

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

FY 2021 ANNUAL REPORT

PROJECT: 132

Project Title

Population estimates of humpback and roundtail chub in Westwater Canyon, Colorado River, Utah.

Bureau of Reclamation Agreement Number:

R19AP00059

Project/Grant Period:

Start date: 10/1/2019

End date: 9/30/2024

Reporting period end date: 9/30/2021

Is this the final report? No

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Abstract:

Westwater Canyon on the Colorado River contains one of the four remaining populations of the endangered humpback chub in the Upper Colorado River Basin. The most recent adult abundance estimates (2016 – 2017) were significantly higher than those between 2007 and 2012, demonstrating a recent population increase to levels seen approximately 15-20 years ago. In 2021, trammel and hoop nets, submersible antennas, and electrofishing gear were used to sample humpback and roundtail chubs in Westwater Canyon in order to support another round of population monitoring. Important metrics of population status including catch rates, size structure, and population size were calculated for humpback and roundtail chub. Catch rates of humpback chub in trammel nets in 2021 were 0.33 fish /hr. Mean length of humpback chub in 2021 was 269 mm. We also continued hoop netting this year and that effort captured 1,329 additional chubs including 422 juvenile *Gila spp*. This was the last year in this two-year cycle of monitoring.

Study Schedule:

Ongoing; initial year of fieldwork cycle-2020, final year of fieldwork cycle-2021.

Relationship to RIPRAP:

GENERAL RECOVERY PROGRAM SUPPORT ACTION PLAN

- V. Monitor populations and habitat and conduct research to support recovery actions (research, monitoring, and data management).
- V.A. Measure and document population and habitat parameters to determine status and biological response to recovery actions.

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COLORADO RIVER ACTION PLAN: MAINSTEM

- V. Monitor populations and habitat and conduct research to support recovery actions (research, monitoring, and data management).
- V.A. Conduct research to acquire life history information and enhance scientific techniques required to complete recovery actions
- V.C.2. Westwater.

Accomplishment of FY 2021 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Task 1: Sampling

In 2021, three sampling passes occurred in Westwater Canyon during September and October as part of the continued efforts to monitor humpback and roundtail chub populations within the Colorado River. Sampling pass one occurred September 15–22, pass two occurred September 30–October 7, and pass three occurred October 15–22. During each pass, sites were surveyed for two consecutive nights at Miners Cabin (RM 123.5), Upper Cougar (RM 121.7), and Little Hole (120.8). The Hades bar site (RM 120.1) was sampled for one night per pass.

Mean daily discharge during passes was measured using data collected remotely from the USGS gauge #09163500 (Colorado River near Colorado-Utah State Line). Temperature was measured once daily at each site due to temperature sensors being cancelled at the USGS gauge. Mean flow for the first pass was 2,758 cfs (2,620–2,960 cfs), and temperatures ranged from 17.3–21.5 °C. Mean flow for the second pass was 3,532 cfs (2,940–5,280 cfs), and temperatures ranged from 16.4–18 °C. Mean flow for the third pass was 3,390 cfs (3,210–3,620 cfs), and temperatures ranged from 10.8–11.8 °C.

Humpback and roundtail chub were sampled using trammel and hoop nets, electrofishing, and submersible antennas during the 2021 sampling. Trammel nets were set each day at 16:00 and checked every two hours until 22:00, then they were pulled. The nets were reset the next morning at 5:00, checked every two hours and pulled at 11:00. Three to five trammel nets were set at each site depending upon habitat availability. Hoop nets were used to increase captures of juvenile chubs (<200 mm). Six to twelve hoop nets were set at each site. Hoop nets were set at 15:00 on the day we arrived at the site and checked the following day at 9:00. At Miners, Upper Cougar, and Little Hole, hoop nets were reset after being checked and checked again the following morning at 9:00. Hades only had one round of hoop net sets. Electrofishing occurred every afternoon at 14:00. All *Gila spp.* and endangered fishes were identified to species when possible, measured (total length; mm), weighed (g), scanned for a PIT tag, PIT tagged (if necessary), and released. There were ten total antennas set for the duration of the 2021 field season (three at each site; Miners, Upper Cougar, and Little Hole, and one at Hades). Data from the antennas are still being processed and will not be included in this annual report at this time.

The data and analysis in this report are preliminary due to the limited time to review the data between the conclusion of sampling and writing this report. Sampling efforts in 2021 resulted in the capture of 432 individual adult (≥ 200 mm) humpback chub and 2,445 individual adult roundtail chub. Additionally, eight sub-adult (<200 mm) humpback chub, 111 sub-adult roundtail chub, and 635 sub-adult *Gila spp.* were collected. Fish identified as *Gila spp.* were too small to reliably identify in the field.

The average total length of captured humpback chub during 2021 sampling was 269 mm with a range of 111–435 mm (n=461) and the average total length of roundtail chub captured was 247 mm with a range of 92–425 mm (n=2,745). The mean length of *Gila spp.* caught during electrofishing and trammel and

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hoop net surveys was 113 mm with a range of 82 to 160 mm (n=619). Analysis of length frequency histograms suggests that there is a broad range of adult humpback and roundtail chub within the Westwater Canyon population (Figure 1). Length frequency of *Gila spp.* indicates that recruitment is strong; however, we are unable to differentiate humpback chub recruits from roundtail chub recruits for these smaller size classes.

Trammel net surveys resulted in 944 hours of total effort during fall of 2021 sampling. Humpback chub trammel net catch per unit effort (CPUE) during 2021 was 0.33 fish per hour (Figure 2). Roundtail chub CPUE was 1.31 fish per hour (Figure 2). Catch per unit effort was slightly higher for humpback chub during pass 1 and temporally consistent for roundtail chub (Figure 2). This year we continued hoop netting in our sampling and had great results for smaller chubs and adult roundtail chubs (Figure 3). Hoop netting surveys resulted in 4,442 hours of total effort during our 2021 sampling. Roundtail chub had the highest CPUE in hoop nets with 0.17 fish/ hour (Figure 3). We captured 1,329 totals chubs in hoop net sampling. A majority of those were adult roundtail chub (56%) and juvenile chubs (<200 mm; 38%). *Gila spp.* catch rates were highest on pass 1 and adult roundtail chub were highest on pass 3 (Figures 3). Electrofishing was also effective at capturing smaller size class (<200 mm) chubs and adult roundtail chub (Figure 4). Catch per unit effort was highest for humpback chubs and *Gila spp.* during pass 1 (Figure 4). Catch per unit effort was highest for roundtail chubs during pass 3 (Figure 4).

Closed capture population models (Huggins' p and c) were calculated in Program MARK to estimate population size and capture probability for humpback chub and roundtail chub. Model averaging was used to estimate populations for both humpback and roundtail chub because AIC weights were less than 0.90 on all models (Table 1). Population estimates for both humpback and roundtail chubs used the Mo (constant p), Mt (time varying p), and Mb (behavioral response) models to calculate the estimates.

The preliminary model averaged estimate for humpback chub for 2021 is 3,240 (95% CI 1,494-4,986, SE=830, CV=0.26). The preliminary model averaged capture probabilities for humpback chub ranged from 0.02-0.09. The model averaged estimate for roundtail chub for 2021 is 16,552 (95% CI 13,289-19,815, SE=1,539, CV=0.09). The preliminary model averaged capture probabilities for roundtail chub ranged from 0.03-0.06. The capture probabilities for humpback and roundtail chub in 2021 were low (<10%), which is why these estimates are preliminary and should be used with caution. The addition of the antenna data will increase the capture probabilities and the precision of these population estimates. .

Task 2: Data entry

The 2021 data was entered and quality checked and will be uploaded into STReAMs by January 2022.

Task 3: Annual reporting

This report summarizes the 2021 data, meeting reporting requirements.

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Table 1. Program MARK model output for all models used for the 2021 abundance estimates on humpback and roundtail chubs in Westwater Canyon, UT.

Humpback Chub						
Model	AICc	Delta AICc	AICc Weights	Model Likelihood	Num. Par	Deviance
{Mt,p(t)=c(t)}	913.0282	0	0.57612	1	3	4388.7199
{Mt,p(t)=c(t)} constrained last p}	913.6419	0.6137	0.42388	0.7358	4	4387.3213
{Mb,p(.) c(.)}	944.071	31.0428	0	0	2	4421.772
{M0,p(.) = c(.)}	1081.8398	168.8116	0	0	1	4561.547
Roundtail Chub						
{Mt, p(t) = c (t) constrained last p}	6066.9723	0	0.82795	1	4	32959.467
{Mt, p(t) = c (t)}	6070.1147	3.1424	0.17205	0.2078	3	32964.612
{Mb, p(.) c (.)}	6240.8614	173.8891	0	0	2	33137.36
{M0, p(.) = c (.)}	6253.5402	186.5679	0	0	1	33152.04

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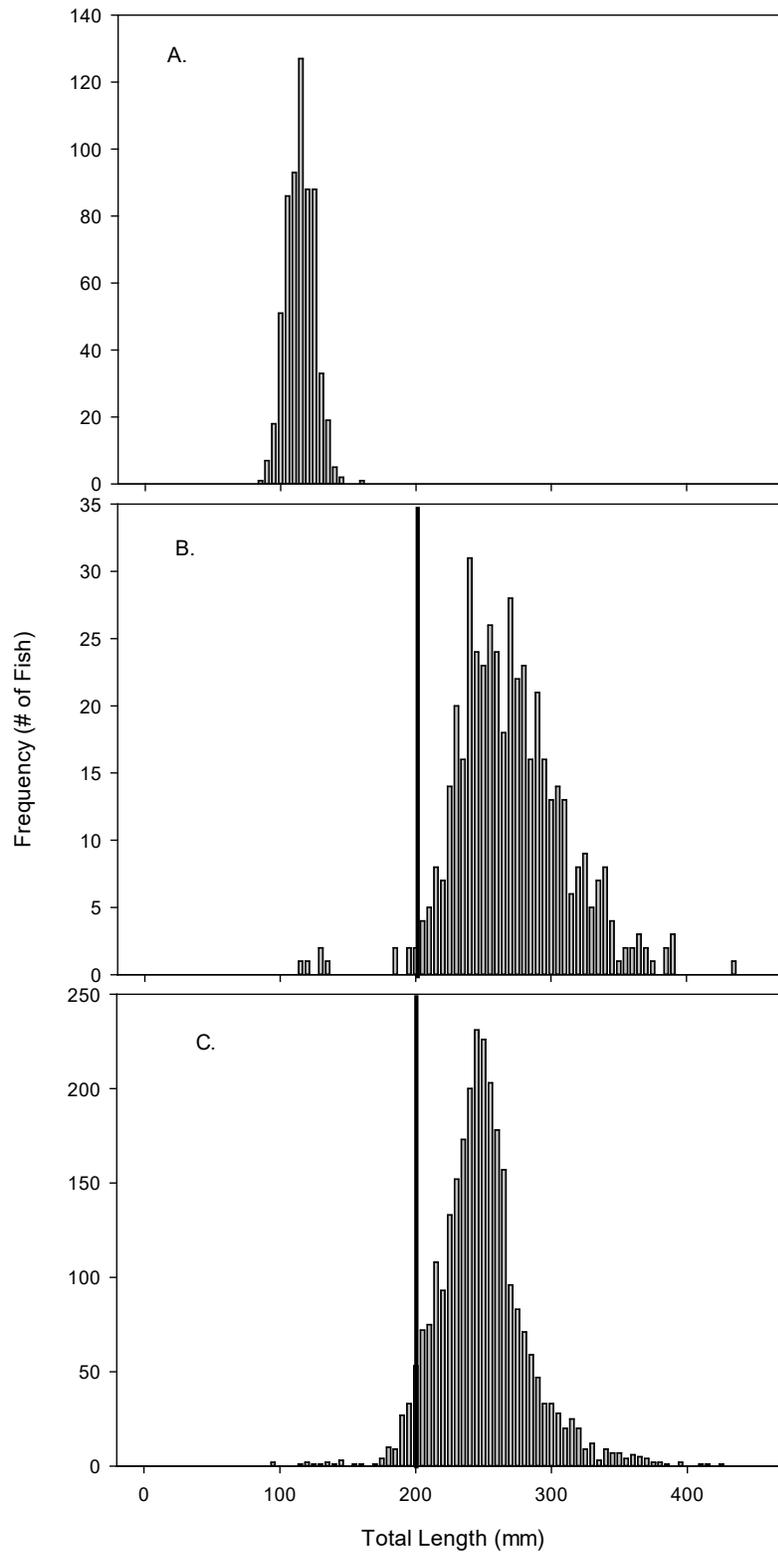


Figure 1. Length-frequency histograms for A.) *Gila* spp. B.) humpback chub, and C.) roundtail chub during Westwater Canyon sampling in 2021. Black bars denote the separation of juvenile and adult fish.

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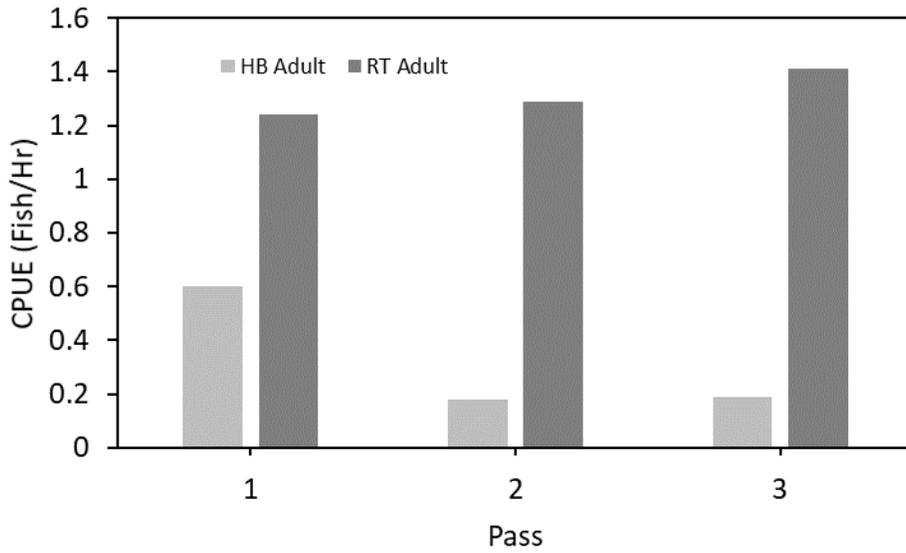


Figure 2. Catch per unit effort (fish/hour) by sampling pass for humpback and roundtail chub captured in trammel nets during fall of 2021.

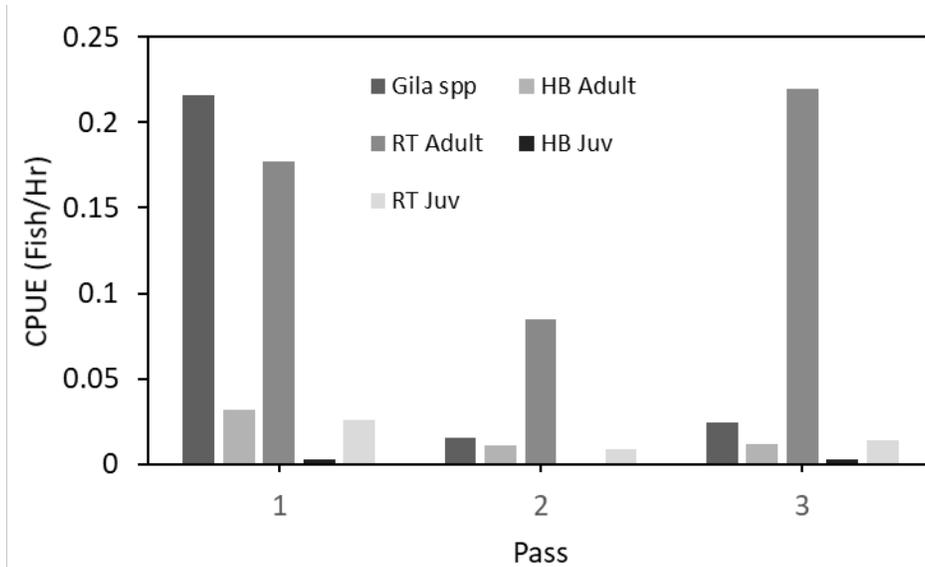


Figure 3. Catch per unit effort (fish/hour) by sampling pass for *Gila spp.*, humpback and roundtail chubs captured in hoop nets during fall of 2021.

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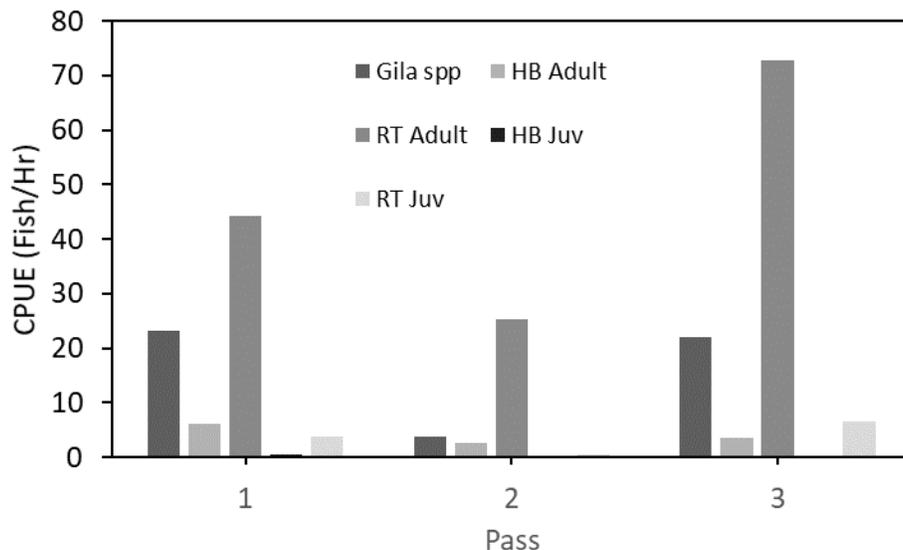


Figure 4. Catch per unit effort (fish/hour) by sampling pass for *Gila spp.*, humpback and roundtail chubs captured electrofishing during fall of 2021.

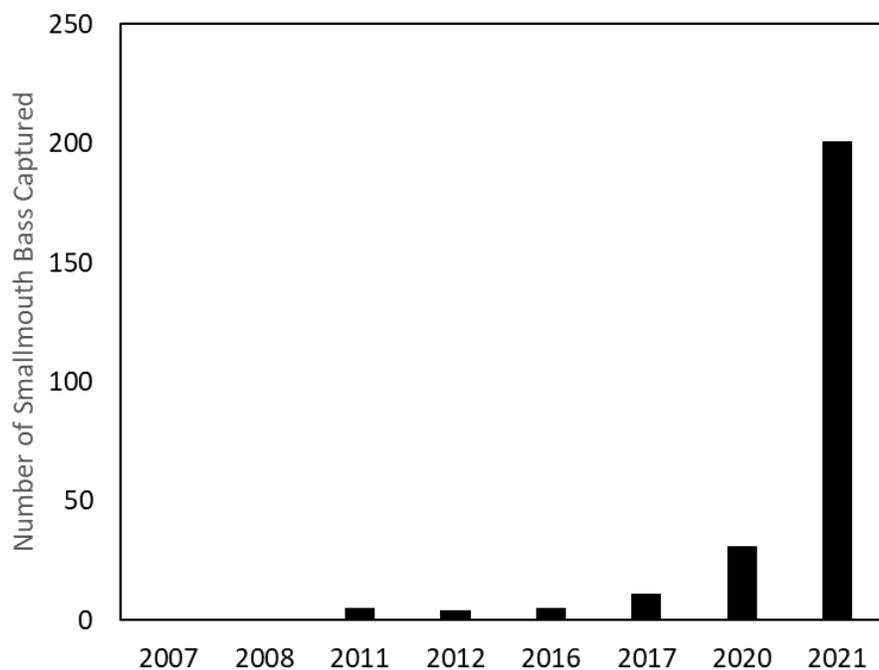


Figure 5. Number of smallmouth bass captured in Westwater Canyon during humpback chub abundance estimate efforts.

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Additional noteworthy observations:

We captured two other endangered species including four razorback sucker and six bonytail. Several nonnative species were captured and removed including 223 black bullheads, two yellow bullheads, five green sunfish, two gizzard shad, one largemouth bass, two striped bass, one white sucker hybrid, and nine white suckers.

We also caught 201 smallmouth bass, which is the highest number of smallmouth bass that has been removed from Westwater Canyon during Project 132 (Figure 5).

Recommendations:

- Continue current monitoring efforts including: use of trammel nets, hoop nets, electrofishing, submersible antennas, and use of robust design mark-recapture analysis for humpback and roundtail chub abundance estimates.
- Consider reducing the frequency and/or period of abundance estimation sampling and consider implementing a single annual electrofishing pass in off-years to monitor chub recruitment and nonnative distribution and density.
- Incorporate a genetics/morphometrics study (separate study) of the Westwater chub population to examine hybridization between roundtail and humpback chubs and provide guidance for field ID.
- Consider some form of nonnative removal effort through Westwater Canyon to reduce the expanding and increasing smallmouth bass population.
- Consider a summary analysis of catch rate and abundance data from all Upper Basin HBC populations. Exploring correlations of catch rates with abundance estimates, nonnative fish catch rates, and environmental factors through time could provide insight into both the Westwater Canyon humpback chub population and factors influencing population dynamics throughout the Upper Basin.

Project Status:

Year two of two-year project was completed. The project is on track and ongoing. No changes in objective, deadlines, predicted funding, project direction or probability of success are foreseen.

FY 2021 Budget Status

Funds Provided: \$108,970

Funds Expended: \$90,000

Difference: \$18,970, for final report.

Percent of the FY 2021 work completed, and projected costs to complete: 90%, remaining funds (\$18,970) are for final report, to be completed in 2023.

Recovery Program funds spent for publication charges: \$0

Status of Data Submission

Data will be uploaded into STReAMS by the end of January 2022.

Signed:

Brian Hines

Principal Investigator

11/22/2021