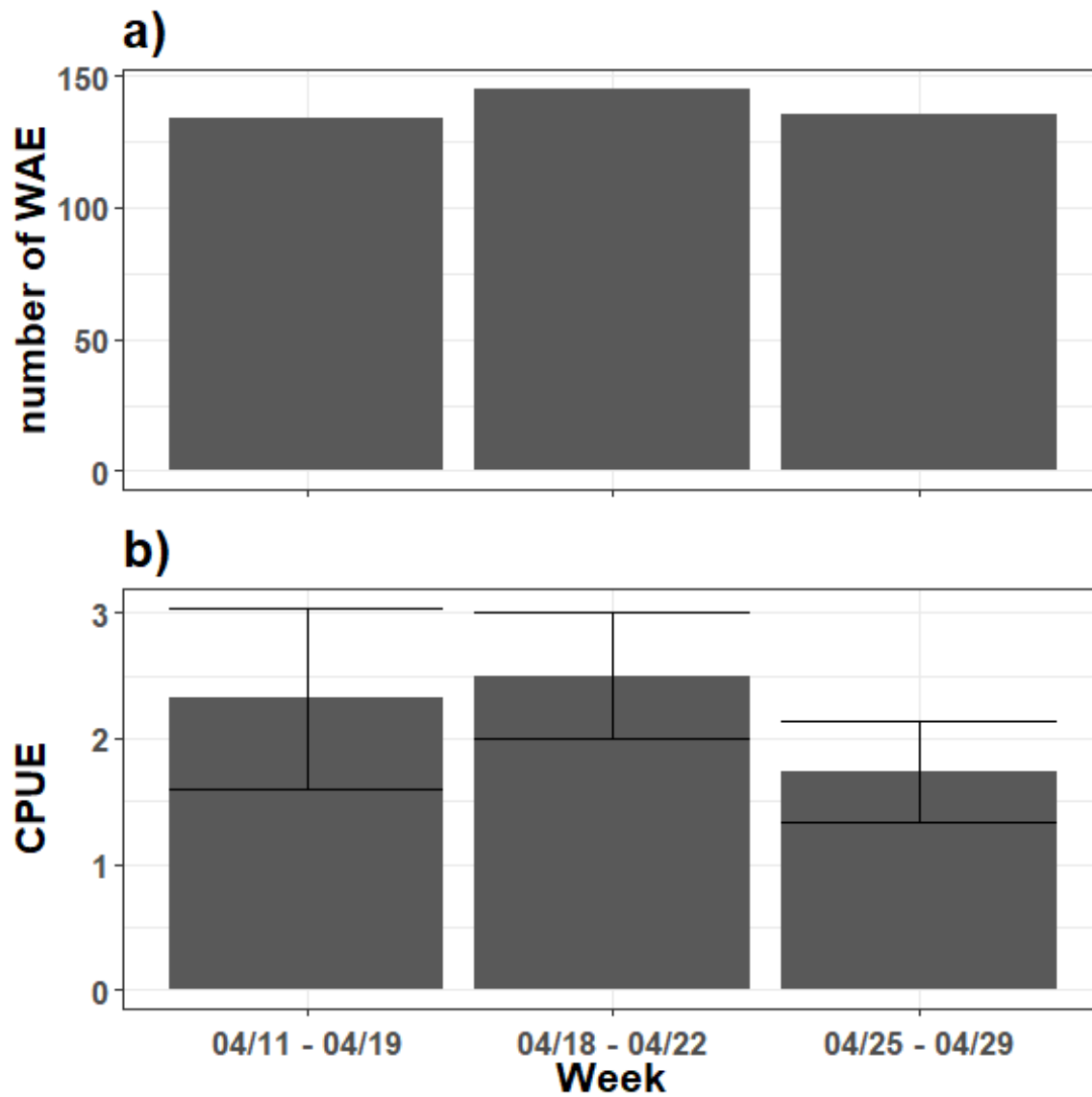
Figure 4: Weekly catch (a) and mean weekly CPUE (b, with SE bars) of Walleye captured during the spring 2022 Walleye suppression netting.
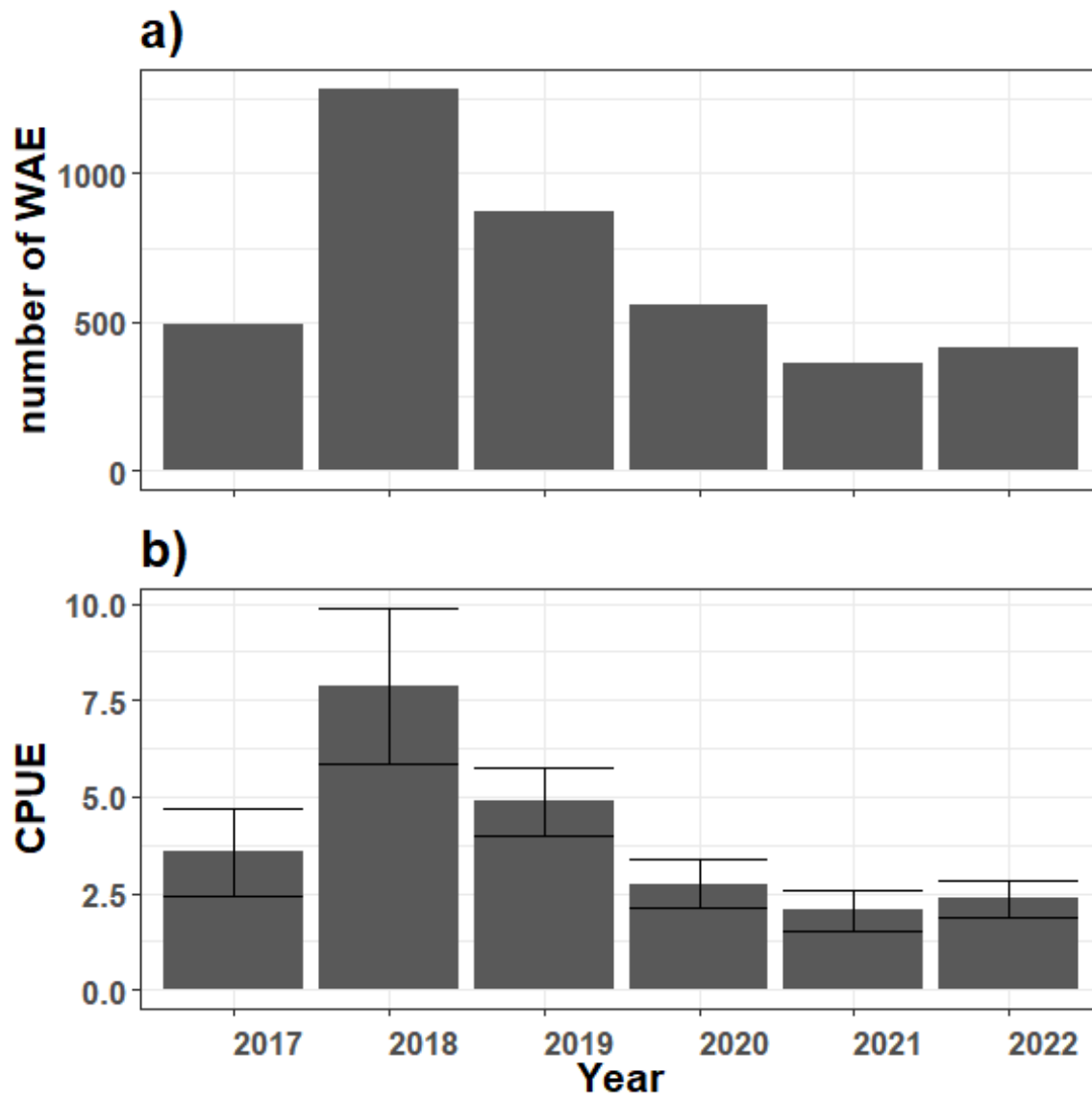
Figure 5: Annual catch and mean CPUE of Walleye during the designated spring gillnetting efforts from 2017–present.
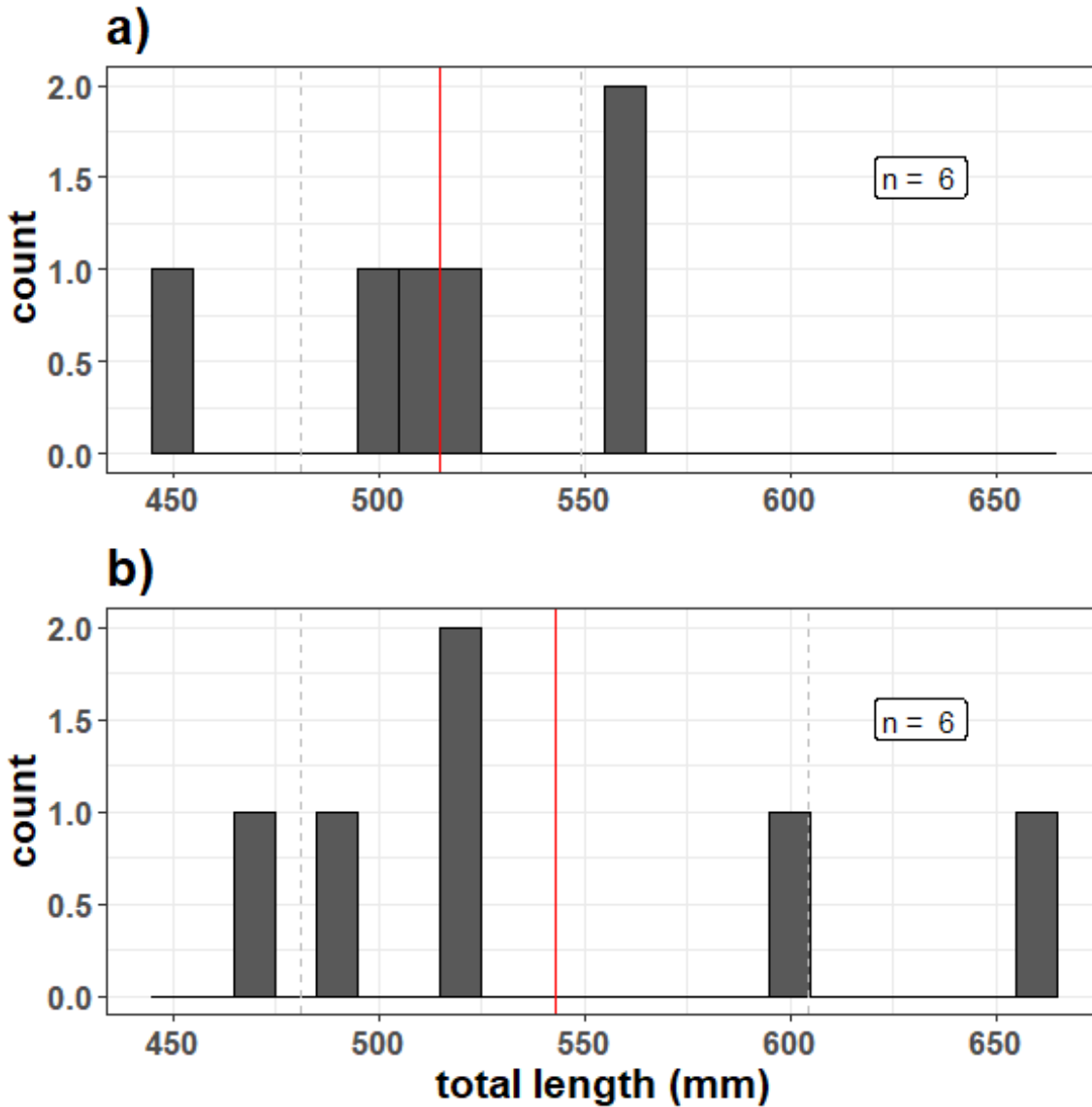
Figure 6: Length frequencies of Bull Trout captured in gillnets during spring 2022 Walleye suppression netting. Panels a) is the length frequency of Bull Trout released alive and panel b) that of Bull Trout captures that resulted in direct mortalities. Vertical red lines represent the sample mean length for each group and the dashed grey lines represent two standard errors above and below the sample mean.
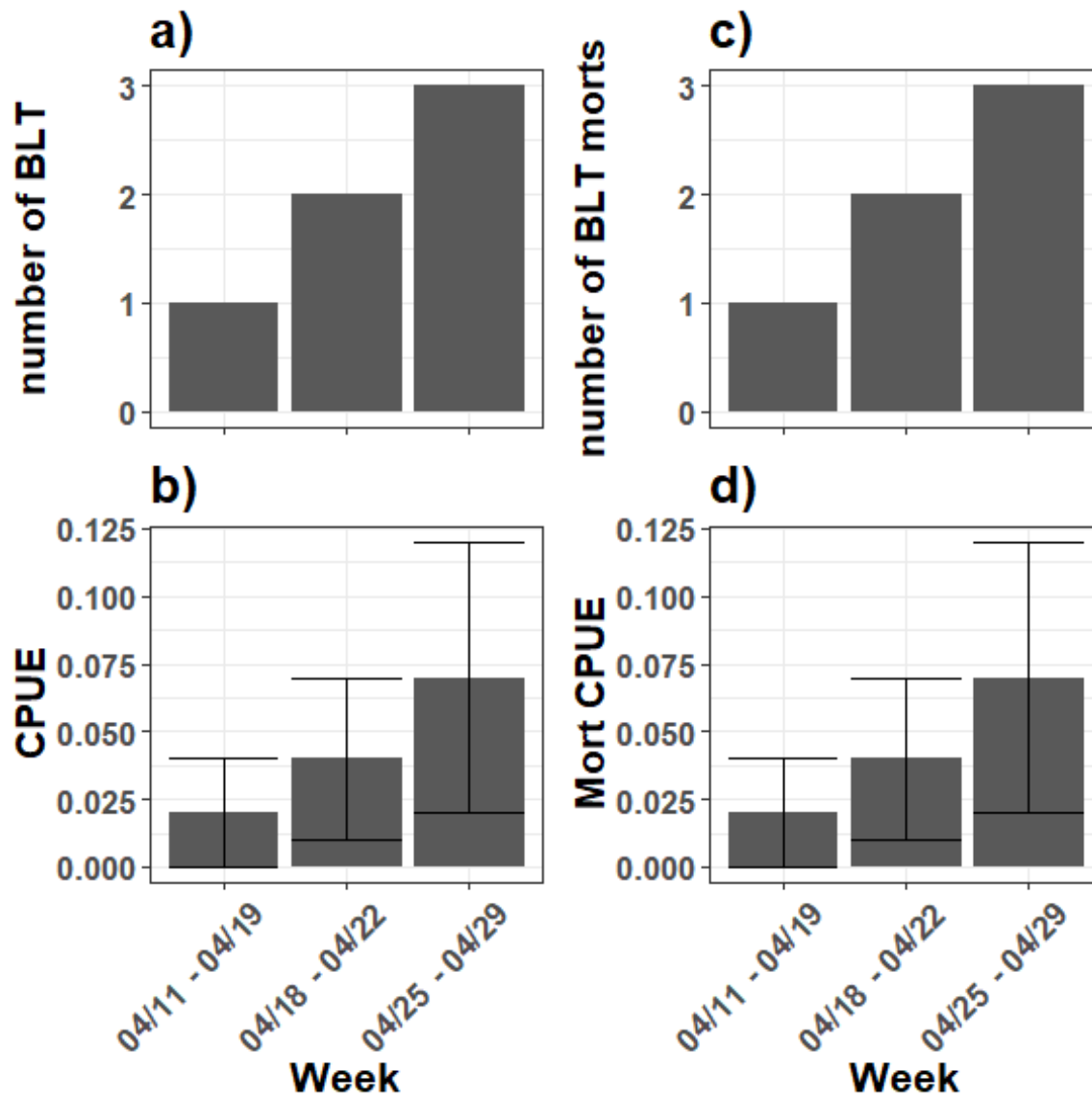
Figure 7: Weekly catch (a) and mean weekly CPUE (b, with SE bars) of Bull Trout captured and released alive during the spring 2022 Walleye suppression netting. Panels a) and c) summarize the catch (b) and mean weekly CPUE (d) of direct Bull Trout mortalities during the spring 2022 Walleye suppression netting.

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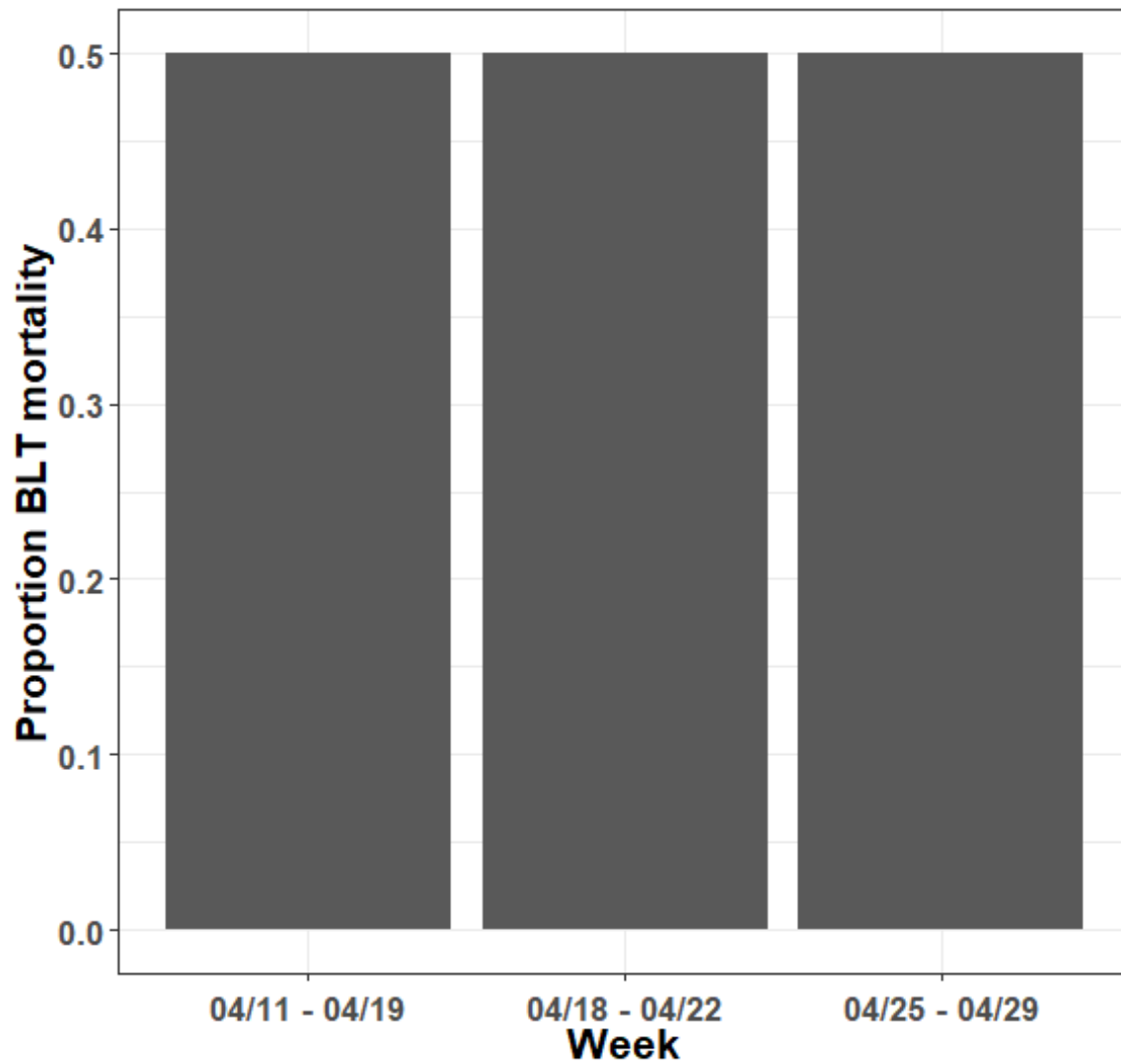
Figure 8: Proportion bycatch resulting in direct mortalities for Bull Trout captured during the spring 2022 Walleye suppression netting.
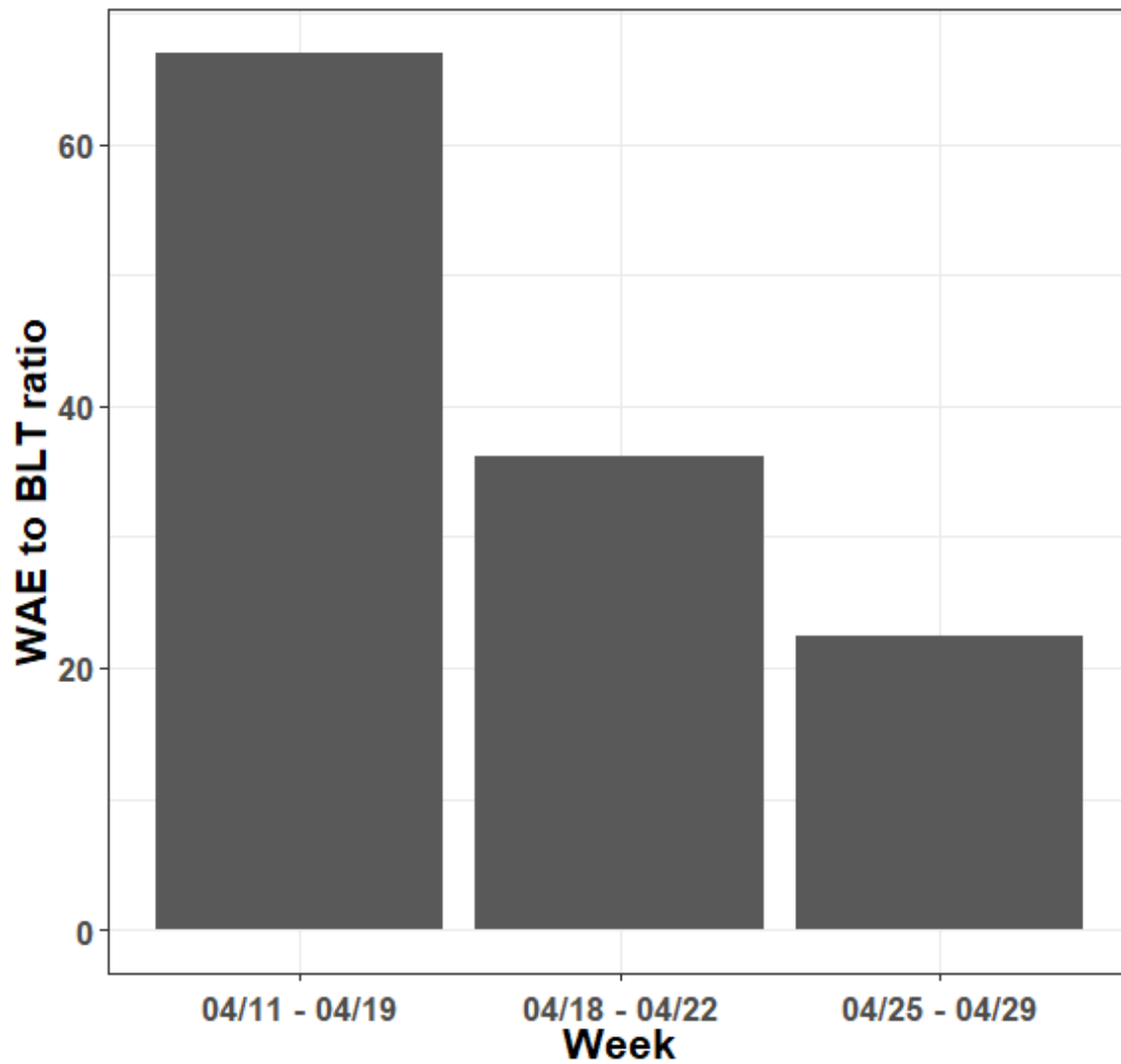
Figure 9: Walleye to Bull Trout catch ratios during the spring 2022 Walleye Suppression netting.
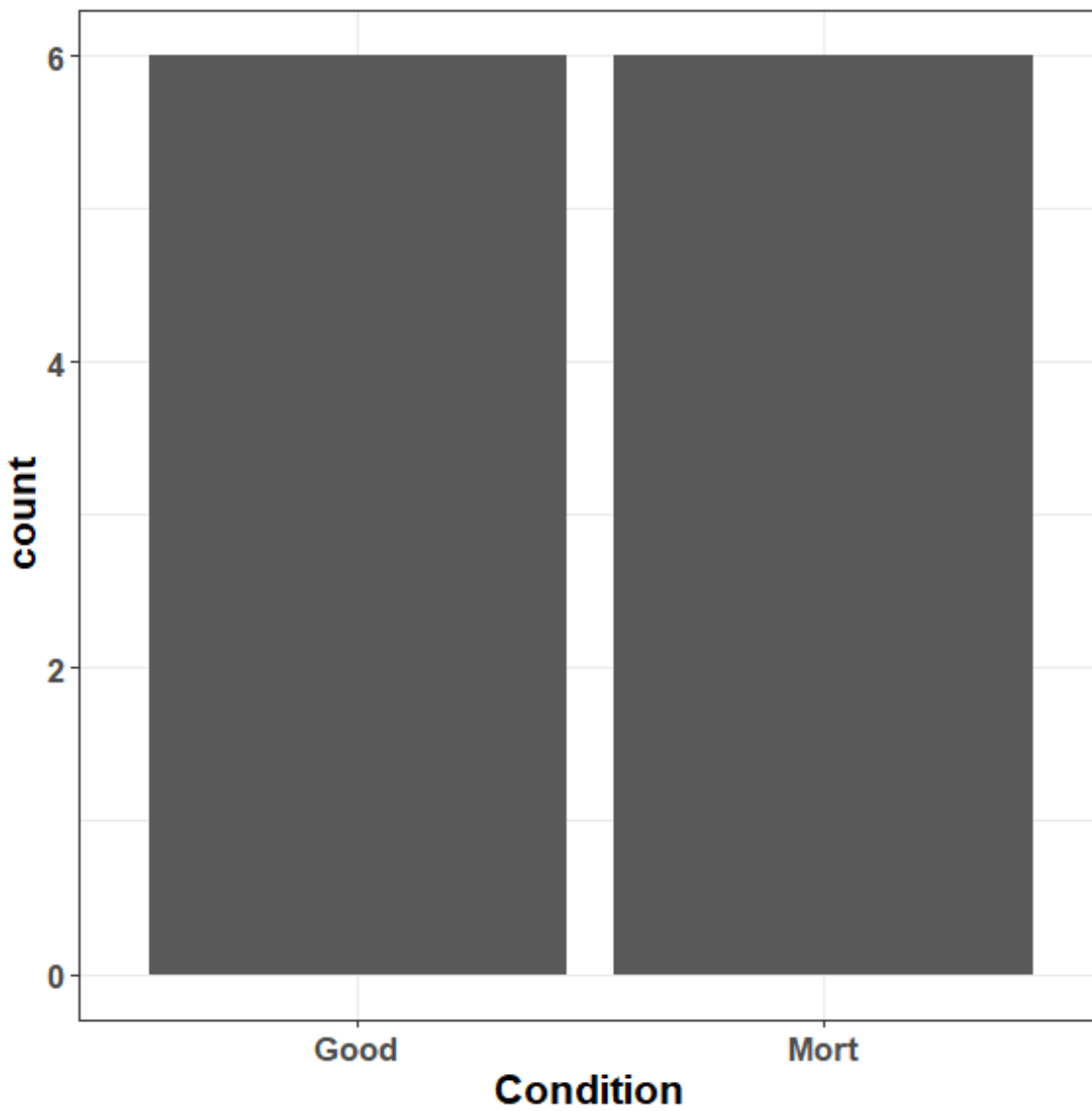
Figure 10: Condition index of Bull Trout captured during spring 2022 Walleye suppression netting.
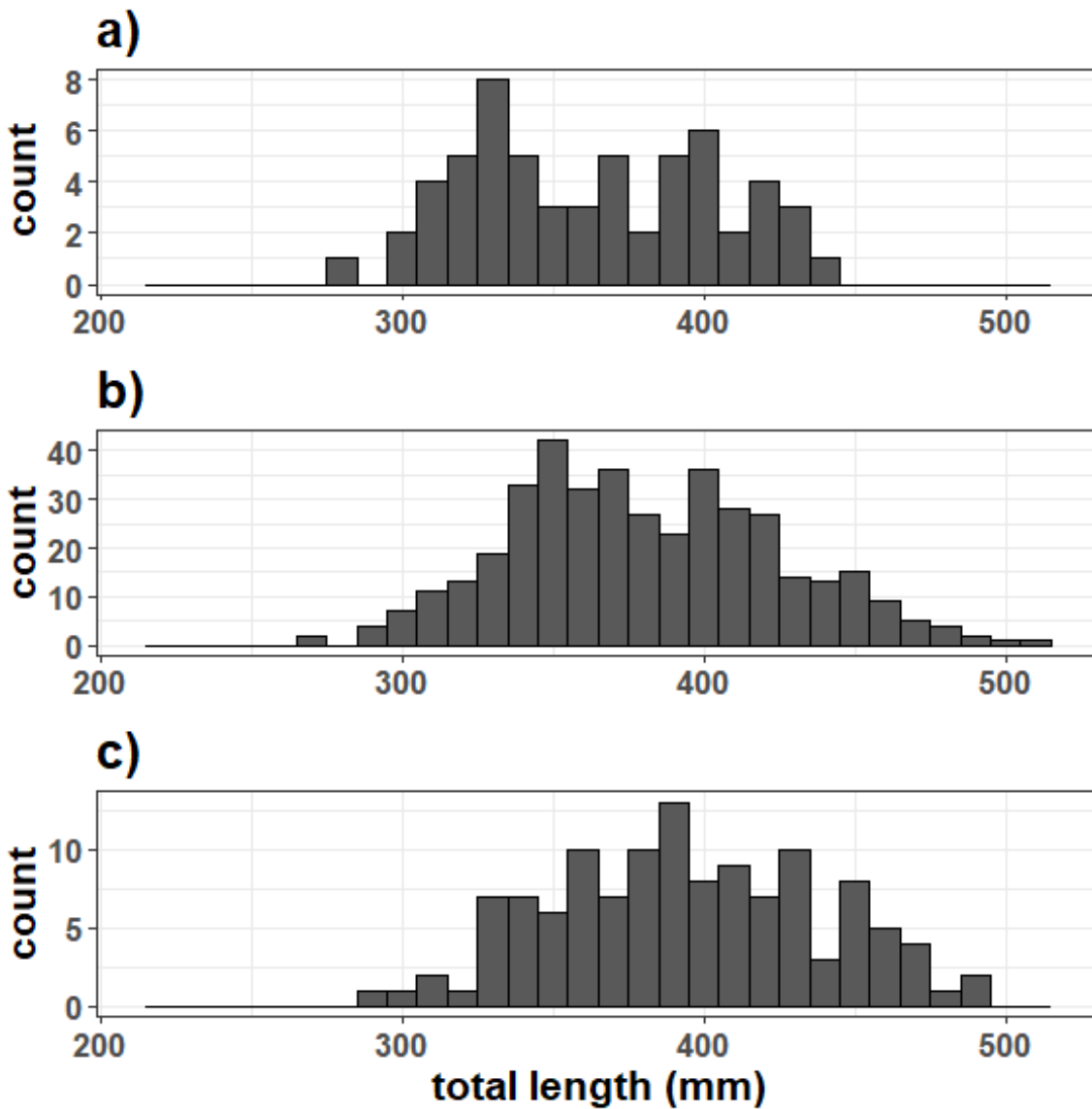
Figure 11: Length frequency of Smallmouth Bass a) released untagged, b) tagged with a non-reward T-bar tag, and c) double-tagged with a reward and non-reward T-bar tags during spring 2022 Walleye suppression netting. There were no direct mortalities to Smallmouth Bass during the gillnetting efforts.
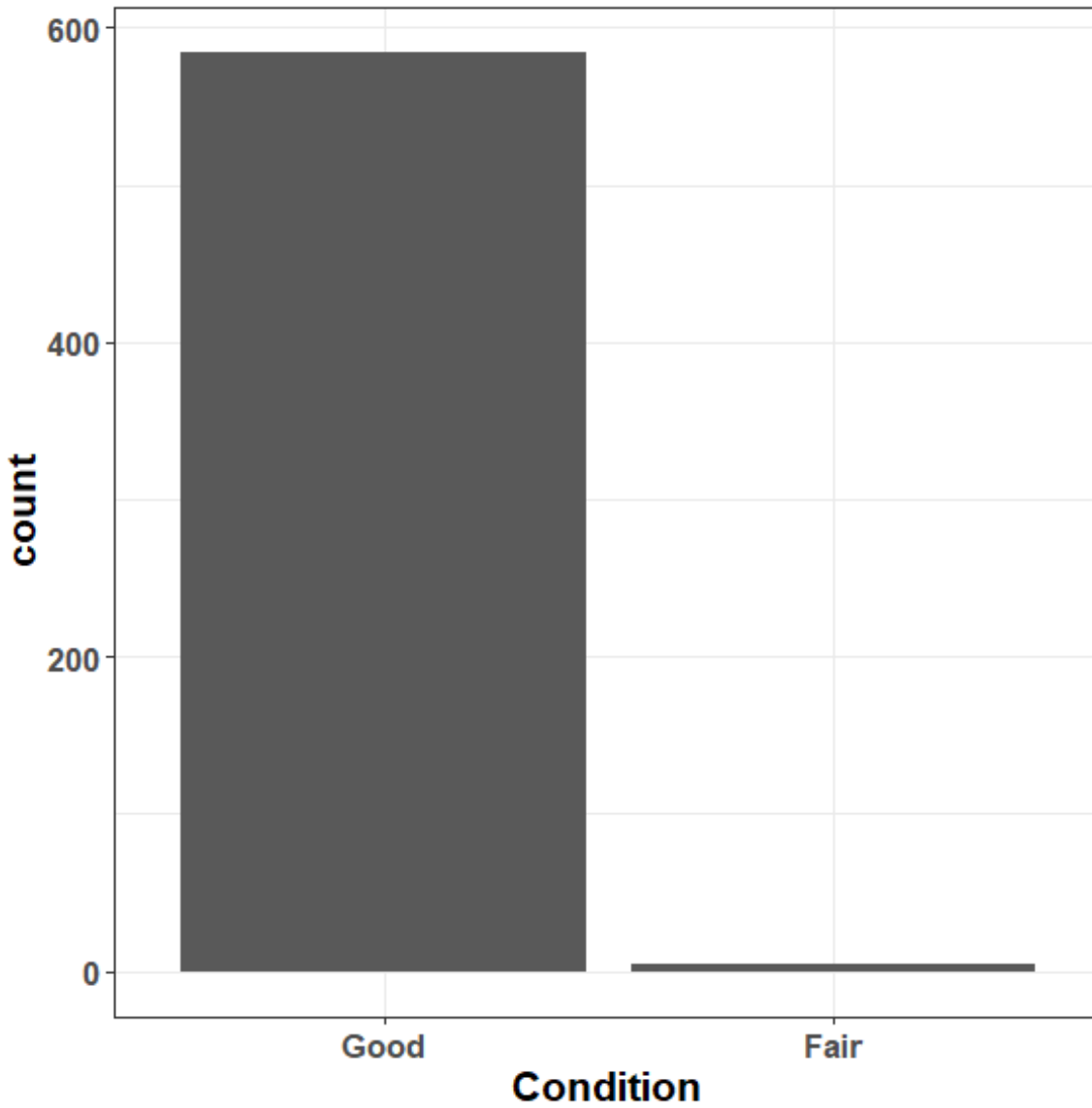
Figure 12: Condition index of Smallmouth Bass captured during spring 2022 Walleye suppression netting.
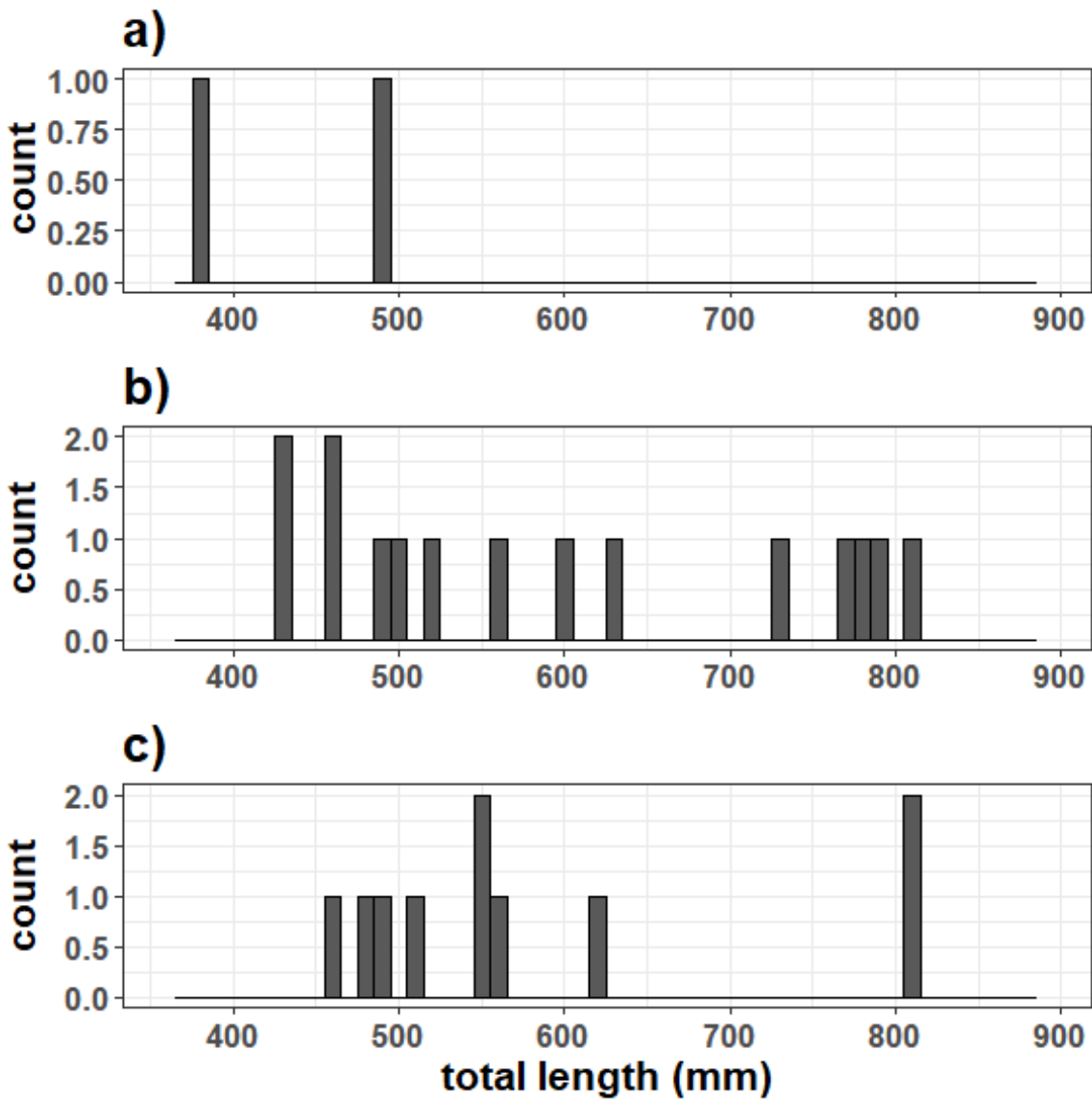
Figure 13: Length frequency of Rainbow Trout a) released untagged, b) double-tagged with $50-reward and non-reward T-bar tags, c) direct mortalities during spring 2022 Walleye suppression netting.
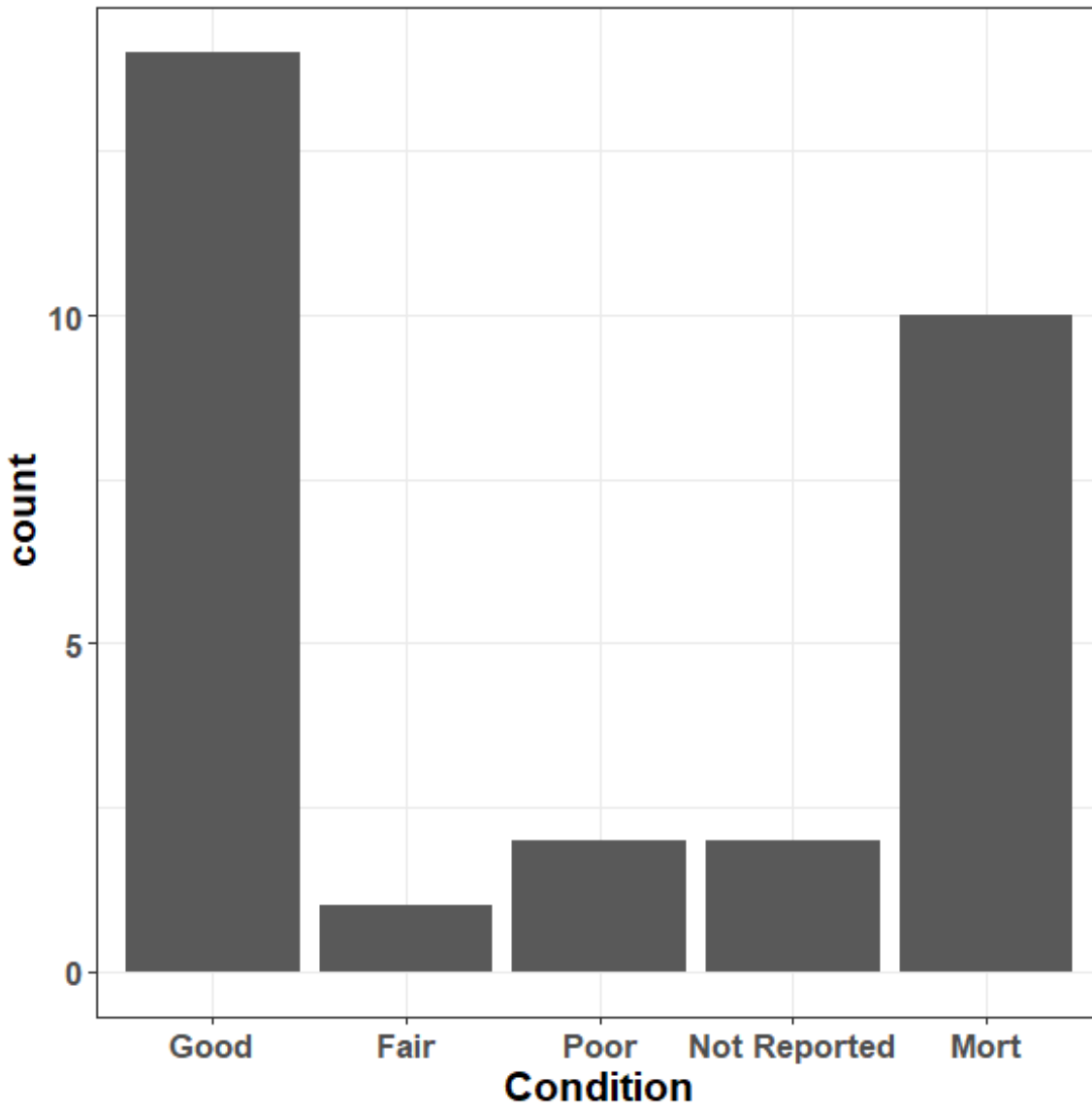
Figure 14: Condition index of Rainbow Trout captured during spring 2022 Walleye suppression netting.

Non-game fish species counts

During the three-week Walleye suppression gillnetting in spring 2022, we enumerated all non-game fish captured during two randomly selected days each week. See the following tables for a summary of those data.

Table 6: Total catch of each non-game species from the spring 2022 Walleye suppression gillnetting.

Species	n
Lake Whitefish	609
Largescale Sucker	521
Longnose Sucker	221
Northern Pikeminnow	76
Brown Bullhead	16
Tench	9
Peamouth	1

Table 7: Total catch of each non-game species by netting location during the spring 2022 Walleye suppression gillnetting. 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
Clark Fork Delta	0	77	82	23	23	1	5
Fisherman Island to Hawkins Point	2	84	30	21	1	0	0
Outside Train Trestle	0	164	7	8	8	0	0
Pack River Delta	14	143	377	162	28	0	1
Sheepherder Point	0	37	14	5	8	0	3
Train Trestle	0	104	11	2	8	0	0

APPENDIX F. WALLEYE ANGLER INCENTIVE PROGRAM SUMMARY

2022 LPO Walleye Angler Incentive Program Summary

Ken Bouwens
Rob Jakubowski

Total Walleye heads submitted = 1,247

Total unique anglers participating = 157

Table 1. Number of Walleye removed through the Lake Pend Oreille Idaho, Angler Incentive Program (AIP), by month 2019–2022.

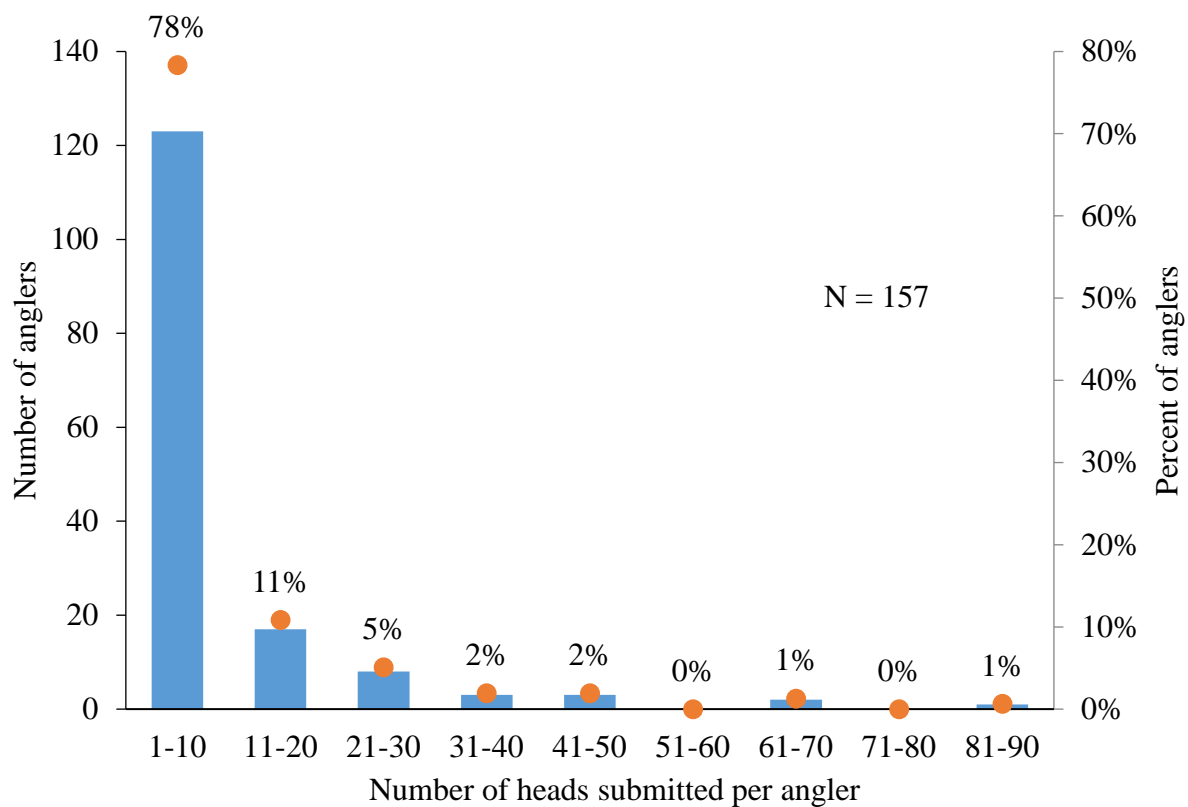| Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
2019			26	89	79	154	156	171	76	18	9	7	785
2020	12	17	60	53	71	121	137	206	130	25	14	14	860
2021	10	1	85	9	54	86	215	184	76	14	13	10	757
2022	21	23	14	34	82	90	471	278	117	78	27	12	1,247

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 2022.
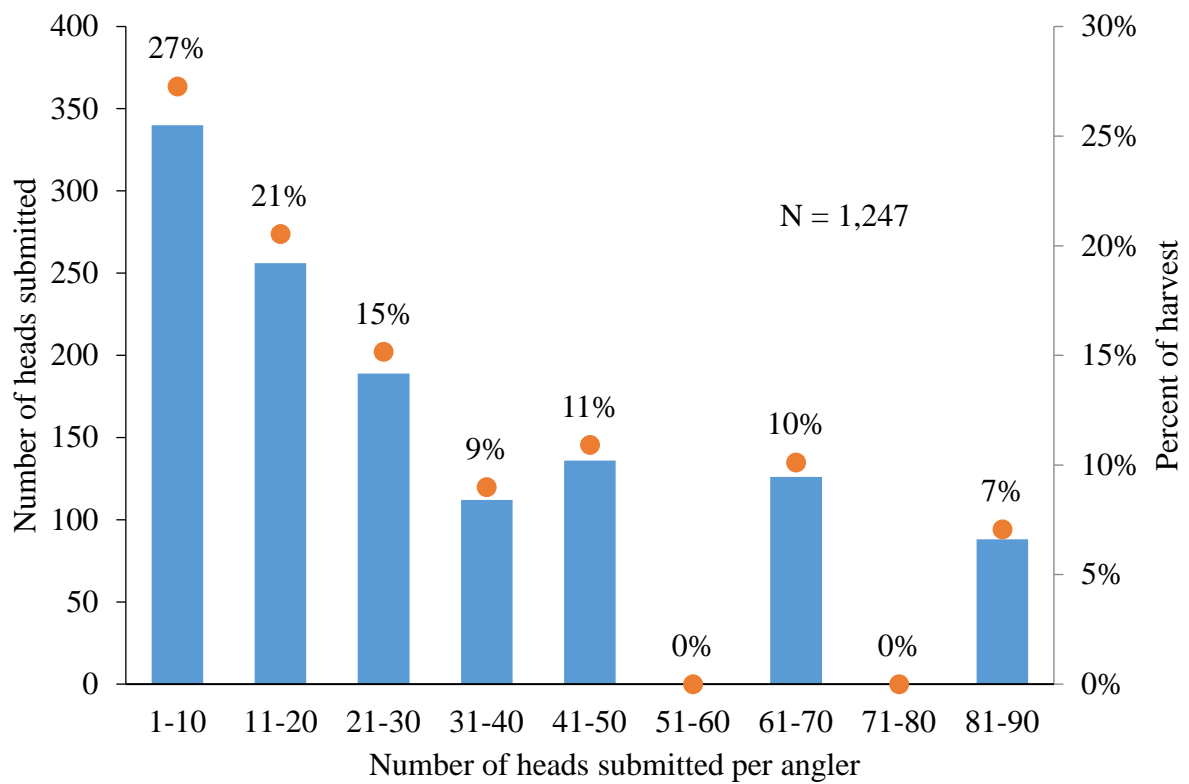
Figure 2. Number and percent of AIP harvest, grouped by number of heads submitted per angler, through the Lake Pend Oreille Walleye AIP during 2022.
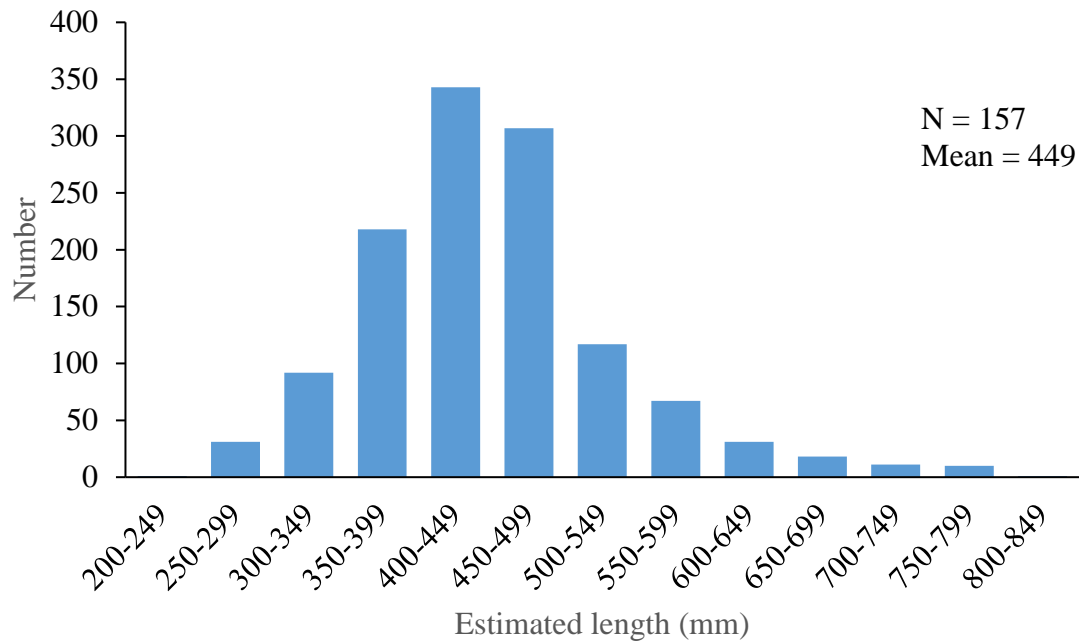
Figure 3. Length-frequency plot of Walleye captured by anglers participating in the AIP during 2022 by estimated total length bins. Lengths were derived using a head length to total length regression formula, developed from Walleye captured by the LPO Predator Suppression Program on Lake Pend Oreille.
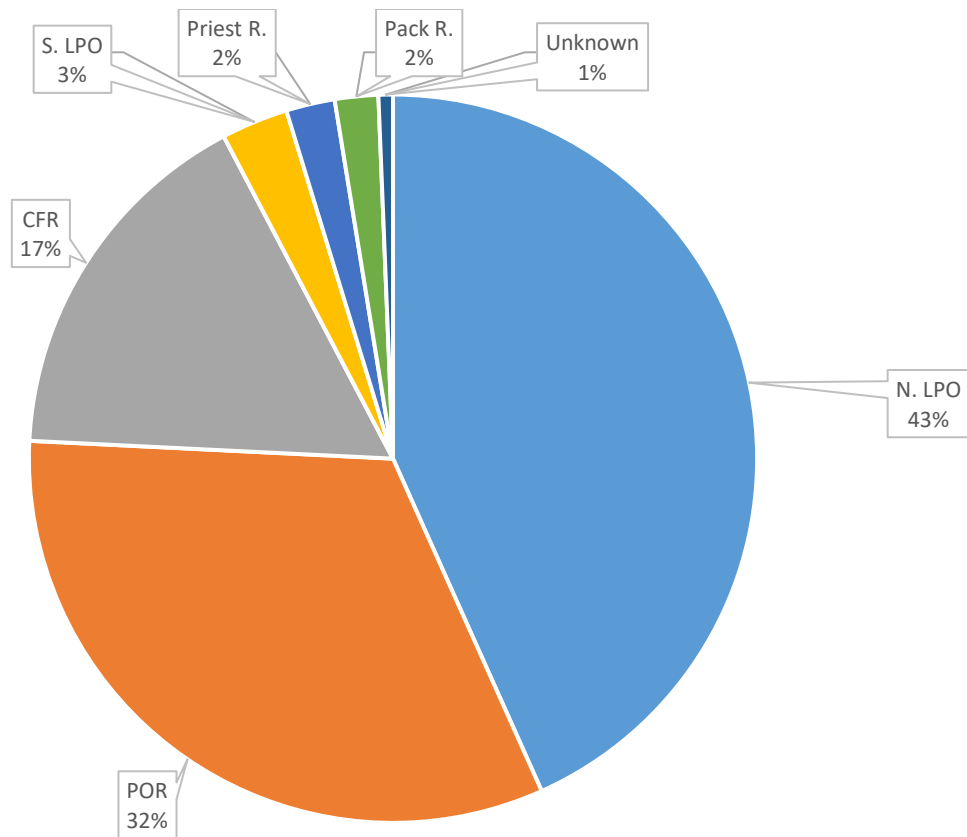
Figure 4. Locations (N. LPO: areas of LPO north of Windy Point; POR: Pend Oreille River; CFR: Clark Fork River, S. LPO: areas of LPO south of Windy Point; Priest R.; Pack R.) where Walleye were reported to have been caught, as a percentage of the total, by anglers participating in the Walleye AIP, 2022.