California Department of Fish and Wildlife
North Central Region
Sierra District

Summary of the 2019 Clear Lake Hitch Survey on Clear Lake

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Summary

In an effort to evaluate the Clear Lake Hitch (*Lavinia exilicauda chi*) (HCH-C) fishery in Clear Lake, a Schnabel and Schumacher-Eschmeyer mark-recapture survey was conducted from March 14, 2019 through May 17, 2019. A total of 184 HCH-C were collected, measured, and/or fin clipped during this season. A record drought from 2012 – 2016 may be a reason for the low number of HCH-C collected. It is unknown how many HCH-C may have been missed during these periods where sampling was not conducted. The data from this survey in conjunction with the 2020 - 2023 data will be used to monitor the status of this fishery. Also, data collected from previous surveys will be incorporated to the overall study to help manage the fishery.

Introduction

The objectives of this survey were to:

- Determine the number of HCH-C spawning in Holiday Harbor, Konocti Casino Harbor, Clear Lake State Park, and Soda Bay
- Determine the average size of HCH-C spawning in Clear Lake
- Collect population data with which to compare future survey efforts

In September of 2012, The Center for Biological Diversity submitted a petition to the California Department of Fish and Wildlife (CDFW) to list the HCH-C as threatened under the California Endangered Species Act (CESA) (Fish and Game Code, 2050). In August 2014, the California Fish and Game Commission voted to list the HCH-C as threatened under CESA.

In 2013, CDFW conducted a population estimate of HCH-C in two tributaries to Clear Lake, Cole and Kelsey Creeks, to estimate the abundance and distribution of HCH-C (Ewing 2013). This estimate was done to help in the status review process under CESA. From 2014 - 2017, CDFW conducted a population estimate of HCH-C in Adobe and Kelsey Creeks to estimate the abundance and distribution of HCH-C (Ewing 2014, Ewing 2015, Ewing 2016, Ewing 2017). CDFW is currently gathering information on the HCH-C to allow for informed decisions on future fisheries management at Clear Lake.

The 2019 report aims to present a more accurate estimate of population size with 95% confidence intervals mean length, catch per unit effort (CPUE), population estimate, and

numbers of HCH-C seen for the survey period. The estimate of population size with accompanying confidence intervals was based on multiple mark and recapture survey efforts.

Holiday Harbor, Konocti Casino, Soda Bay, and Clear Lake State Park are four historically HCH-C spawning areas in Clear Lake (Figure 1).

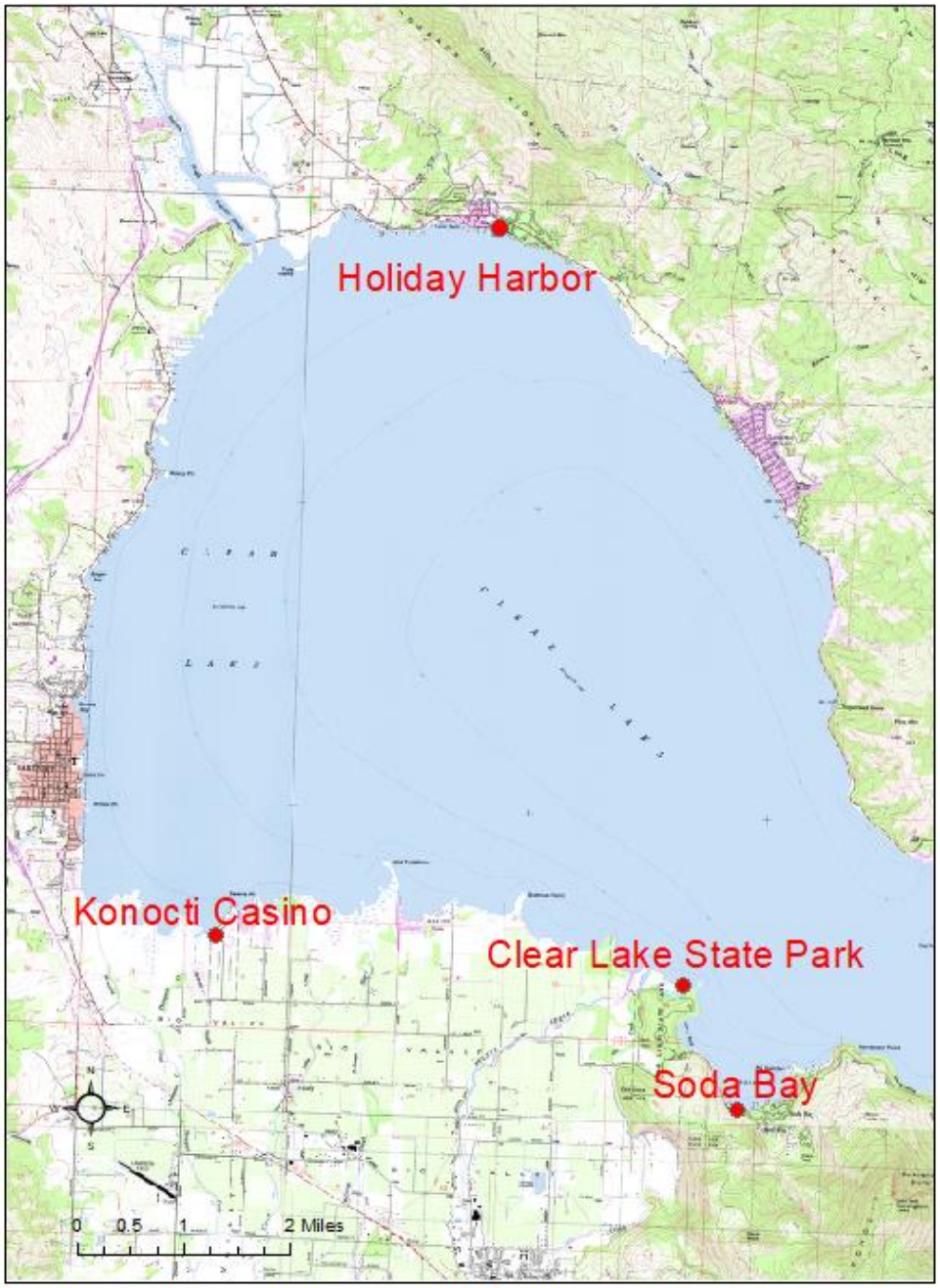

Figure 1. Locations of Holiday Harbor, Konocti Casino, Clear Lake State Park, and Soda Bay E-fishing transects in Spring, 2019.

Methods and Materials

In estimating the population of HCH-C in these historic spawning areas, CDFW considered the populations to be "closed" with the Schnabel (SM) and Schumacher-Eschmeyer (SEM) Methods to be used as the statistical analysis. According to Krebs (1999) and Seber (1982), the following assumptions must be met for the estimates to be reliable:

(a) The population is closed, so that N (the population) is constant
(b) All animals have the same probability of being caught in the first sample
(c) Marking does not affect the catchability of an animal.
(d) The second sample is a simple random sample, i.e. each of the possible samples has an equal chance of being chosen.
(e) Animals do not lose their marks in the time between the two samples.
(f) All marks are reported on recovery in the second sample.

A total of nine sampling efforts were conducted to mark and recapture HCH-C on Clear Lake. However, not all sites were sampled nine times due to factors such as anglers present in the site or unsafe lake conditions. The population estimates will only be for HCH-C collected in Holiday Harbor, Konocti Casino Harbor, Clear Lake State Park, and Soda Bay.

Each electrofishing sampling effort took a total of one to two days using one boat. Electrofishing was completed using an 18 ft. Smith-Root SR electrofishing boat. Pulsed DC current (8-12 amps) was used to "stun" the fish. The crew consisted of two forward netters, one person marking/checking for recaptures at the live-well if available, and one boat operator. The boat navigated in a continuous line parallel to shore. HCH-C under electronarcosis were netted and placed in a holding tank. An effort was made to capture all shocked HCH-C; however, sometimes HCH-C eluded capture on the outer edge of the electrical field.

The start and stop times for time spent electrofishing were recorded. Water temperatures were also recorded at the same time for each effort. The first 100 HCH-C collected, regardless of site collected, were measured in total length (inches, in.) regardless of size (Figure 2). HCH-C that were 5.0 in. (127 mm) and greater in total length were given a single hole punch on the upper caudal fin using a single, handheld paper hole puncher. HCH-C that were less than 5.0 in. total length were received a small fin clip in their caudal fin. This was done in order to protect these fish during this delicate life stage. The mean total length, CPUE, relative population

estimate, and numbers of HCH-C collected would be calculated.

Figure 2. Juvenile HCH-C being measured (S. Newton, 3/13/14).

Results

Holiday Harbor

Two HCH-C were collected and measured in Holiday Harbor in 2019. Both HCH-C were marked with a single hole punch with no hole punch recaptures. Of the seven sampling efforts, no initial mortalities were documented. Initial mortalities would be deaths immediately associated to processing the HCH-C. Average total length for HCH-C collected in Holiday Harbor in 2019 was 9.6 in. CPUE was 0.03 fish per minute.

Konocti Casino Harbor

Twenty-seven HCH-C were collected in Konocti Casino Harbor in 2019, in which six were measured. All HCH-C were marked with a single hole punch with no hole punch recaptures. No initial mortalities were documented during each of the eight sampling efforts. Average total length for HCH-C collected in Konocti Casino Harbor in 2019 was 11.2 in. CPUE was 0.13 fish per minute.

Clear Lake State Park

One hundred fifty-five HCH-C were collected in Clear Lake State Park in 2019, in which 115 were measured. The majority of HCH-C were marked with a single hole punch with no hole punch recaptures, while there were two fin-clipped HCH-C. Of the nine sampling efforts, no initial mortalities were documented. Average total length for HCH-C collected in Clear Lake State Park in 2019 was 12.3 in. CPUE was 0.23 fish per minute.

Soda Bay

No HCH-C were collected in Soda Bay in 2019.

Overall, one hundred eighty-four HCH-C were collected in 2019 (Table 1). Average total length of HCH-C collected was 12.2 in.

Table 1. Mark-recapture sample data for 2019. CT = Total number of individuals caught in sample t. Rt = Number of individuals already marked when caught in sample t. Ut = Total number of individuals caught and marked for first time in sample t. Mt = Total number of individuals marked in the population at sample t.

Date	Ct	Rt	Ut	Mt
3/14/2019	1		1	
3/29/2019	6	0	6	1
4/3/2019	7	0	7	7
4/10 and 4/11, 2019	3	0	3	14
4/18 and 4/19, 2019	3	0	3	17
4/24 and 4/25, 2019	141	0	141	20
5/1 and 5/2, 2019	0	0	0	161
5/9 and 5/10, 2019	19	0	19	161
5/17/2019	4	0	4	180
Total	184	0	184	

Discussion

No population estimates could be made at any of the sampling sites due to no HCH-C recaptures collected. The number of HCH-C collected in 2019 was well below what CDFW had anticipated collecting. Historically these four sampling locations sampled have held thousands of HCH-C at each site, thus the reason they were chosen for sampling. It is possible the record drought that California experienced from 2012 – 2016 may have negatively impacted the spawning of HCH-C. Many of the tributaries that would have normally held suitable water to spawn in, were limited or not available for HCH-C during the drought. The negative side-effects

of that drought now may be showing the impacts it had on the HCH-C. Regardless of the low numbers collected, CDFW is scheduled to sample the same four sites until at least 2023 for consistency and comparison reasons.

References

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