State of California
The Resources Agency
Department of Fish and Wildlife

Pardee Reservoir General Fish Survey
Calaveras and Amador Counties
Fall, 2019

By

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North Central Region

Pardee Reservoir on October 15, 2019 (Photo by S. Manabe).

Summary

To evaluate the fishery of Pardee Reservoir (Pardee), a general fish survey was conducted on October 15, 2019. For this survey, eight locations were selected for sampling with an electrofishing boat. Fish collected during the survey included Largemouth Bass (LMB) (*Micropterus salmoides)*, Green Sunfish (GSF) (*Lepomis cyanellus*), Bluegill (BG) (*Lepomis macrochirus)*, Kokanee Salmon (KOK) (*Oncorhynchus nerka*), Rainbow Trout (RT) (*Oncorhynchus mykiss*), Redear Sunfish (RES) (*Lepomis microlophus*), and Smallmouth Bass (SMB) (*Micropterus dolomieu*). Another specie that has been found in Pardee in past general fish surveys, but not found during this years' survey was Channel Catfish (CCF) (*Ictalurus punctatus*) (Ewing 2012a).

Results from the 2019 survey demonstrated that Pardee still had a wide diversity of fish species with indications of a successful spawn for some of the warmwater species. However, the low number of fish collected made it difficult to assess the fishery. This fall's data along with future efforts will be used to monitor the status of this fishery.

Introduction

The objectives of this survey were to assess the following:

- **Fish species composition and condition**
- **Fish age class distribution**
- **Body condition of each species**

Pardee is a public facility operated by East Bay Municipal Utility District. Pardee is located approximately 10 miles southwest of the city of Jackson (**Figure 1**). Pardee's elevation is approximately 568 ft. above sea level in the western foothills of the Sierra Nevada. At maximum pool, Pardee occupies 2,134 surface acres and has 210,00 acre-feet of water storage (Dept. of Water Resources 2019). Pardee was first filled in 1951 and currently supports a significant warmwater fishery, in addition to a wild and hatchery salmonid fishery.

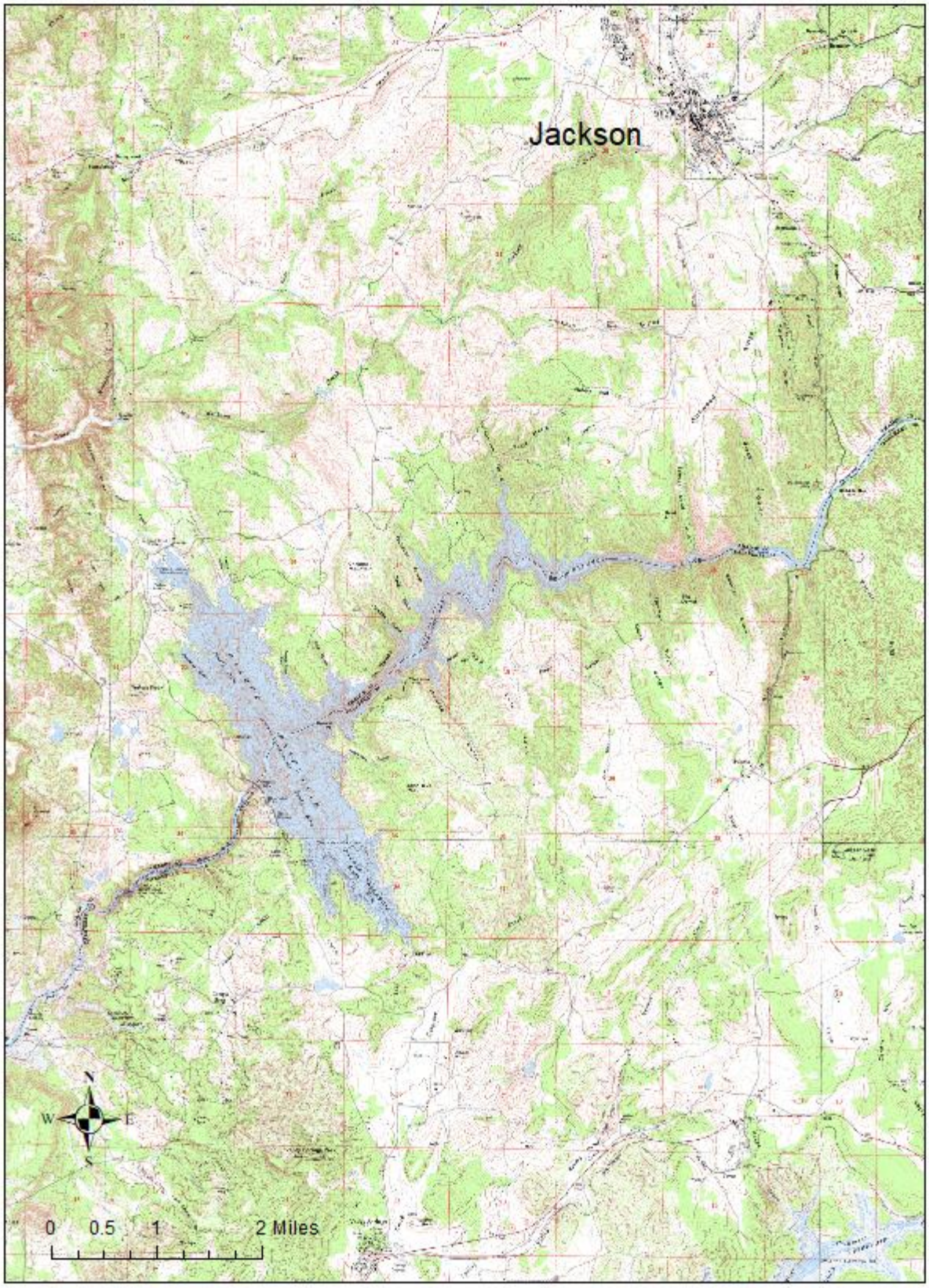

Figure 1. Pardee Reservoir, Amador and Calaveras Counties.

Methods and Materials

Eight sites (Figure 2) were sampled for 600 electrofishing seconds (10.0 minutes) each using an 18 ft. Smith-Root electrofishing boat. Sites were surveyed between the hours of 18:09 and 21:14. Pulsed DC current (2-8 amps) was used to "stun" the fish. The boat ran parallel along the shore in a continuous manner with start and stop sites marked by GPS (Global Positioning System). When an electrical field was applied to the water, it was measured on a counter and the time was recorded as generator seconds for each transect. The crew consisted of two forward netters, one crewmember working the livewell, and one boat operator. Fish under galvanotaxis (involuntary movement toward an electrical field) were netted and placed in a holding tank. Netters tried to capture all shocked fish. However, small fish (< 25 mm) and fish on the outer edge of the electrical field sometimes eluded capture. The mean length and weight for each species was determined and an analysis of population indices were evaluated for species. These indices include catch per unit of effort (CPUE) and proportional and relative stock densities (PSD and RSD) (Neumann et al. 2012). For each transect, fish were identified to species and the first 25 of each species had measurements recorded for total length (TL) in millimeters (mm) and weights in grams (g). Weights were determined using an AND© 6.6 lb. capacity digital scale. All fish after the first 25 of a species were then tallied. Weights were only collected when the minimum total length for GSF was 60 mm, 80 mm for BG and RES, 150 mm for LMB and SMB, and 120 mm for RT.

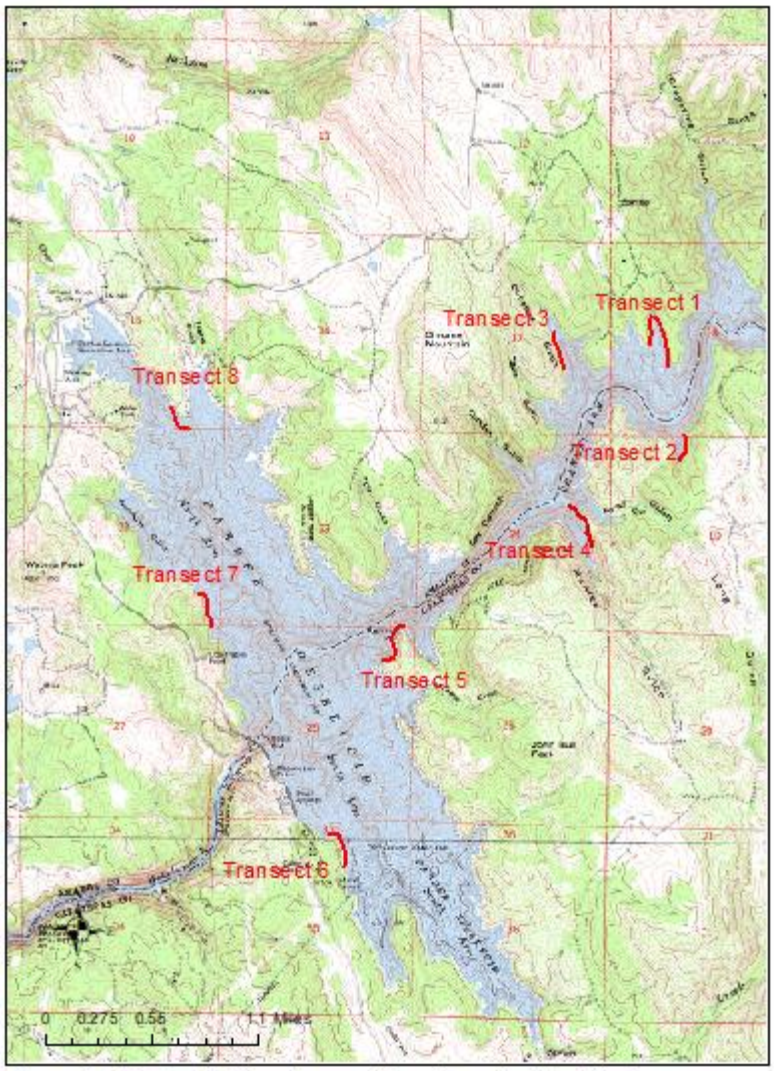

Figure 2. Electrofishing transect locations for the Pardee Reservoir general fish survey on October 15, 2019.

Catch Per Unit of Effort

CPUE was defined as the number of fish collected per minute of shocking time. The data was used to estimate CPUE for all species combined and for individual species.

CPUE = N/M

where:

N = total number of collected or the total number of a species and

M = number of minutes that the electric field was active in the water

Proportional Stock Density (PSD)

PSD is a numerical description of length-frequency data. The PSD is the percentage of a given species which are of a stock length and those which are also of a quality length. Table 1 presents the length categories that have been proposed by Gablehouse (1984) for various fish species.

PSD = (number of fish ≥ minimum quality length) / (number of fish ≥ minimum stock length) x 100

According to R.O. Anderson and R. M. Neumann (1996) when PSD is reported it should be rounded to the nearest whole number and should not include a percent symbol. Reporting decimals may imply an accuracy not supported by this analysis.

If a minimum sample size of 20 of a given species was not collected or a minimum size was not met, no PSD was calculated.

Table 1. Proportional stock density length categories for selected species Gablehouse (1984). Measurements are minimum total lengths in millimeters (mm) for each category.

Species	Stock (mm)	Quality (mm)
Bluegill	80	150
Channel Catfish	280	410
Green Sunfish	80	150
Largemouth Bass	200	300
Redear Sunfish	100	180
Smallmouth Bass	180	280

Relative Stock Density (RSD)

Similar to PSD, the RSD is a percentage of a given species of a minimum stock length as compared to those which are of a preferred, memorable, or trophy lengths.

RSD-P = (number of fish ≥ minimum preferred length) / (number of fish ≥ minimum stock length) x 100

RSD-M = (number of fish ≥ minimum memorable length) / (number of fish ≥ minimum stock length) x 100

RSD-T = (number of fish ≥ minimum trophy length) / (number of fish ≥ minimum stock length) x 100

For BG, Gablehouse (1984) found the preferred size is 200 mm and the memorable size is 250 mm. For LMB, Gablehouse (1984) found the preferred size is 380 mm and the memorable size is 510 mm.

As with PSD, the RSD should be rounded to the nearest whole number so as not to imply a greater accuracy than is supported by this analysis. According to Gablehouse (1984) a balanced population of LMB PSD should be 40 to 70, RSD-P 10 to 40, and RSD-M 0 to 10 (Table 2). Anderson (1985) identified balanced populations of bluegill as having a PSD of 20 to 60, with RSD-P of 5 to 20 and RSD-M of 0 to 10 (Table 2).

Table 2. Generally accepted proportional stock density (PSD) index ranges for balanced fish populations (from Willis et al. 1993).

Species	PSD	RSD-P	RSD-M	Source
Bluegill	20-60	5-20	0-10	Anderson (1985)
Crappie	30 - 60	>10		Gablehouse (1984)
Largemouth Bass	40-70	10-40	0-10	Gablehouse (1984)

Results

Table 3 summarizes the species composition, mean total length and weight, and length ranges of species collected. A total of 89 fish, representing seven species were collected during the survey. BG comprised 31.5% of the total fish sampled. LMB followed with 23.6% of the total fish sampled. GSF and RES constituted 22.5 and 11.2% of the total catch, respectively. RT and SMB each made up 5.6 and 4.5%, respectively. One KOK was collected, comprising 1.1% of the total catch. The total CPUE for this survey effort was 1.11 fish/min.

Table 3. Species composition from Pardee Reservoir, October 15, 2019.
Mean Total Length (TL) was measured in millimeters (mm). Average Weight was in grams (g)

	Species	Number	Percent	CPUE	(TL)	Weight**	Length Ranges
1	Bluegill	28	31.5%	0.4	73.0	58.0	43 - 232
2	Largemouth Bass	21	23.6%	0.3	111.9	415.3	52 - 399
3	Green Sunfish	20	22.5%	0.3	55.2	NA	40 - 70
4	Redear Sunfish	10	11.2%	0.1	130.8	75.8	75 - 284
5	Rainbow Trout	5	5.6%	0.1	409.2	681.8	316 - 480
6	Smallmouth Bass	4	4.5%	0.1	99.5	NA	79 - 125
7	Kokanee Salmon	1	1.1%	0.0	220.0	98	NA
	Total	89					
	Generator minutes:	80.0					
	CPUE (Fish/ gen. min)	1.11					

*Common Carp (*Cyprinus carpio*, CC) were present throughout survey. CC were not netted due to the damage they do on the dip nets, difficulty in processing them, as well as the mess they make on the boat (slimecoat, blood).

**Weights were only collected when the minimum total length for GSF was 60 mm, 80 mm for BG and RES, 150 mm for LMB and SMB, and 120 mm for RT.

Bluegill

BG total length ranged from 43 – 232 mm (1.7 – 9.1 in.) (Table 3). The length class mode was in the 70 mm (2.8 in.) class (Figure 3). This indicates they are likely zero to one-year old fish (Moyle 2002). The length frequency distribution shows a BG population where most fish measured were less than 100 mm (3.9 in.) (Figure 3).

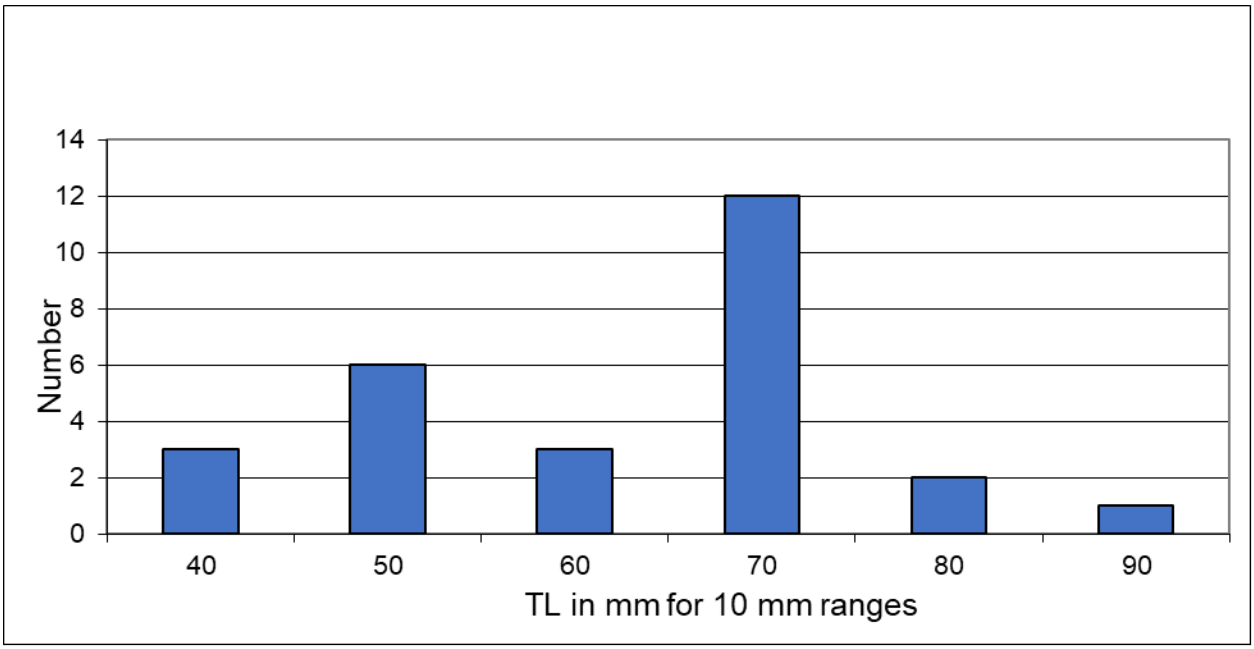

Figure 3. Length-frequency distribution for BG captured by electrofishing at Pardee Reservoir, Fall, 2019. In order to keep the the graph to scale, one BG measuring 232 mm was removed from the graph.

Bluegill PSD was 25 and RSD-P was 25. These values suggest that there is a balanced population of quality-size BG, but an unbalanced population of preferred-size BG in Pardee.

Largemouth Bass

LMB total length ranged from 52 – 399 mm (2.0 – 15.7 in.) (Table 3). The total length mode was the 75 mm (3.0 in.) class (Figure 4). This indicates they are likely one to two-year old fish (Moyle 2002). The length frequency distribution shows the majority of LMB measured were less than 100 mm (3.9 in.) (Figure 4).

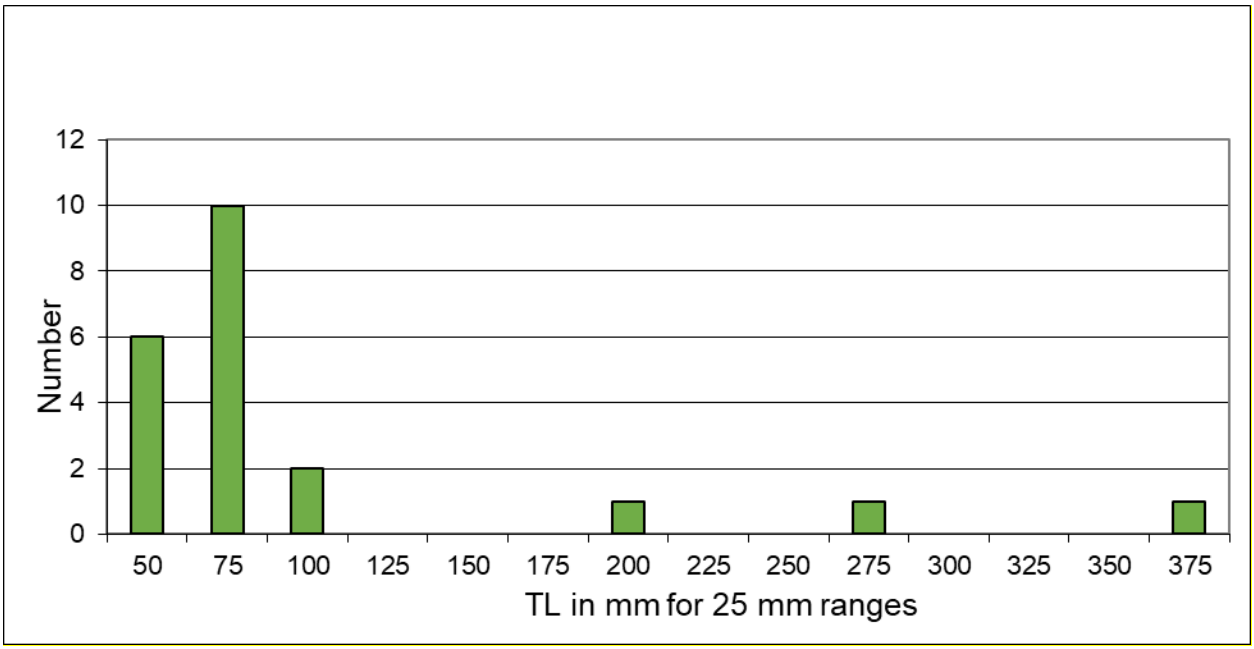

Figure 4. Length-frequency distribution for Largemouth Bass captured by electrofishing at Pardee Reservoir, Fall, 2019.

Both PSD and RSD-P for LMB was 33. These values suggest that there is an unbalanced population of quality-size LMB, but balanced population of preferred-size LMB in Pardee.

Green Sunfish

GSF total length ranged from 40 – 70 mm (1.6 – 2.8 in.) (Table 3). The length class mode was the 50 mm (2.0 in.) class (Figure 5). This indicates they were likely zero to two-year old fish (Moyle 2002). The length frequency distribution shows the majority of GSF measured were less than 60 mm (2.4 in.) (Figure 5).

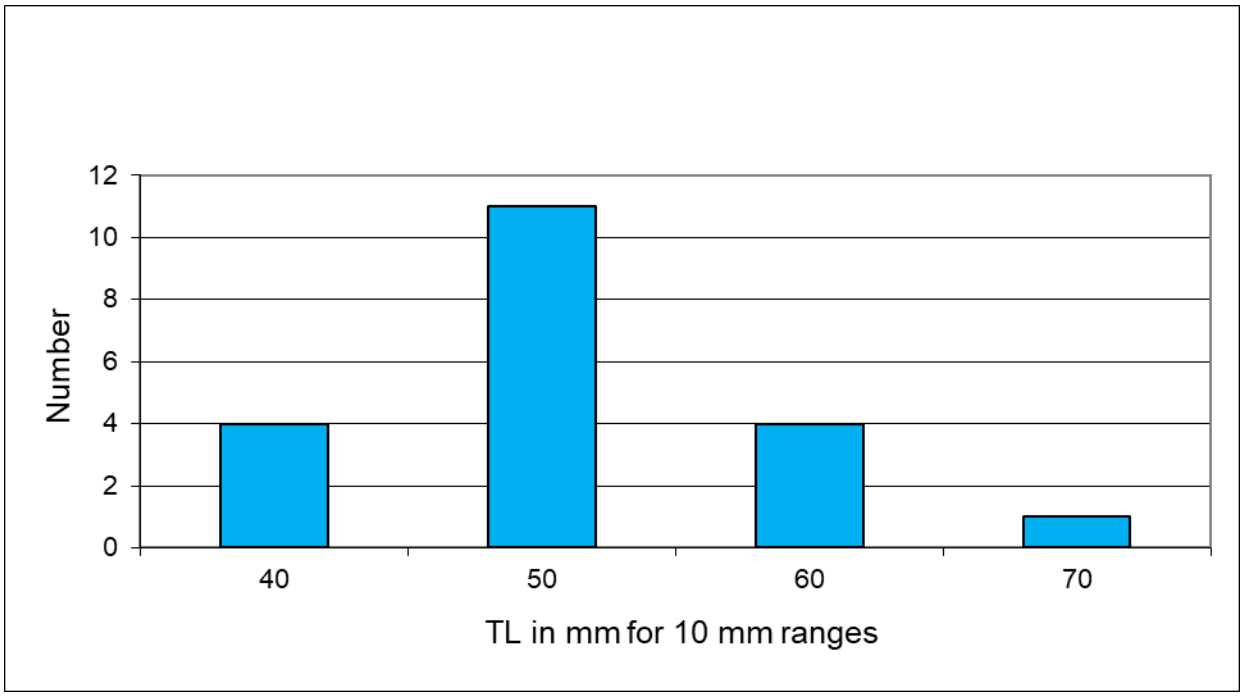

Figure 5. Length-frequency distribution for Green Sunfish captured by electrofishing at Pardee Reservoir, Fall, 2019.

Discussion

Most of the shoreline sampled was deep. It is likely more fish were present at greater depths that could not be sampled by the electrofisher. Due to the lack of suitable sample sizes for most species collected during this survey, no summaries were made, since the results would be unreliable and possibly inaccurate. BG recruitment appeared to be successful in 2019. The larger-size BG classes were lacking, possibly because these larger fish were occupying greater depths and unable to sample. A spring survey can help determine the survivorship of these BG over the winter. Like BG, GSF, and LMB, recruitment also appeared to be successful. The larger-size GSF and LMB were likely inhabiting deeper water at the time of survey. Pardee is also home to a healthy CCF population, though it was not shown in this fall survey. During a population estimate for black bass in Pardee in May 2012 (Ewing 2012b), many CCF greater than five pounds were seen. During the fall season, it is likely many of these CCF were occupying more suitable deeper water habitat. For consistency, future fall and spring surveys will be planned to occur at the same time of year using the same transects.

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