

California Department of Fish and Wildlife
Inland Fisheries Assessment and Monitoring Program

Stampede Reservoir Kokanee Fishery Evaluation – 2021

by

Jana Lott
Scientific Aid
Fisheries Branch

Kyle Murphy
Senior Environmental Scientist
Fisheries Branch



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Table of Contents

ABSTRACT.....	2
INTRODUCTION.....	2
STUDY LOCATION.....	3
METHODS.....	3
ANGLER SURVEY.....	3
KOKANEE.....	4
SCALE COLLECTION AND ANALYSIS.....	4
RESULTS.....	4
ANGLER SURVEY.....	4
KOKANEE.....	5
SCALE COLLECTION AND ANALYSIS.....	6
DISCUSSION.....	6
LITERATURE CITED.....	6
TABLES.....	9
Table 1.....	9
Table 2.....	9
FIGURES.....	10
Figure 1.....	10
Figure 2.....	10
Figure 3.....	11
Figure 4.....	11
Figure 5.....	12
Figure 6.....	12
Figure 7.....	13
Figure 8.....	13
Figure 9.....	14

ABSTRACT

Stampede Reservoir, located in Tahoe National Forest, is a popular fishing spot for sport and recreational anglers. Due to its strong natural spawn run, Stampede is the sole source of Kokanee eggs for the CDFW Landlocked Salmon Program. To be able to manage the Kokanee and other sport fisheries at this reservoir, angler access point surveys were conducted during the summer season of 2021. A CDFW scientific aid interviewed anglers after their day fishing. Information regarding number of anglers, total rods used, total hours fished, species targeted, and number of fish kept and released (separated by species) were collected. Anglers were also asked to rate their satisfaction with overall angling experience, number and size of fish caught. Total lengths were taken of all fish kept; Kokanee kept were additionally checked for the presence of an adipose fin and scale samples were collected for age analyses. Kokanee measured during the surveys had a total length average of 272mm (10.7 in). The management goal for this fishery is 330mm (13 in) TL. The 2021 fishery did not meet this management goal. A total of 306 Kokanee were measured, of those, only 0.33% (n=1) were marked. Kokanee anglers were generally satisfied with their overall fishing experience and number of fish caught but were dissatisfied with the size of fish. Further studies on zooplankton populations and Kokanee recruitment rates at Stampede would provide additional information in the development of future adaptive management strategies

INTRODUCTION

Stampede Reservoir was formed by the completion of the Stampede Dam in 1970. The dam itself is owned and operated by the US Bureau of Reclamations and is a part of the Washoe project, which serves as the drainage basins of the Truckee and lower Carson Rivers to supply irrigation water to other projects (US Bureau of Reclamation 2020). The reservoir provides flood control, recreation for water enthusiasts of all kinds, and is a popular destination for recreational anglers. The reservoir contains a variety of sport fish: Kokanee (KOK), Rainbow Trout (RT), Brown Trout (BN), Smallmouth Bass (SMB), Lake Trout (LT), and Lahontan Cutthroat Trout (LCT). The California Department of Fish and Wildlife (CDFW) has a long history of stocking Stampede Reservoir with Kokanee, Brown Trout, Lahontan Cutthroat, Lake Trout, and Rainbow Trout (Fig. 1). Currently, LCT and KOK are the only sport fish being stocked annually. Stampede Reservoir is utilized by CDFW as its sole Kokanee egg take location for the Landlocked Salmon Program; this is because of Stampede's strong natural run of Kokanee and is easily accessible thus making it an ideal location for the egg take operation.

Angler surveys are conducted as a means to track the different sport fisheries present, but specifically to evaluate the Kokanee fishery and its needs. Surveys include questions for anglers and collection of scale samples when possible. This data is used by fishery managers when

developing adaptive management strategies for these fisheries; actions such as assessing management goals, fish stocking needs, or regulation changes all utilize information provided by anglers. Scale samples collected give biologists important information regarding age makeup of the Kokanee population. In 2018, all Kokanee stocked in Stampede Reservoir had their adipose fins removed as a way for CDFW to estimate the proportion of stocked to naturally spawned adults in the fishery. This information is vital in fishery management because it aids biologist in determining stocking allotments and creating projections for future egg take.

STUDY LOCATION

Stampede Reservoir is a man-made reservoir, located in Sierra County and part of the Tahoe National Forest, approximately 30 minutes from the town of Truckee, California. It is situated at an elevation of just under 6000 feet above sea level (Fig. 2). The reservoir has a capacity of 226,500 acre-feet of water, a max depth of 120 feet, a surface area of about 3450 acres and about 25 miles of shoreline (US Bureau of Reclamation 2021). Inflow to Stampede Reservoir is provided by three main tributaries: Little Truckee River, Sagehen Creek, and Davies Creek. Stampede drains back into the Little Truckee River, which is impounded to form Boca Reservoir, which flows into the Truckee River. As part of the Washoe Project, the water reserved in this reservoir is used for a variety of fishery enhancement strategies; primarily for the spawning of the endangered Cui-ui along the Truckee River and the operation of the Pyramid Lake Fishway (US Bureau of Reclamation 2021). In 2021, California was declared to be in a drought emergency and the effects of this are evident at Stampede. The reservoir reached a low of 35% capacity, compared to 2020 which reached a low of 53% capacity (California Department of Water Resources 2021). As a result of low water levels, a fish kill occurred at Stampede in mid-September that effected mainly Kokanee; CDFW biologists believes the primary culprit was either low levels of dissolved oxygen, high water temperatures, or fall turnover (Mouser 2021).

METHODS

ANGLER SURVEY

CDFW conducted access point angler surveys at Stampede Reservoir from June 6, 2021, to August 22, 2021. It is important to note that, due to wildfires in the surrounding areas resulting in closure of the reservoir to public access, creel surveys were about a month and a half shorter than initially planned. Utilizing a CDFW scientific aid stationed at the Camp Roberts boat launch, angler surveys were conducted from 0800h to 1300h. The surveys were stratified between weekdays and weekends/holidays to account for heavier usage by anglers. Additionally, weather conditions and surface water temperatures were taken at the beginning of each survey. Anglers were surveyed once they had finished fishing for the day to ensure that the

results represented complete fishing trips. The survey collected the following information: number of anglers, number of rods used, total hours fished, species targeted, number of fish kept and released (separated by species) and county of residence. If the angler was from out of state, their state of residence was recorded (and not county). Additionally, anglers were asked to rate their satisfaction of their overall experience, number of fish caught, and size of fish caught that day. The satisfaction ratings were on a scale from 1 to 5, with 1 being very dissatisfied and 5 being very satisfied. If the angler did not catch anything during their day fishing, they were only asked to rate their overall experience. Fish kept by anglers were identified to species and total length (TL) was measured to the nearest millimeter.

KOKANEE

Kokanee measured during the survey were checked for the presence of an adipose fin. With the permission of the angler, scale samples were taken to be analyzed for age and growth estimates. Samples were collected by scraping from the posterior to anterior of the fish between the dorsal fin and lateral line. Scales were placed in a coin envelope and labeled with information including date, location collected, species, total length, and if the fish had an adipose fin or not. Total lengths of Kokanee collected from angler surveys conducted by CDFW in 2019 and 2020 were compared to the data from 2021 to observe annual changes in fish length.

SCALE ANALYSIS

Scale analysis is performed by first rehydrating the scales in a small dish of water. Using a dissecting microscope (Motic SMZ-143 Series), viable scales were separated and cleaned. Viable scales are characterized by having a clear focus with minimal regeneration and degeneration (Minard and Dye 1998). A small, soft bristled paint brush was used to clear scales of debris and then scales were placed in a separate dish to be mounted onto a glass slide. This process was repeated until there were six cleaned scales per fish. Cleaned scales were mounted onto a slide with a dot of clear nail polish varnish on top before placing on the cover slide. Once the slide was dried under a weight, one scale from each slide was imaged using a Moticam 10 digital microscope camera attached to a Motic BA210 compound microscope. Three individuals conducted independent age readings of the scales, with the total length of the fish hidden to reduce bias.

RESULTS

ANGLER SURVEY

From June 6th to August 22nd, 2021, 118 angler groups were interviewed, representing 232 individual anglers, and a total of 798.75 hours were fished. Approximately 74% (n=172) of anglers interviewed targeted Kokanee, 13% (n=29) targeted Smallmouth Bass, 5% (n=12)

targeted Rainbow Trout, and 8% (n=19) did not have a target species (Fig. 3). No anglers reported targeting Lahontan Cutthroat Trout. Approximately 41% (n=94) of anglers interviewed were from the state of Nevada, 15% (n=35) of anglers were from Placer County, 9% (n=22) were from Nevada County and 8% (n=19) were from Sacramento County; the remaining 27% (n=62) of anglers came from 15 other counties, which were each represented by fewer than five angling groups (Fig. 4). Anglers targeted Kokanee most frequently with a total of 572.25 hours fished, followed by Smallmouth Bass (106.5 hours), Rainbow Trout (42 hours), and anglers that did not specify a target species (78 hours) (Table 2). The majority of fish caught were Kokanee (n=718), representing 500 kept Kokanee and 218 released. A total of 208 Smallmouth Bass were caught and all of them were released by anglers. Additionally, three Rainbow Trout were kept and nine were released, for a total of 12 Rainbow Trout caught; one Brown Trout was recorded as kept. One angler reported catching and releasing a Pikeminnow (Table 1).

Angler satisfaction ratings are separated into target species. A majority of Kokanee anglers (73%) reported being satisfied or very satisfied with their overall experience fishing for the day, 13% felt neutral and 14% reported being dissatisfied or very dissatisfied. A majority of Kokanee anglers (65%) rated being satisfied or very satisfied with the number of fish caught, 16% felt neutral, and 19% of anglers reported being dissatisfied or very dissatisfied. A minority of Kokanee anglers (15%) felt satisfied or very satisfied with the size of fish caught, 42% felt neutral about the size of fish caught, and 43% of anglers reported being dissatisfied or very dissatisfied with the size of fish caught. Half of Smallmouth Bass anglers (50%) rated being satisfied or very satisfied with their overall fishing experience, 31% expressed feeling neutral and 19% were dissatisfied or very dissatisfied with their overall experience fishing. When asked to rate their satisfaction with the number of fish caught, 43% of Smallmouth Bass anglers were satisfied or very satisfied, 36% were neutral, and 21% were dissatisfied or very dissatisfied. In rating the size of bass caught, 57% of Smallmouth Bass anglers expressed being dissatisfied or very dissatisfied, 21% were neutral and 22% of anglers were satisfied or very satisfied. Anglers targeting Rainbow Trout reported being mostly satisfied or very satisfied with their overall fishing experience (62%), 13% were neutral, and 25% expressed being dissatisfied or very dissatisfied (Fig. 5).

KOKANEE

A total of 306 Kokanee were measured with total lengths ranging from 209mm (8.2 in.) to 336mm (13.2 in.), and a mean length of 272mm (10.7 in.); the majority of Kokanee measured were between 279-304mm (11-11.9 in.) (Fig. 6). Total lengths of Kokanee were compared from the past three years (2019-2021) to determine the differences in the population's total lengths (Fig. 7). A Shapiro Wilks normality test was run and determined that the Kokanee length data from 2019 to 2021 was not normally distributed (p-value = 1.601e-06, p-value < 2.2e-16, p-value = 4.402e-14, respectively). As a result of the data not being normally distributed, a non-parametric Mann-Whitney U test was used and showed that there was a significant difference between the three years of Kokanee lengths. The total lengths of Kokanee measured in 2021

are significantly greater than the total lengths of Kokanee measured in 2020 ($W = 230323$, $p\text{-value} = 1.035e-14$). The total lengths of Kokanee measured in 2019 were significantly greater than both the Kokanee lengths measured in 2021 ($W = 50114$, $p\text{-value} = 6.065e-16$) and 2020 ($W = 141642$, $p\text{-value} < 2.2e-16$).

SCALE COLLECTION AND ANALYSIS

The age and growth analyses are ongoing. To date, all the scales collected during the 2021 creel at Stampede Reservoir have been mounted, imaged, and aged. The age analysis showed that a majority ($n=35$) of Kokanee were two years old. Eight Kokanee were aged to be three years old and zero one year old Kokanee were observed in the creel. A Frasier-Lee back calculation was used to determine length at age estimates and showed that the average's from the Kokanee caught in 2021 are as follows: one year old Kokanee averaged to be 5.2 inches ($n=43$), two year old Kokanee averaged to be 9.3 inches ($n=43$) and three year old Kokanee averaged to be 9.5 inches ($n=8$). Age analysis of otoliths are underway and will be used to further validate the current aging data.

DISCUSSION

Anglers continue to enjoy the various sport fishing opportunities available at Stampede Reservoir. Kokanee continue to be the main targeted species. Unfortunately, anglers targeting KOK during the 2021 season expressed a dissatisfaction with the size of fish caught.

A review of the catch data shows that there was a significant increase in the size of KOK over the 2020 season, but still well short of the management goal for this water. Age analysis showed that 2020 and 2021 KOK populations matured at 2-years of age. When comparing this to years past, 2013-2015, Kokanee populations were made up of predominantly 3-year-old fish (Fig. 8). This can explain the unimodal distribution of Kokanee seen when observing lengths of the 2021 population (Fig 9). This early maturation helps explain the reason for the smaller size observed in anglers catch as this affects the number and size of fish available for harvest. The reason for this significant change in age at maturation is poorly understood, but maturation timing is strongly influenced by environmental factors like water temperature, food abundance, etc. A higher proportion of early maturing fish was reported as a result of water temperatures (Saunders et al, 1982). Fish population densities and stocking rates could also be contributing factors.

In 2021, California was experiencing the second year of drought. This is the second drought to occur in California in less than 10 years. Lower than normal water levels were observed throughout the season and could have resulted in increased water temperatures due to reduce storage volumes. Water quality in 2021 likely created adverse conditions for fish during a portion of the summer months which led to a fish kill on September 17th, 2021. Regional staff estimated that hundreds to thousands of Kokanee perished during this event (Mouser 2021).

In both 2020 and 2021, the department was able to obtain its desired egg take goals even with the lack of marked fish observed during both years of creels and spawn runs. Less than 10 marked fish were observed during egg collection efforts. Just like any other salmon species, Kokanee have a strong homing instinct that leads them back to the stream they hatched in to spawn. Kokanee are stocked from the boat ramp because of the accessibility issues associated with other locations at Stampede, and thus, could explain their low numbers observed in the spawning run. Because of the low numbers of returned marked fish, we assume that the abundance of fish seen in the spawn run are a result of naturally recruited fish that have imprinted in the Little Truckee river as juveniles.

The environment has a strong influence over the annual fish size in this reservoir. The supplemental stocking rate coupled with natural production affects fish density. The department has no control over environmental changes but can control the stocking rate. Therefore, it is recommended that stocking densities should be considered in developing future adaptive management strategies designed to increase angler satisfaction of the Kokanee fishery.

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TABLES

Table 1. The total number of fish caught by species at Stampede Reservoir.

	Kept	Released	Total
Kokanee	500	218	718
Rainbow Trout	3	9	12
Brown Trout	1	0	1
Smallmouth Bass	0	208	208
Other	0	1	1

Table 2. The number of anglers, hours fished, and total rods used for each species at Stampede Reservoir.

	Anglers	Hours Fished	Total Rods
Kokanee	172	572.25	220
Rainbow Trout	12	42	19
Smallmouth Bass	29	106.5	32
Unspecified	19	78	25

FIGURES

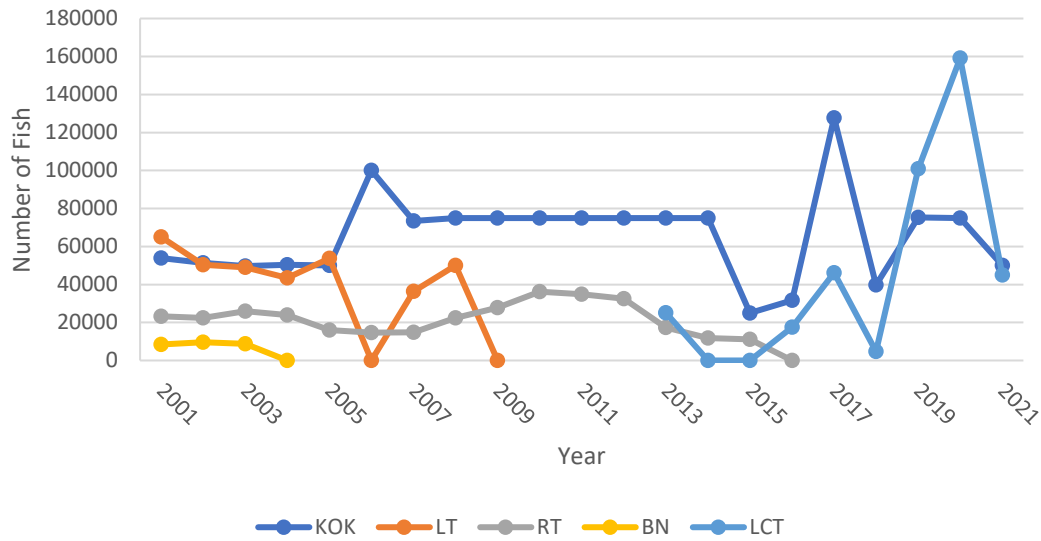


Figure 1. Stocking history of Stampede Reservoir over the past 20 years

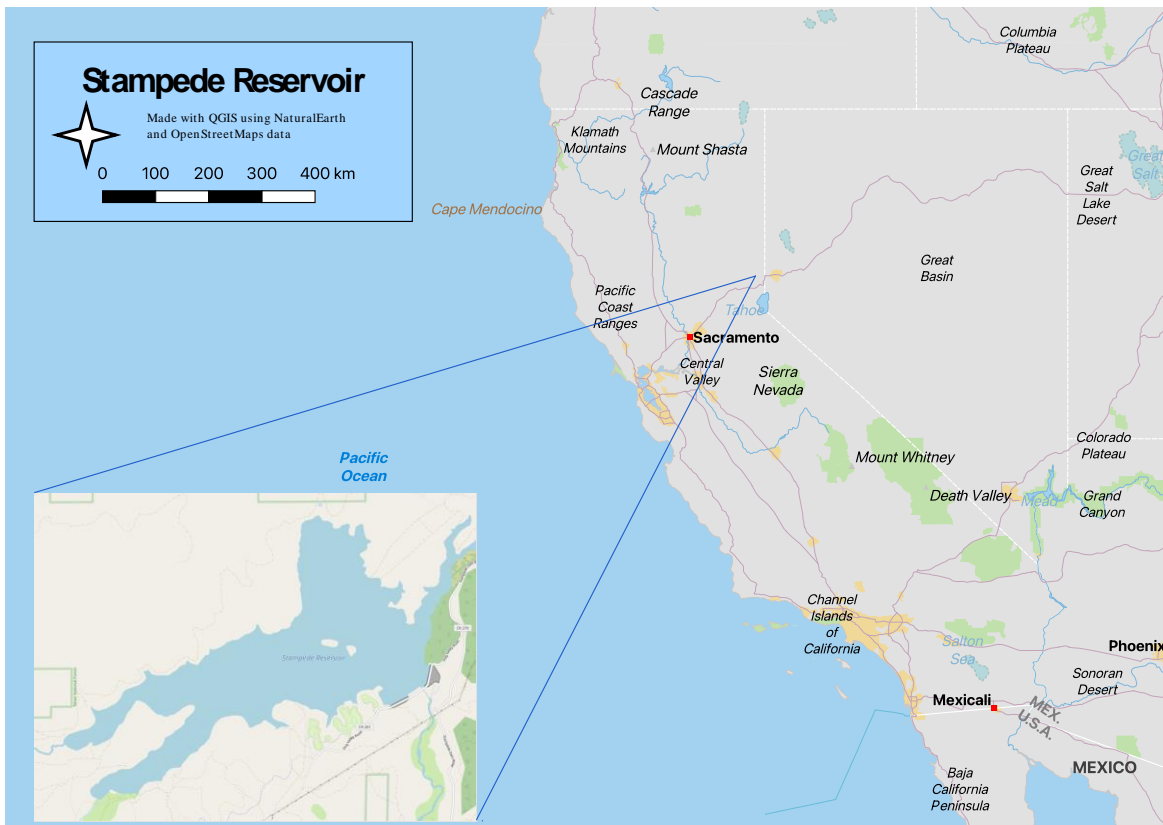


Figure 2. Map showing the location of Stampede Reservoir.

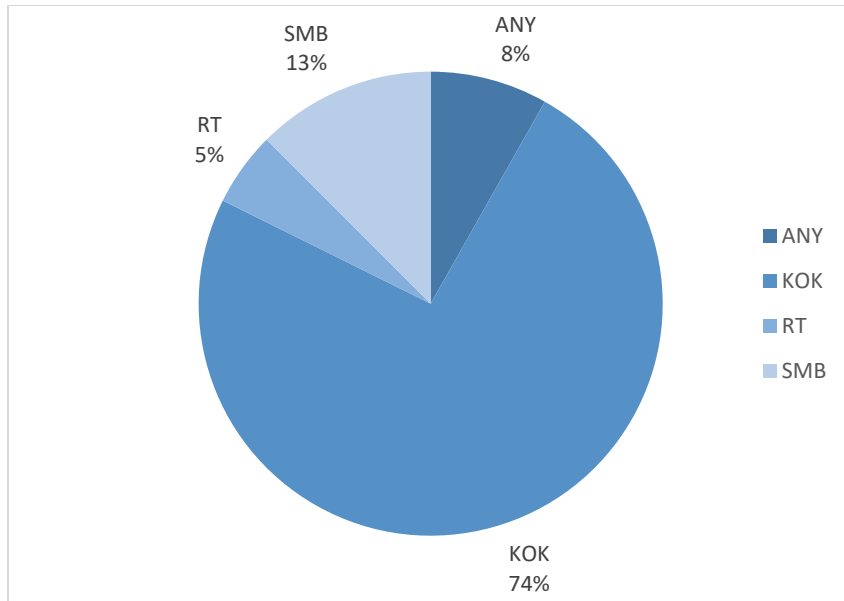


Figure 3. The percentage of anglers that targeted a specific species at Stampede Reservoir

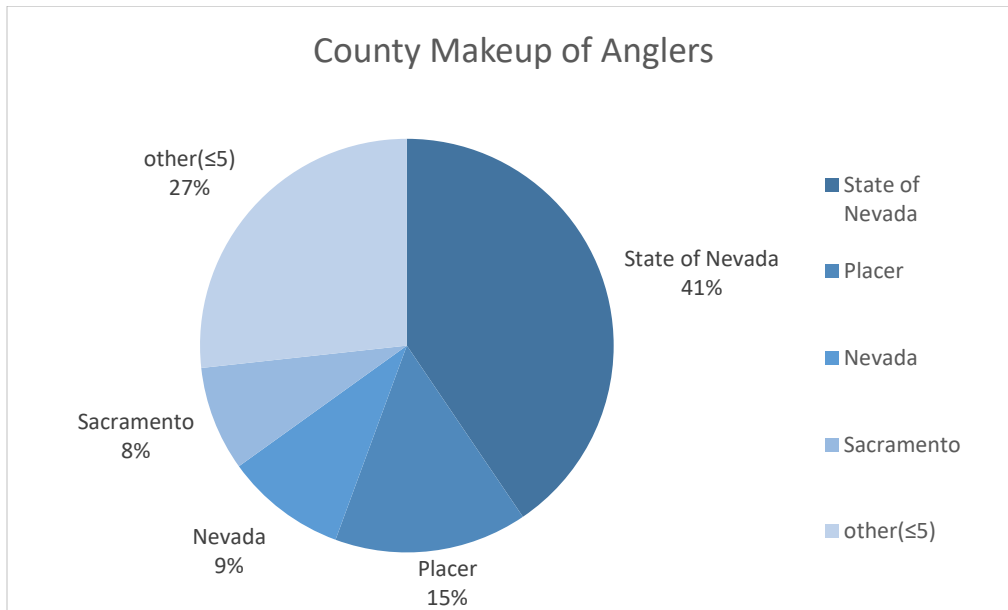


Figure 4. County residence of anglers at Stampede Reservoir

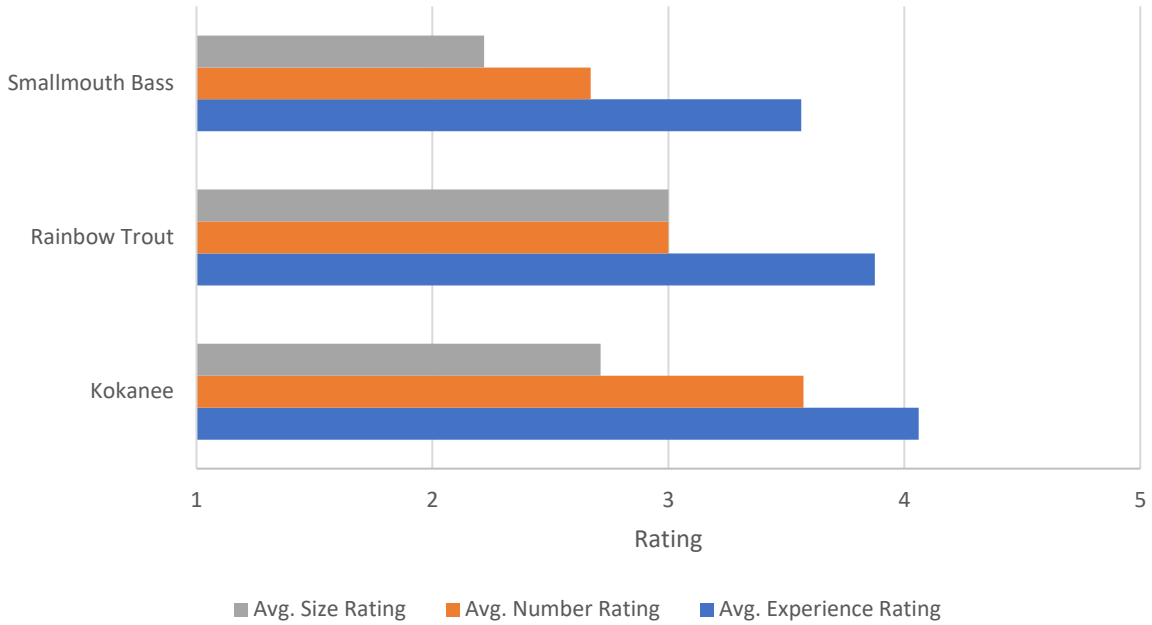


Figure 5. Average satisfaction ratings of size of fish, number of fish caught, and overall experience of the days fishing (separated by target species).

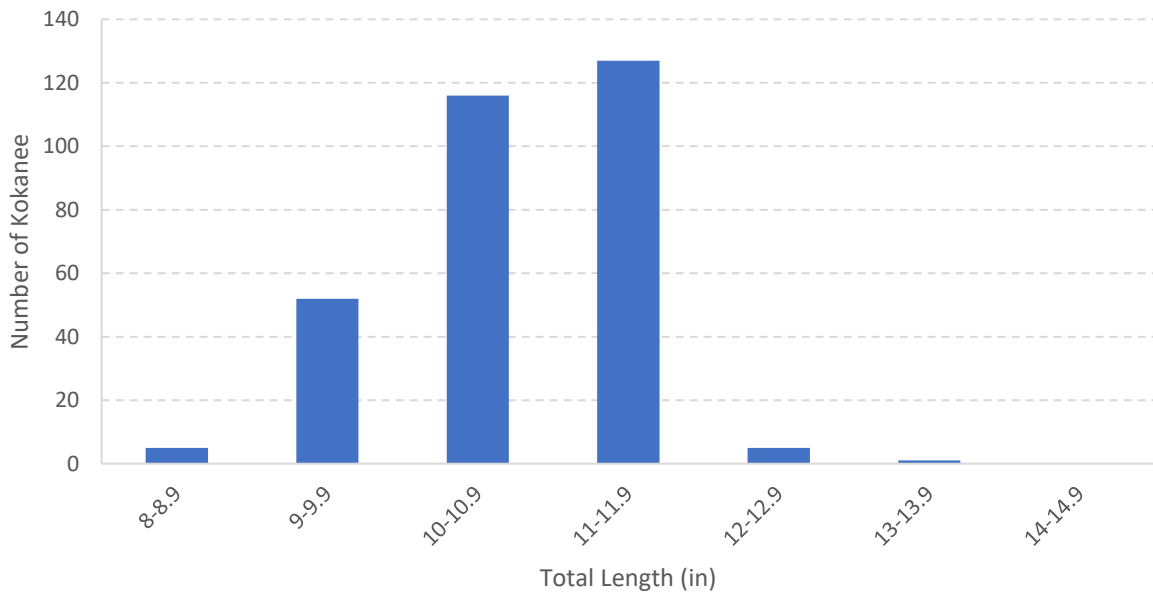


Figure 6. Total length distribution of Kokanee measured during the 2021 survey at Stampede Reservoir.

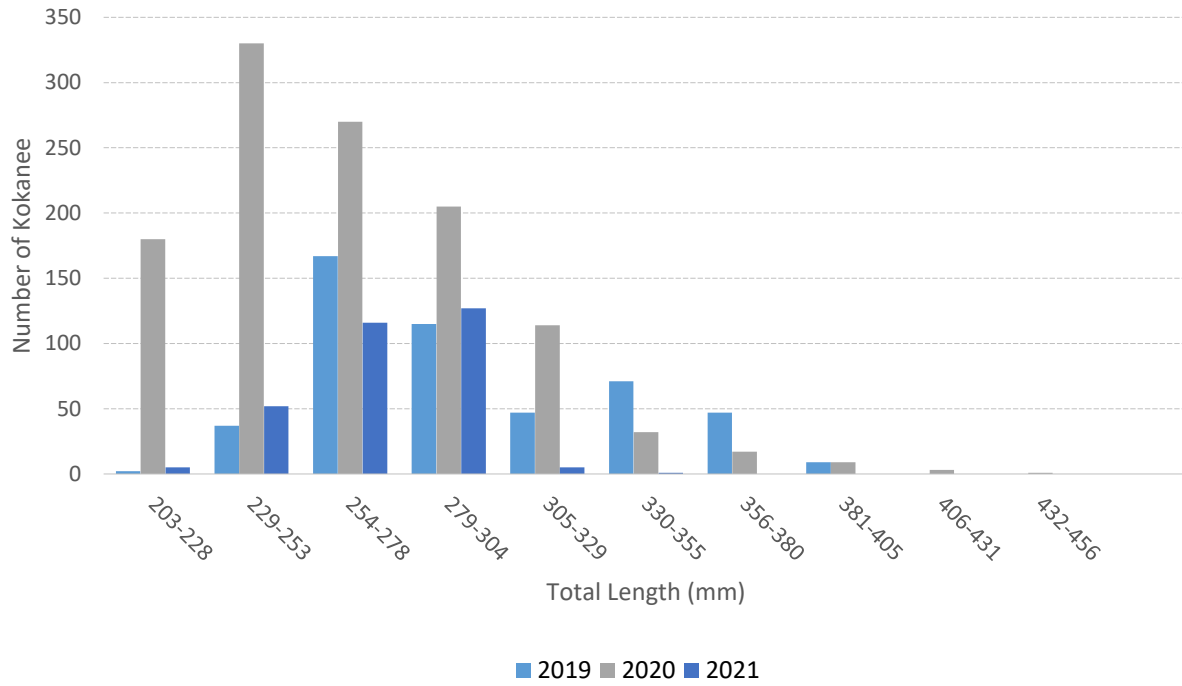


Figure 7. Total lengths of Kokanee measured at Stampede Reservoir, from 2019-2021

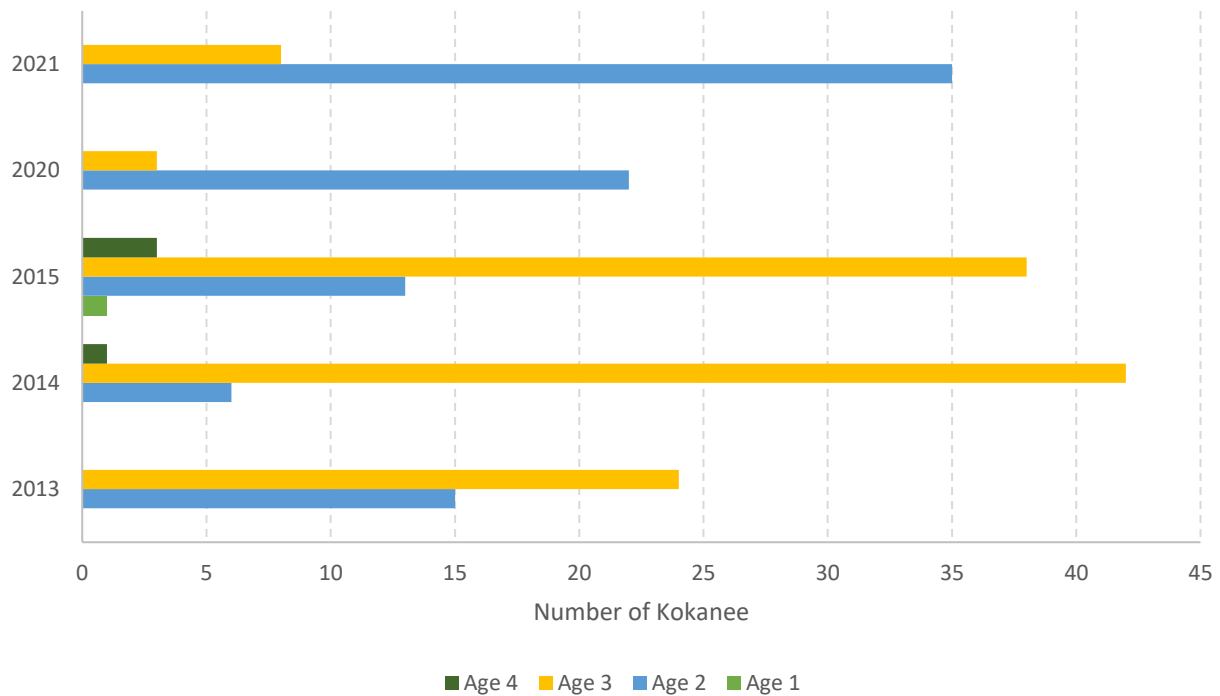


Figure 8. Age composition of Kokanee from 2013-2015 and 2020-2021.

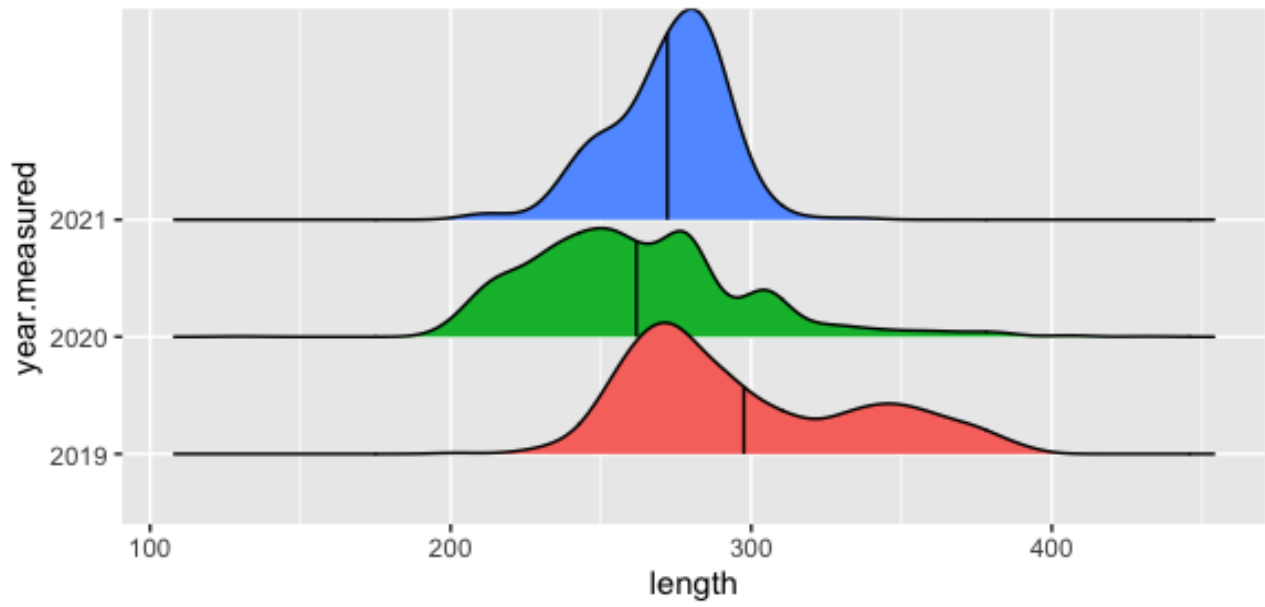


Figure 9. Ridgeline density plot of Kokanee lengths measured from Stampede Reservoir; a mean line is included for reference.