TECHNICAL MEMORANDUM ◦ DECEMBER 2021

2021 Chorro Creek Pikeminnow Suppression

PREPARED FOR

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Cover photos: Efishing crew on Chorro Creek (top left), adult Sacramento pikeminnow (top right), beach seining in pool habitat (bottom right) and bedrock falls on Chorro Creek (bottom right).

Table of Contents

1 INTRODUCTION

Adult pikeminnow captured in Chorro Creek

To benefit native steelhead (*Oncorhynchus mykiss),* a Sacramento Pikeminnow (*Ptychocheilus grandis)* Management Plan (Management Plan) was developed for Chorro Creek in 2017 (Stillwater Sciences 2017). The Management Plan was developed with input from a diverse technical advisory committee ranging from local biologists to pikeminnow experts to specifically address a recovery action that was included in the South-Central California Coast Steelhead Recovery Plan, "develop and implement non-native species monitoring program to track status and impacts of non-native species of plants and animals on all steelhead life history stages, particularly rearing juveniles (NMFS 2013)." The Management Plan was partially funded and implemented from 2017 through 2020. In 2021, the Morro Bay National Estuary Program was awarded funding to fully implement the Management Plan for three years (2021 – 2023) through the California Department of Fish and Wildlife (CDFW) Proposition 1 Restoration Grant Program. This report summarizes data from the 2021 surveys and compares the results to data collected from 2017 through 2020.

1.1 Study Area

The Study Area for 2021 pikeminnow suppression efforts includes mainstem Chorro Creek from the tidal extent of Morro Bay up to Chorro Reservoir. Prior to 2021, sampling was primarily limited to study reaches downstream of Questa College; however, in 2021 the Camp SLO and the CMC study reaches were added to the suppression efforts. Study reaches sampled in 2021 included Chorro Flats, JJ, Chorro Creek Ecological Reserve (CCER), Cal Poly, California Department of Fish and Wildlife (CDFW) downstream of the Water Treatment Plant (WTP), CDFW upstream of the WTP, Camp SLO, and CMC (Figure 1).

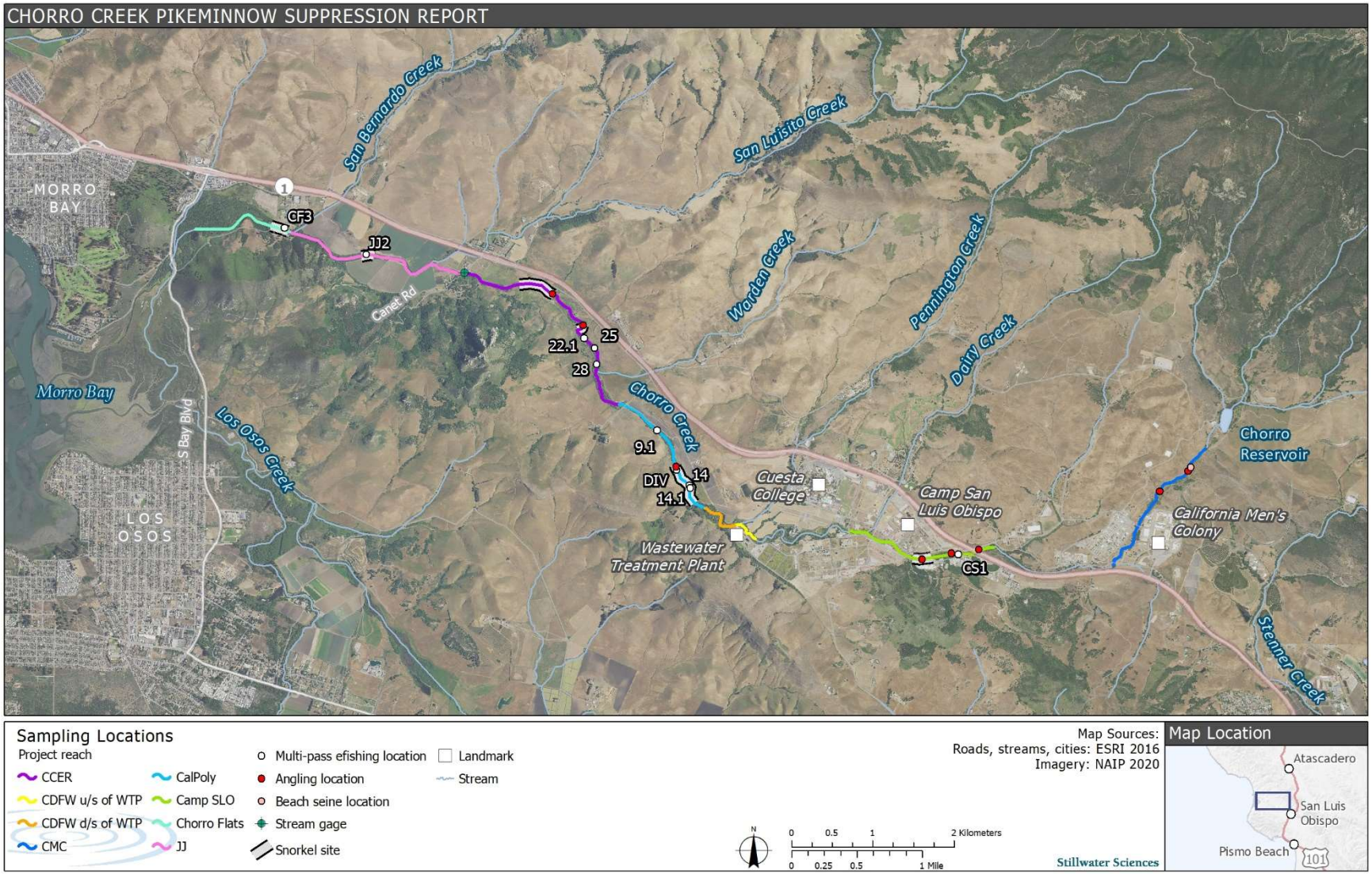

Figure 1. Study Area and high priority sampling locations within study reaches of Chorro Creek.

2 METHODS

Fish suppression and monitoring efforts were conducted in previously established study reaches that were primarily delineated based on access and landownership as opposed to channel characteristics. Pikeminnow suppression was conducted using multi-pass and single pass backpack electrofishing, beach seining, and angling as described in the Management Plan (Stillwater Sciences 2017). Sampling efforts were conducted during the fall when stream flows are at their lowest and pikeminnow are concentrated into smaller areas. The majority of the habitat during this time of year is less than 1.2 meters (m) in depth, which facilitates efficient removal with a backpack electrofisher (Adams et al. 2011).

Electrofishing crew

2.1 Snorkeling

Snorkeling was conducted in Chorro Creek prior to sampling to inform fish suppression efforts and prioritize sampling locations. Two snorkelers conducted single pass snorkel surveys moving in an upstream direction. Fish species observed were identified to species, assigned to a size bin (based on length), and enumerated.

2.2 Multi-Pass Electrofishing

Multi-pass backpack electrofishing was conducted in habitat units previously selected for long term monitoring, and within one newly established long term monitoring unit on Camp SLO (CS1). Multi-pass electrofishing was conducted following methods by Pollock and Otto (1983) to: (a) increase capture effectiveness and (b) estimate habitat-unit specific density from which to determine the density of both steelhead and pikeminnow. Block nets were installed at the upstream and downstream ends of each multi-pass sampling unit to prevent migration in and out of the unit and to facilitate an accurate assessment of sample populations. Two biologists with Smith Root LR-24 backpack electrofishers and two or three netters began at the downstream block net and proceeded upstream, working closely together. As fish were captured (netted), they were placed in buckets with aerated stream water until the completion of the pass. A minimum of three passes were conducted within each segment. If there was poor depletion after three passes, a fourth pass was performed.

All captured pikeminnow and steelhead were identified to species and measured to both standard length (SL) and fork length (FL). Other fish species captured were identified to species, enumerated, and a subset of up to 50 individuals were measured to SL and FL. All pikeminnow captured were humanely euthanized using methods included in the American Veterinary Medical Association (AVMA 2013) guidelines and all other fish were returned to the stream after measuring. Gut content analysis was conducted on pikeminnow over approximately 150 millimeter (mm) (SL), which involved dissecting the fish's stomach and visually identifying any objects observed in the stomach.

2.3 Single Pass Electrofishing

Single pass backpack electrofishing was conducted in Chorro Creek study reaches to remove pikeminnow, increase sample size for various habitat unit types, and document species distribution patterns and relative abundance for pikeminnow and steelhead. For locations sampled using single pass backpack electrofishing, two biologists with Smith Root LR-24 backpack electrofishers and two or three netters began at the downstream end of the habitat unit and proceeded upstream either to the top of the unit or through multiple units within a stream section. As fish were captured (netted), they were placed in buckets with aerated stream water. Once enough fish were captured or over 100 m of stream was sampled, fish were processed as discussed above in Section 2.2.

2.4 Beach Seining

Beach seining was conducted at one location within the CMC reach. Suitable beach seine locations are limited in the watershed due to heavy debris and other potential snags. Four seine hauls were made in a single pool in which a crew used a 50 ft by 5 ft beach seine net to sample the unit. All fish captured during beach seining were processed as discussed above in Section 2.2.

Beach seining on CMC

2.5 Angling

Angling was conducted in locations previously identified as pikeminnow "hot spots" where subadult/adult pikeminnow (fish >180 mm SL) were previously observed in high abundance and where habitat conditions limit the effectiveness of backpack electrofishing due to depths >4 ft or a combination of water depth and extensive cover (e.g., log jams and overhanging branches). Angling was conducted by one or two biologists using artificial lures with barbless hooks. All fish captured during angling were processed as discussed above in Section 2.2.

2.6 Analysis

Fish capture numbers from the 2021 sampling effort were compared with results from previous sampling efforts conducted from 2017–2020 to assess trends in abundance and distribution. A length frequency histogram was generated to estimate pikeminnow and steelhead age classes based on fish size. Relative abundance for steelhead and pikeminnow was standardized to a unit length of 100 m by dividing the number of fish captured by the habitat unit length sampled during a given year, then multiplied by 100 m. Fish density estimates with 95% confidence intervals were calculated at habitat units surveyed by multiple pass depletion between 2017–2021 for steelhead and pikeminnow using the FSA: Fisheries Stock Assessment package, implemented in R (Ogle et al. 2020, R Core Team 2020).

3 RESULTS

A total of 191 pikeminnow and 238 steelhead were captured in Chorro Creek during surveys conducted in 2021. To date, a total of 838 pikeminnow have been removed from Chorro Creek during suppression efforts from 2017–2021. The ratio of pikeminnow to steelhead was 10

pikeminnow to 1 steelhead during 2017; however, steelhead were more abundant all other years (Table 1).

Table 1. Fish captured and ratio of pikeminnow to steelhead in Chorro Creek during sampling conducted in 2017–2021.

Native or introduced	Species	2017	2018	2019	2020	2021	Total
Native	Steelhead	23	107	260	479	238	1,107
	Speckled dace	122	99	317	255	208	1,001
	Three-spine stickleback	134	39	69	45	365	652
Introduced	Pikeminnow	224	88	218	117	191	838
	Sacramento sucker	180	26	173	146	935	1,460
	Largemouth bass	0	2	0	0	0	2
	Bluegill	0	0	2	0	39	41
	Green sunfish	0	0	0	1	0	1
	Mosquito fish	0	0	0	0	14	14
Total		**683**	**361**	**1,039**	**1,043**	**1,990**	**5,116**
Ratio of steelhead to pikeminnow		**1:10**	**12:10**	**12:10**	**41:10**	**12:10**	**13:10**

3.1 Age Class

The size ranges of pikeminnow and steelhead captured in Chorro Creek between 2017–2021 include multiple age classes of pikeminnow and steelhead. The vast majority of individuals from both species are within the young-of-year (YOY) age class; however, several age classes were observed with some pikeminnow likely to be over age 5+ and steelhead likely to be over age 3+ (Figure 2). Pikeminnow less than or equal to 70 mm SL are estimated to fall within the YOY age-class while steelhead less than or equal to 140 mm SL are estimated to fall within the YOY age-class, based on the length frequency distribution of fish captured (Figure 2) and age-classes reported in literature (Moyle 2002, Bell et al. 2011, Hayes et al. 2008).

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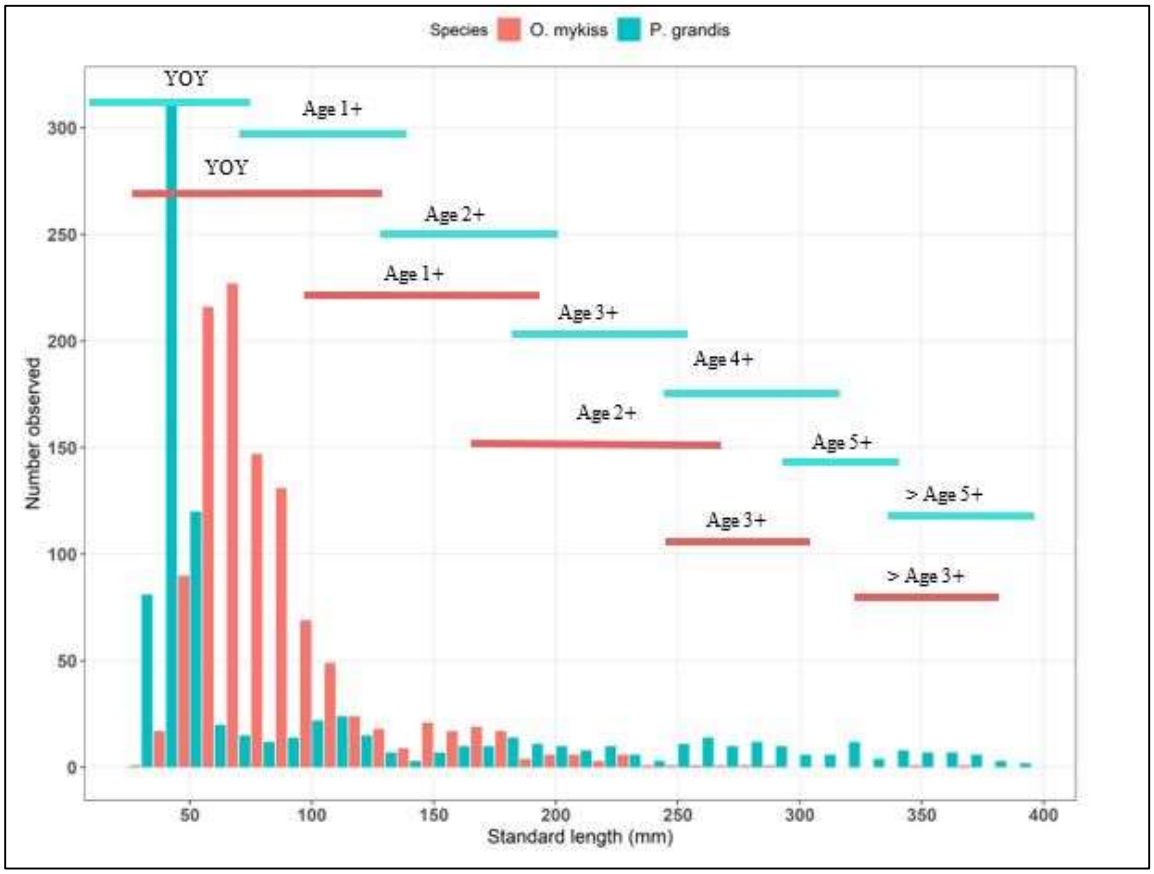

Figure 2. Length frequency distribution for pikeminnow and steelhead captured during 2017-2021. Age classes for pikeminnow are based on Moyle 2002, and for steelhead are based on Bell et al. 2011, and Hayes et al. 2008.

3.2 Composition

In 2021, eight fish species were captured in Chorro Creek including steelhead, pikeminnow, speckled dace, Sacramento sucker, three-spine stickleback largemouth bass, bluegill, and Western mosquitofish (Figure 3). Although steelhead capture numbers were fairly high in 2021, percent composition appears lower than previous years (Figure 4) likely from the very high numbers of speckled dace and Sacramento suckers captured in 2021 compared to previous years (Table 1).

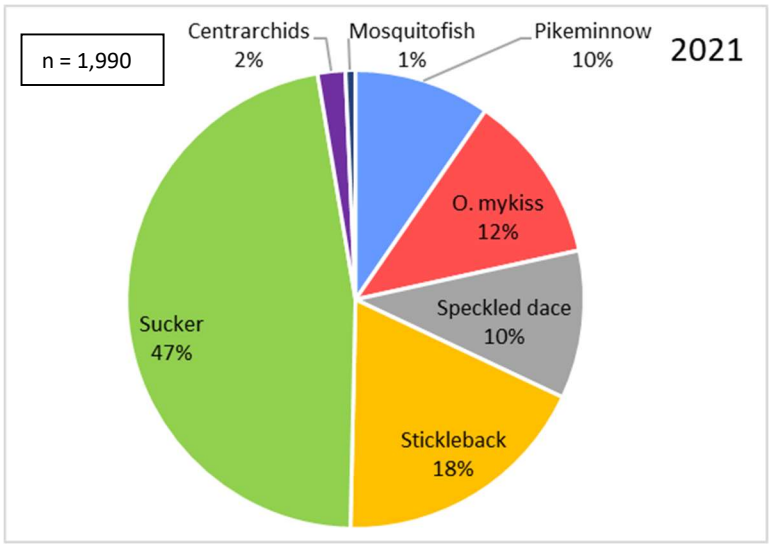

Figure 3. Percent composition for fish captured in Chorro Creek during sampling conducted in 2021.

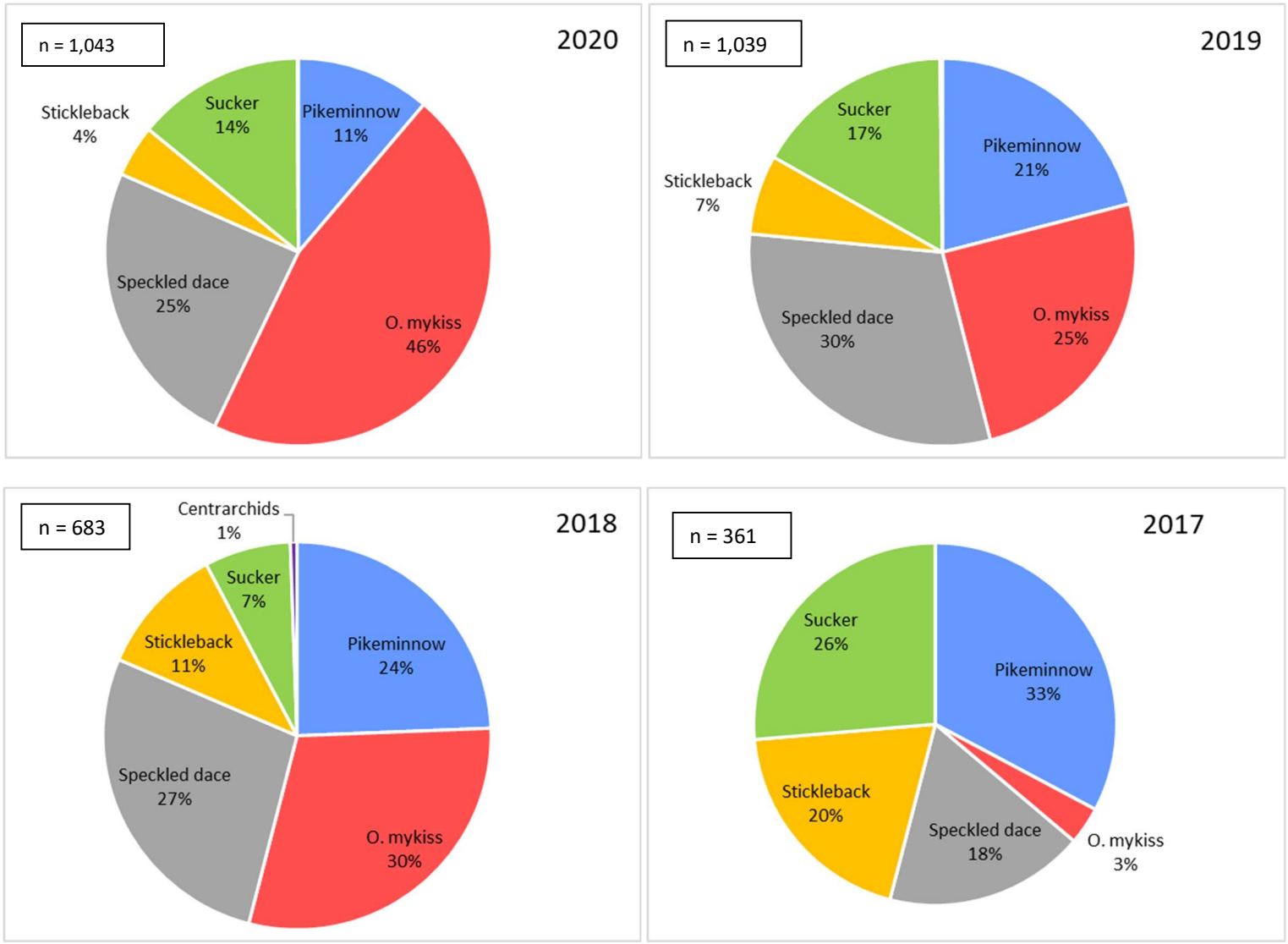

Figure 4. Percent composition for fish captured in Chorro Creek during sampling conducted in 2017–2020.

3.3 Distribution

Pikeminnow observations in 2021 were limited in the lower study reaches while steelhead observations were generally highest within the lowest reaches for both snorkel surveys (Table 2) and fish capture surveys (Figure 5). Camp SLO was the exception where both pikeminnow and steelhead observations were low during snorkel surveys, but steelhead were abundant in the capture data. Snorkeling was not conducted on the CMC study reach; however, backpack electrofishing, angling, and beach seining efforts conducted in the CMC study reach resulted in high numbers of pikeminnow and no steelhead in 2021 (Figure 5). The CMC study reach was not sampled before 2021.

Table 2. Fish species observations by study reach during snorkel surveys, 2021.

	Pikeminnow			O. mykiss				Other Species		
Snorkel Reach*	**<250 mm**	**>250 mm**	**Total**	**<76 mm**	**76 to 152 mm**	**152 to 250 mm**	**Total**	**Stickle back**	**Speckled dace**	**Sac. sucker**
Camp SLO	9	10	**19**	1	1	0	**2**	980	205	111
Cal Poly	504	11	**515**	0	7	0	**7**	217	639	317
CCER	5	15	**20**	31	10	0	**41**	0	0	68
JJ	18	0	**18**	56	6	0	**62**	295	185	299
Chorro Flats	0	0	**0**	39	10	3	**52**	0	0	129

* no snorkeling occurred on the CMC reach in 2021.

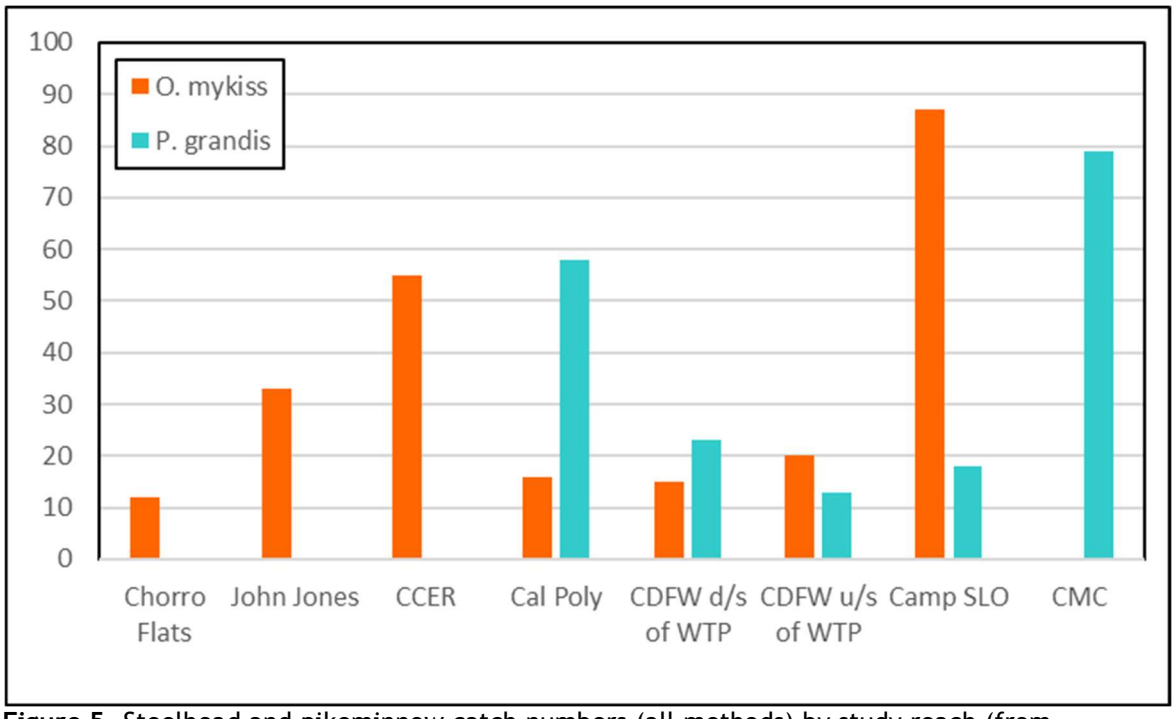

Figure 5. Steelhead and pikeminnow catch numbers (all methods) by study reach (from downstream [left] to upstream [right]) in 2021.

3.4 Abundance and Density

Overall pikeminnow capture was highest in 2017 and lowest in 2018 (Table 1). Pikeminnow abundance fluctuated between years and was most apparent in pikeminnow less than 70 mm SL (Figure 6 and Figure 7). Pikeminnow abundance generally increased upstream of the CCER reach. Steelhead abundance also fluctuated between years but was lowest during 2017 when only a few fish greater than 70 mm SL were observed (Figure 7). Steelhead were not observed in the CMC reach in 2021 which is the first year of pikeminnow suppression efforts in that reach; however, steelhead were present in all other reaches where sampling occurred each year. Although steelhead were observed in all study reaches, except the CMC study reach, steelhead abundance and density were generally higher at the downstream study reaches across all sample years (Figure 6 and Figure 7). Pikeminnow abundance and density tended to be higher within locations toward the upstream extent of the study area across all sample years (Figure 6 and Figure 7). Fish smaller than 70 mm SL made up the greatest proportion of pikeminnow density at each site while steelhead had higher densities for fish larger than 70 mm SL.

Steelhead in excellent condition captured in Chorro Creek

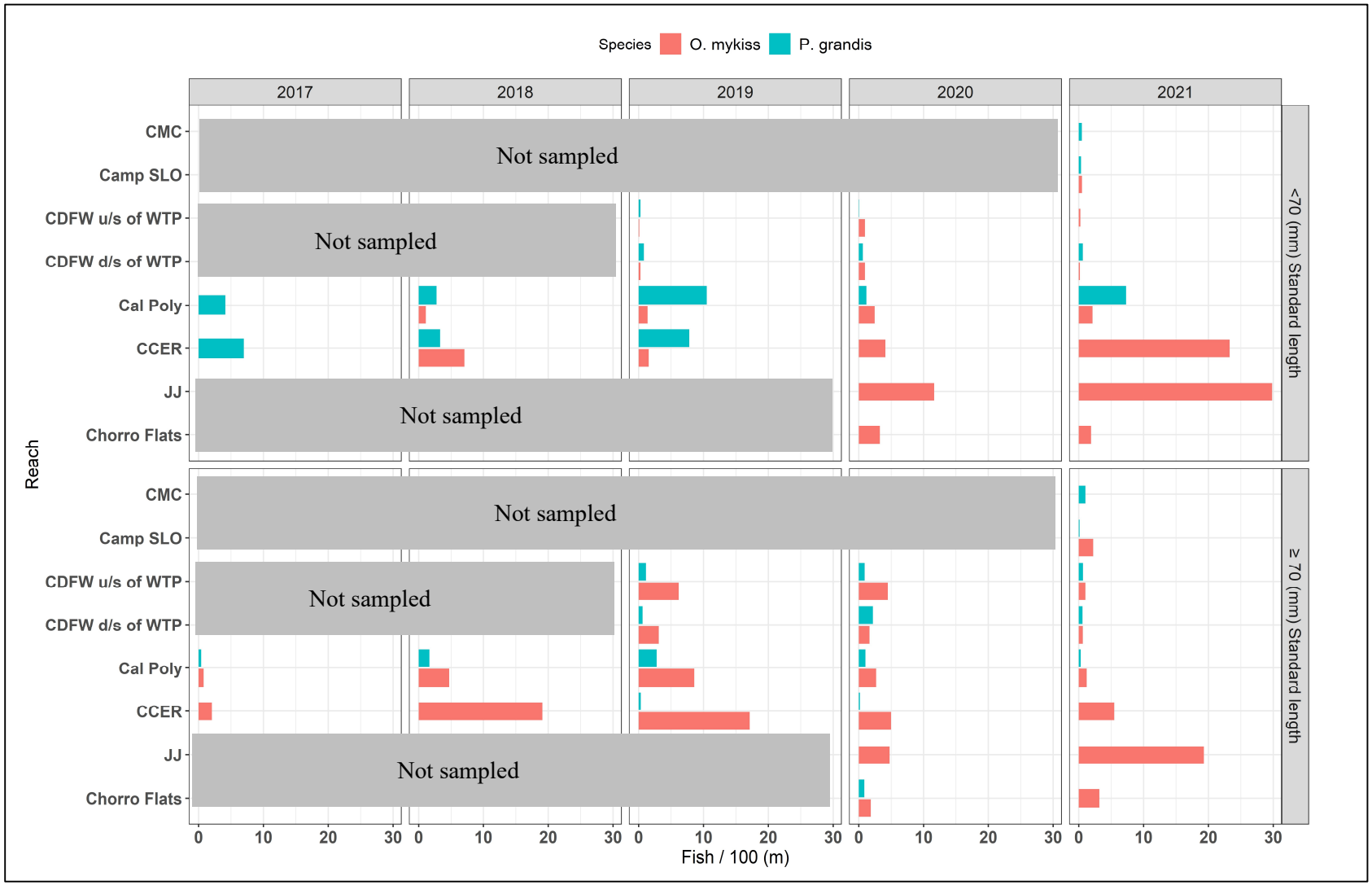

Figure 6. Relative abundance steelhead and pikeminnow based on single pass electrofishing (single pass includes 1st pass from multi-pass locations and single pass locations). Habitat units are ordered from downstream (bottom) to upstream (top).

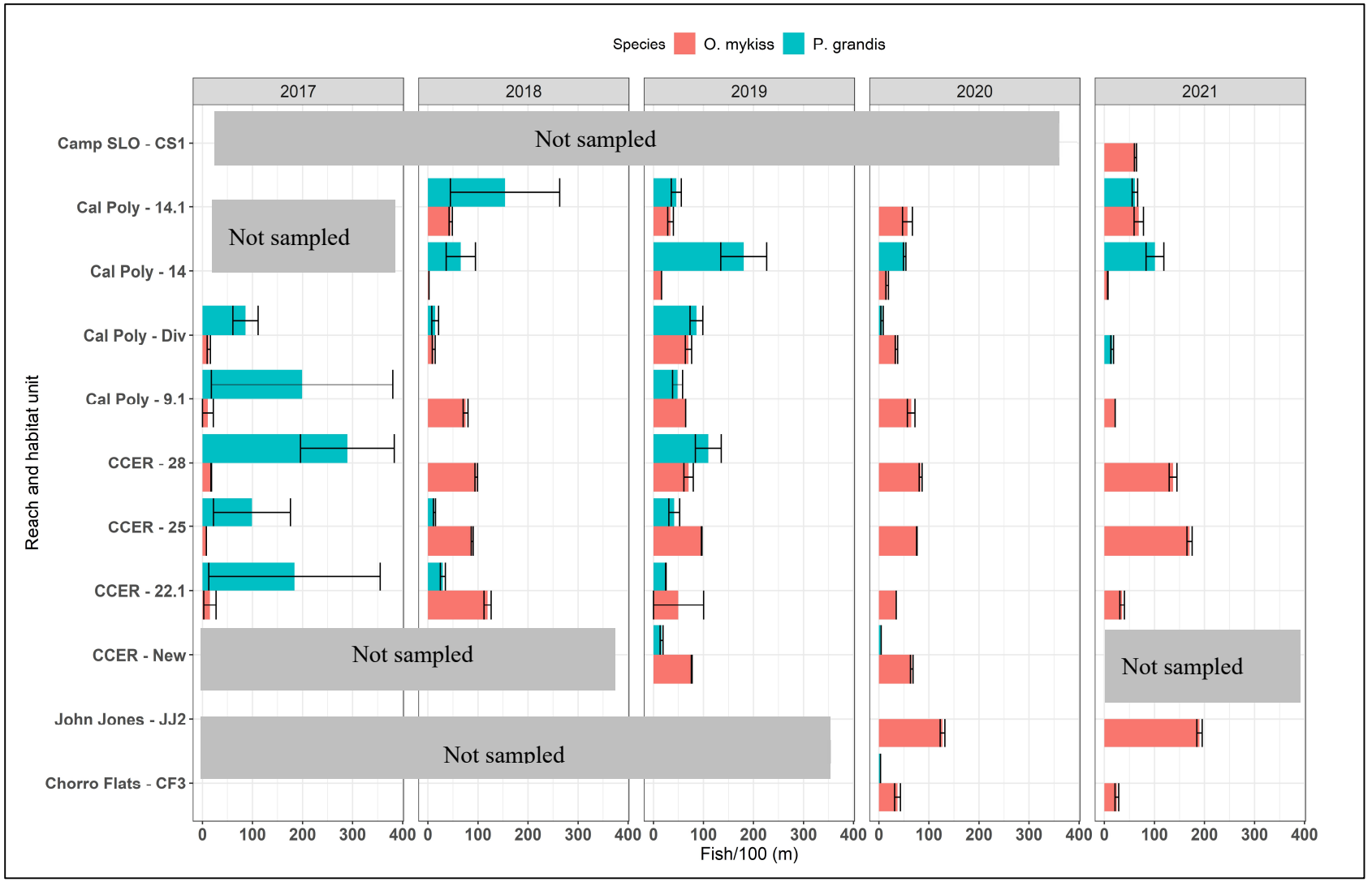

Figure 7. Estimated density for pikeminnow and steelhead with 95% C.I.s for multi-pass backpack electrofishing units in Chorro Creek 2017-2021. Habitat units are ordered from downstream (bottom) to upstream (top).

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