

# UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

FY 2022 ANNUAL REPORT

PROJECT: 131

## **Project Title**

Population Estimate of Humpback Chub (*Gila cypha*) in Black Rocks.

## **Bureau of Reclamation Agreement Number:**

R20PG00024

## **Project/Grant Period:**

Start date: 10/01/2019

End date: 09/30/2024

Reporting period end date: 09/30/2022

Is this the final report? Yes  No

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## **Abstract:**

Robust population estimates are now critical to monitor progress towards recovery of the humpback chub (USFWS 2001). Recovery goals require estimates of population size at regular intervals to measure population response to management activities. A population estimate for the Black Rocks population of humpback chub was made for the years 1998–2000 (McAda 2002), 2003–2004 (McAda 2007), and 2007–2008 (Francis and McAda 2011); a more robust design model was reported on all years 1998–2012 (Francis et al. 2016) and 1998–2017 (Francis et al. 2022)<sup>1</sup>. This report summarizes the work directed at a sixth estimate of population size for humpback chub in Black Rocks during the 2020–2021 time-period. Humpback chub data from the 2020–2021 effort has been added to a matrix that Colorado State University Larval Fish Lab (CSU-LFL) uses for life history parameter estimation for this and the Westwater Canyon population. This matrix was completed and sent to Utah Division of Wildlife Resources to incorporate the Westwater Canyon data from 2020–2021; the matrix with both population data was then sent to CSU-LFL for use in statistical modeling.

In the late 1970's Dr. Richard Valdez, while working for our office, described a population of humpback "like" chub collected from the Beavertail stretch of DeBeque Canyon of the Colorado River (Valdez et al. 1982). In addition, twelve humpback chub have made passage through the Grand Valley Water User's Fish Passage since 2005 (Francis, 2022). Our office sampled a 1.5 mile reach from August 15<sup>th</sup> through the 19<sup>th</sup>, 2022 with baited modified turtle-hoop-nets and collected seven individual phenotypically confirmed humpback chub. These fish were tagged, and a small caudal fin clip was collected for future genetic testing. Identifying additional populations of humpback chub provides for better protection from extirpation in the face of potential future catastrophe.

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<sup>1</sup> These final reports can be [found here](#).

## UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

### **Study Schedule:**

FY 2020–2022

### **Relationship to RIPRAP:**

Colorado River Action Plan: Mainstem; V.C. Estimate humpback chub populations; V.C.1. Black Rocks

### **Accomplishment of FY 2022 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:**

#### Young-of-year (YOY) *Gila* species monitoring

No YOY monitoring took place in 2022. Four seining trips were conducted in July and August 2020 and 2021 to evaluate YOY *Gila* year-class strength and attempt to determine what environmental variables are the most limiting to recruitment. Due to the pandemic, there was an increased use of Ruby Horsethief Canyon by recreationists. Campsites in Black Rocks proper were all reserved months ahead of time, so we were unable to secure a campsite for overnight hoop netting in both 2020 and 2021. Therefore, we sampled with seines only and floated the canyon in two consecutive days constituting a trip. Due to low water, in 2021, our sampling ended at Westwater Ranger Station (river mile {RM} 127.6) instead of the traditional terminal end of Westwater Wash (RM 124.8).

#### Mark-recapture

Sampling for the mark-recapture portion of this study is conducted in September and October; therefore, sampling overlaps two fiscal years. Sampling in calendar year 2020 overlapped into FY 2021 and sampling in calendar year 2021 overlapped into FY2022. Data analysis and final report writing will occur in FY 2022/2023.

PIT tag antennas deployed in 2016–2017 provided data suggesting our original sampling area did not cover the entire humpback chub occupied reach. For 2020 and 2021, sampling was extended 0.5 miles downstream of the original study area. Low water, in 2020 and 2021, precluded our ability to extend our reach 0.5 miles upstream of the original study area as intended. If water levels allow, the reach will be extended upstream and downstream 0.5 miles in the next sampling cycle (2024-2025).

Our SOW calls for four sampling passes conducted during alternating weeks in September and October 2020 and 2021. Unfortunately, due to equipment issues, we were only able to complete three sampling passes (passes two through four) in 2020. In 2021, a glitch in recreation.gov double booked our administrative hold on Black Rocks camp six. The Bureau of Land Management couldn't correct the issue until pass three. Therefore, full trammel netting and hoop netting passes only occurred during pass three and four. Pass one had trammel netting for one morning and both pass one and two had day trip hoop netting efforts. However, five submersible PIT tag antennas were deployed for the entirety of the of all passes in both years.

Due to low water, in 2020 and 2021, our heavier electrofishing jon boats could not up-run our traditional electrofishing sampling reaches. Therefore, only trammel and baited hoop netting were employed for 2020 and 2021 sampling.

#### Baited Hoop Nets

Baited (with dog food) specialty hoop nets were deployed throughout the reach with hopes to increase capture of juvenile and YOY *Gila* spp. The hoop nets are specialty 54-inch-long Delta H turtle nets with ¼-inch mesh and a 4-inch throat. These nets are set the first afternoon and are checked and baited the next afternoon, repeated throughout the trip. For 2020, baited hoop nets produced 3,911 roundtail chub

## UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

captures (not individuals for all *Gila*), 152 humpback chub (129 adults and 23 juveniles) captures, 21 age 1+ juvenile *Gila spp.*, and 22 YOY *Gila spp.* captures. For 2021, baited hoop nets produced 1,489 roundtail chub captures (not individuals for all *Gila*), 247 humpback chub (228 adults and 19 juveniles) captures, 349 age 1+ juvenile *Gila spp.*, and 0 YOY *Gila spp.* captures.

Catch rate data were not normally distributed (many samples collected zero of the targeted species) requiring transformation of the data for statistical testing. The LN (natural log) transformed mean catch rates (by pass) of humpback chub captured in baited hoop nets ranged between about 0.03 to 0.07 fish per net hour in 2020. During all passes of 2020 mean catch-per-unit-effort (CPE) varied, though not significantly. The LN transformed mean catch rates (by pass) of humpback chub captured in baited hoop nets ranged between about 0.05 to 0.08 fish per net hour in 2021. During all passes of 2021 mean catch-per-unit-effort (CPE) varied, though not significantly. Baited hoop netting was first utilized as a sampling technique in 2012 and catch rates varied, but not significantly, between the years 2012 and 2020. Baited hoop netting 2021 catch rates were significantly higher than 2012 catch rates (Figure 1).

The 2020 LN transformed mean catch rates (by pass) of juvenile *Gila* species (23 confirmed humpback chub and 21 that couldn't be morphologically distinguished) captured in baited hoop nets ranged between about 0.01 to 0.04 fish per net hour in 2020. During all 2020 passes mean catch-per-unit-effort (CPE) varied, though not significantly. The 2021 LN transformed mean catch rates (by pass) of juvenile *Gila* species (19 confirmed humpback chub and 349 that couldn't be morphologically distinguished) captured in baited hoop nets ranged between about 0.07 to 0.12 fish per net hour in 2021. The first two 2021 passes mean catch-per-unit-effort (CPE) was significantly higher than the second two passes. Baited hoop netting was first utilized as a sampling technique in 2012 and catch rates varied, but not significantly, between 2012 and 2020. Baited hoop netting juvenile *Gila* CPE was significantly higher in 2021 when compared to the earlier years (Figure 2).

The LN transformed mean catch rates (by pass) of roundtail chub captured in baited hoop nets ranged between about 0.60 to 0.96 fish per net hour in 2020. During all passes mean catch-per-unit-effort (CPE) varied, though not significantly. The LN transformed mean catch rates (by pass) of roundtail chub captured in baited hoop nets ranged between about 0.26 to 0.37 fish per net hour in 2021. During all passes mean catch-per-unit-effort (CPE) varied, though not significantly. Baited hoop netting was first utilized as a sampling technique in 2012 and catch rates varied, but not significantly, between the years 2012–2017. However, roundtail chub LN transformed mean hoop net catch rates achieved in 2020 were significantly higher than all other sampling years and mean catch rates achieved in 2021 were higher than 2012–2017 (Figure 3).

### Trammel Nets

Seventy-five-foot trammel nets have been the primary method used throughout the years and are crucial for comparing catch per effort and fish community changes through time. Four to five trammel nets, with 1-inch inner mesh, were set to minimize the time between net checks. Attempts were made to keep net sets at one to two hours between net checks. For 2020, trammel nets provided 772 roundtail chub captures (not individuals), 111 humpback chub (110 adults, one juvenile) captures, 10 bonytail (*Gila elegans*) captures, 5 Colorado pikeminnow (*Ptychocheilus lucius*), and 2 razorback sucker (*Xyrauchen texanus*) captures. For 2021, trammel nets provided 437 roundtail chub captures (not individuals for all species), 59 humpback chub (59 adults, zero juvenile) captures, 4 bonytail captures, 3 Colorado pikeminnow captures, and 2 razorback sucker captures.

The LN transformed mean catch rates (by pass) of humpback chub captured in trammel nets ranged between about 0.24 to 0.39 fish per net hour in 2020. The LN transformed mean catch rates (by pass) of

## UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

humpback chub captured in trammel nets ranged between about 0.19 to 0.33 fish per net hour in 2021. The LN transformed mean CPE for humpback chub was significantly higher in 1998, 1999, 2020 and 2021 when compared to all other years, except for some overlap between 1998, 2016, and 2021 (Figure 4).

The LN transformed mean catch rates (by pass) of roundtail chub captured in trammel nets ranged between about 1.04 to 1.31 fish per net hour in 2020. The LN transformed mean catch rates (by pass) of roundtail chub captured in trammel nets ranged between about 0.91 to 1.19 fish per net hour in 2021. The LN transformed mean CPE for roundtail chub increased significantly in 2003 when compared to 1998–2000 and remained significantly higher through 2021 (with the exception of 2007). The LN transformed mean CPE for roundtail chub was significantly higher in 2008, 2020 and 2021 when compared to all other years (Figure 5).

Non-native fishes removed in 2020 include 24 green sunfish, 3 gizzard shad, 14 largemouth bass, 4 smallmouth bass, 1 white by flannemouth sucker hybrid, 1 white by bluehead sucker hybrid, and 3 white sucker. Non-native fishes removed in 2021 include 276 black bullhead, 9 bluegill, 25 green sunfish, 7 gizzard shad, 1 longnose sucker, 12 smallmouth bass, 1 white by flannemouth sucker hybrid, and 1 white sucker.

### Size Structure

Morphologically confirmed humpback chub captured in Black Rocks during 2020 ranged from 178 to 377 mm total length (TL; n=239), with a mean of 249 mm and median of 244 mm. In 2020, 43 juvenile and YOY *Gila spp.* (roundtail chub, humpback chub, or an intergrade that couldn't be morphologically distinguished) captured ranged from 55 to 198 mm TL, with a mean of 116 mm and median of 83 mm. Morphologically confirmed humpback chub captured in Black Rocks during 2021 ranged from 123 to 387 mm total length (TL; n=226), with a mean of 253 mm and median of 253 mm. In 2021, 277 juvenile *Gila spp.* (roundtail chub, humpback chub, or an intergrade that couldn't be morphologically distinguished) captured ranged from 84 to 191 mm TL, with a mean of 119 mm and median of 118 mm (Figure 6).

Roundtail chub captured in Black Rocks during 2020 ranged from 147 to 411 mm TL (n=4,608 out of 4,619), with a mean of 217 mm and median of 204 mm. Roundtail chub captured in Black Rocks during 2021 ranged from 124 to 430 mm TL (n=1,714 out of 1,715), with a mean of 254 mm and median of 250 mm (Figure 7).

### Submersible PIT Tag Antennas

Five PIT tag antennas were deployed in 2020. These fully submersible PIT tag antennas (a product of BioMark) are one meter in diameter with a read range of 40 inches. Tentative 2020 data from these antennas include 3,773 sightings of 1,199 unique tags. These belong to 759 roundtail chub, 112 humpback chub (106 adults and six juveniles), 7 age-1+ juvenile *Gila spp.* (at last capture), 53 bonytail, 24 Colorado pikeminnow, 173 razorback sucker, 3 tagged flannelmouth sucker (*Catostomus latippinis*), and 1 razorback by flannelmouth hybrid sucker. There were 67 PIT tags sighted that belong to fish whose data hasn't been reported to the Upper Colorado River Recovery Program (UCRRP) database STReAMS through January 2021. These data will be updated in STReAMS prior to submission of the matrix to CSU.

Five PIT tag antennas were deployed in 2021. Tentative 2021 data from these antennas include 2,717 sightings of 1,059 unique tags. These belong to 614 roundtail chub, 80 humpback chub (69 adults and 11 juveniles), 84 age-1+ juvenile *Gila spp.* (at last capture), 11 bonytail, 16 Colorado pikeminnow, 52

## UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

razorback sucker, and 1 tagged flannelmouth sucker (*Catostomus latippinis*). There were 201 PIT tags sighted that belong to fish whose data hasn't been reported to the Upper Colorado River Recovery Program (UCRRP) database STReaMS through January 2022. These data will be updated in STReaMS prior to submission of the matrix to CSU.

### Population Estimates

Population estimates, capture probabilities, and coefficients of variations will be included in the final report scheduled to be submitted to the Biology Committee for review in early 2024. To provide these now would be premature as the larger analysis including data from 1998 to the present will allow for more precise and robust estimates.

Humpback chub data from the 2020–2021 effort has been added to a matrix that Colorado State University Larval Fish Lab (CSU-LFL) uses for life history parameter estimation for this and the Westwater Canyon population. This matrix was completed and sent to Utah Division of Wildlife Resources to incorporate the Westwater Canyon data from 2020–2021; the matrix with both population data was then sent to CSU-LFL for use in statistical modeling.

### **Additional noteworthy observations:**

New for 2022:

In the 1970's Dr. Richard Valdez described a population of humpback "like" chub collected from the Beavertail stretch of DeBeque Canyon of the Colorado River River (Valdez et al. 1982). In addition, twelve humpback chub have made upstream passage through the Grand Valley Water User's Fish Passage since 2005 (Francis, 2022). Therefore, we believed it is worthwhile to perform exploratory sampling in suitable habitat to investigate the possibility of resident humpback chub in this area. Our office sampled a 1.5 mile (RMI 197.6 to 196.1) reach in lower DeBeque Canyon from August 15<sup>th</sup> through the 19<sup>th</sup>, 2022 with baited modified turtle-hoop-nets for a total of 520 net soak hours and collected seven individual phenotypically confirmed humpback chub. One of the fish was captured twice during this effort. Humpback chub TL ranged from 180 to 219mm with a mean TL of 195mm. Collections also included 41 roundtail chub and three black bullhead. These fish were tagged, and a small caudal fin clip was collected for future genetic testing. The LN (natural log) transformed mean catch rate of humpback chub captured in baited hoop nets was .015 fish per net hour in 2022 (Figure 8). This catch rate was lower than all five Black Rocks hoop nets catch rates since 2012 (Figure 8) but was only significantly lower than one annual catch rate (2021). Importantly, during this exploratory sampling, only 10% of DeBeque Canyon was sampled. More small groups of fish may be found throughout this canyon bound reach, which warrants future investigation. Identifying additional populations of humpback chub provides for better protection from extirpation in the face of potential future catastrophe.

### **Recommendations:**

- Continue project as designed.
- If water levels allow, the sampled reach will be extended upstream and downstream 0.5 miles from the original study reach in 2024.
- Send Beavertail humpback chub fin clips to SNARCC for genetic testing to determine purity of humpback chub and genetic relationship to nearby populations.

## UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

- Pending genetic results, fund additional monitoring in DeBeque Canyon to better describe the population of humpback chub in this reach of river. Determine if the population is robust enough to warrant future abundance estimation.

### **Project Status:**

On track, ongoing.

### **FY2022 Budget Status**

Funds Provided: \$56,827

Funds Expended: \$56,827

Difference: -0-

Percent of the FY 2022 work completed, and projected costs to complete: 100%

Recovery Program funds spent for publication charges: -0-

### **Status of Data Submission**

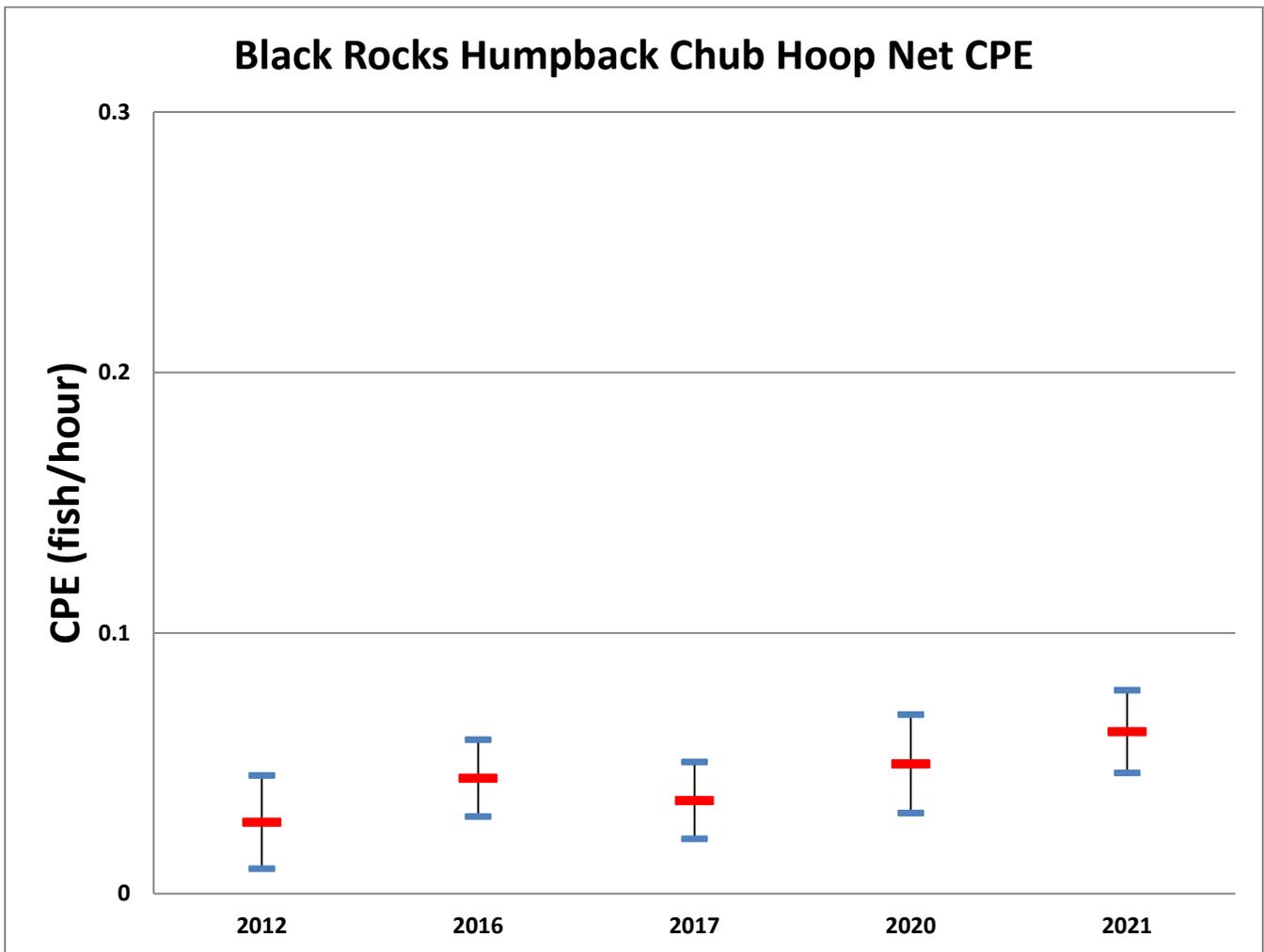
Data has been uploaded into STReAMS.

### **Signed:**

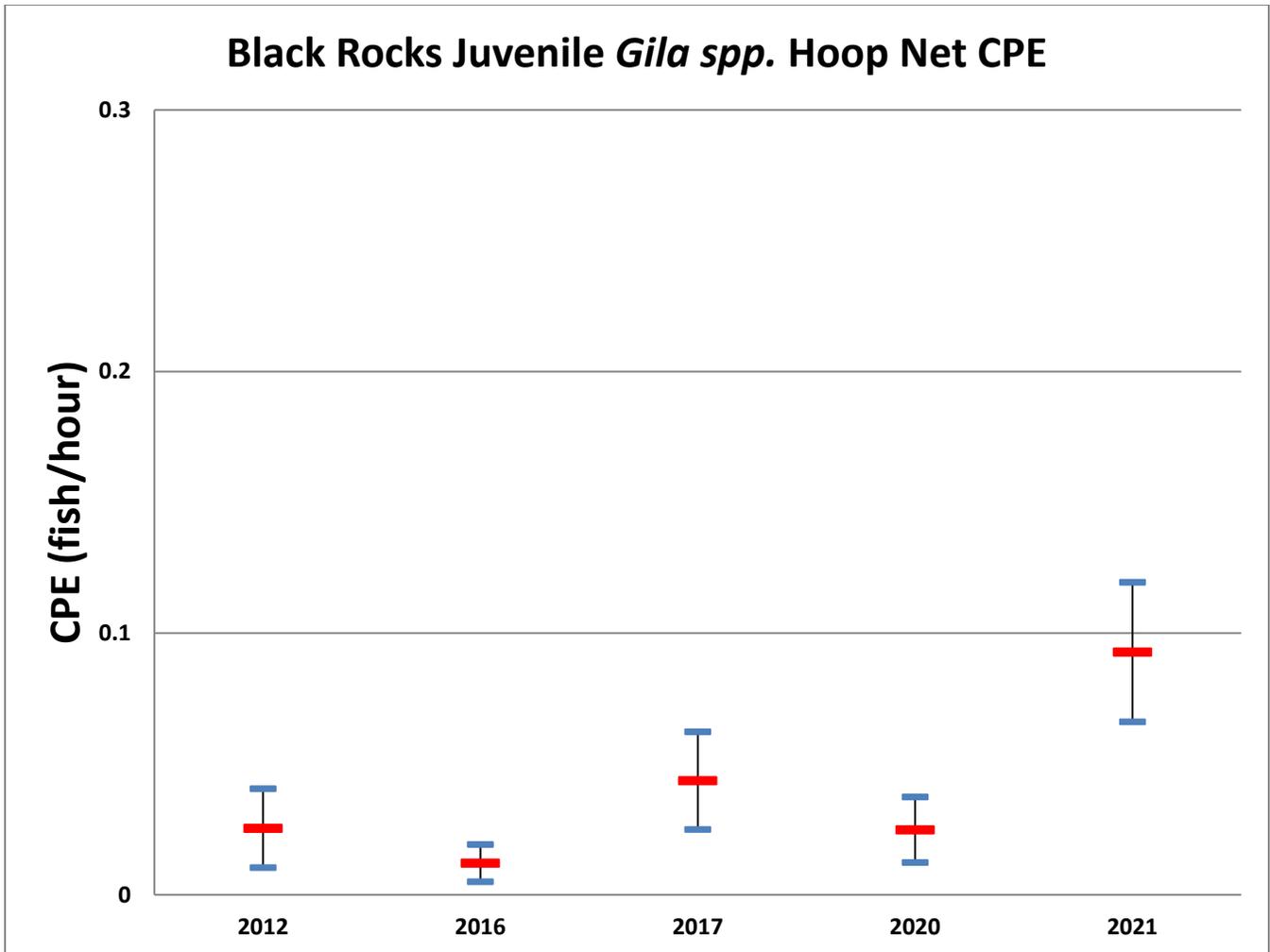
Travis Francis

Principal Investigator

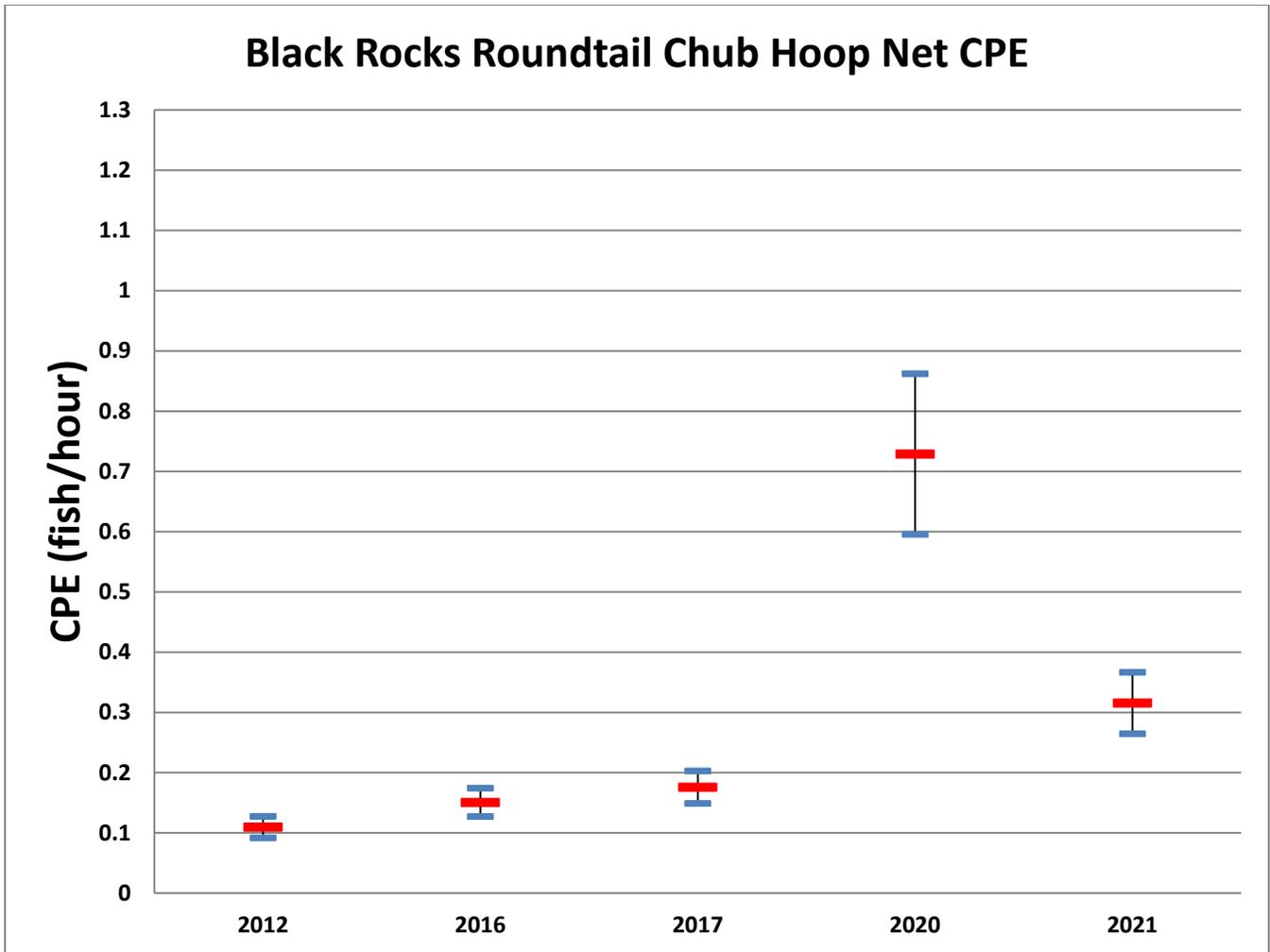
11/7/2022



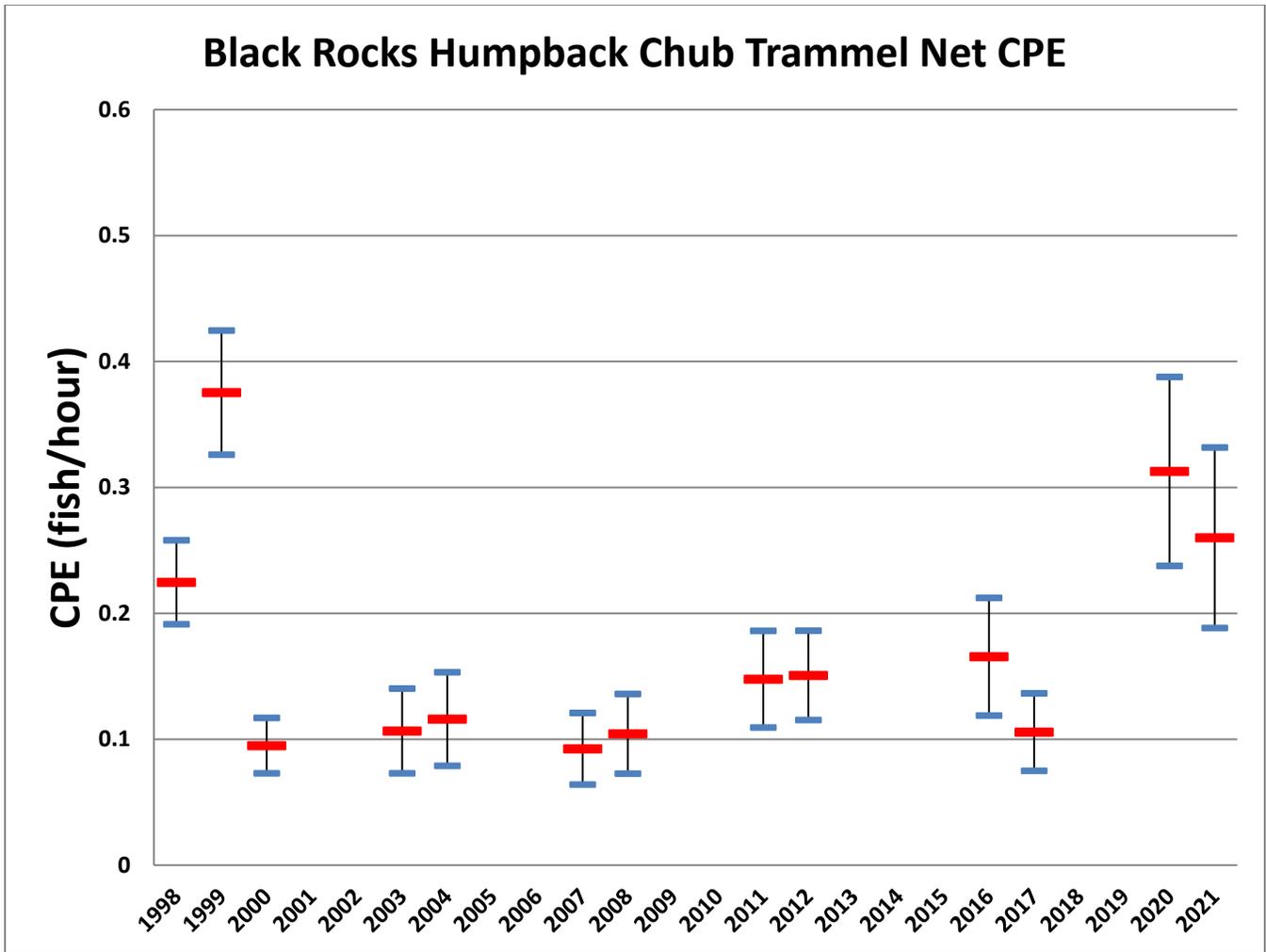
**Figure #1.** LN transformed mean CPE (fish/hr; 95% CI) for humpback chub captured using hoop nets; 2012–2021.



**Figure #2.** LN transformed mean CPE (fish/hr; 95% CI) for juvenile *Gila* spp. captured using hoop nets; 2012–2021.

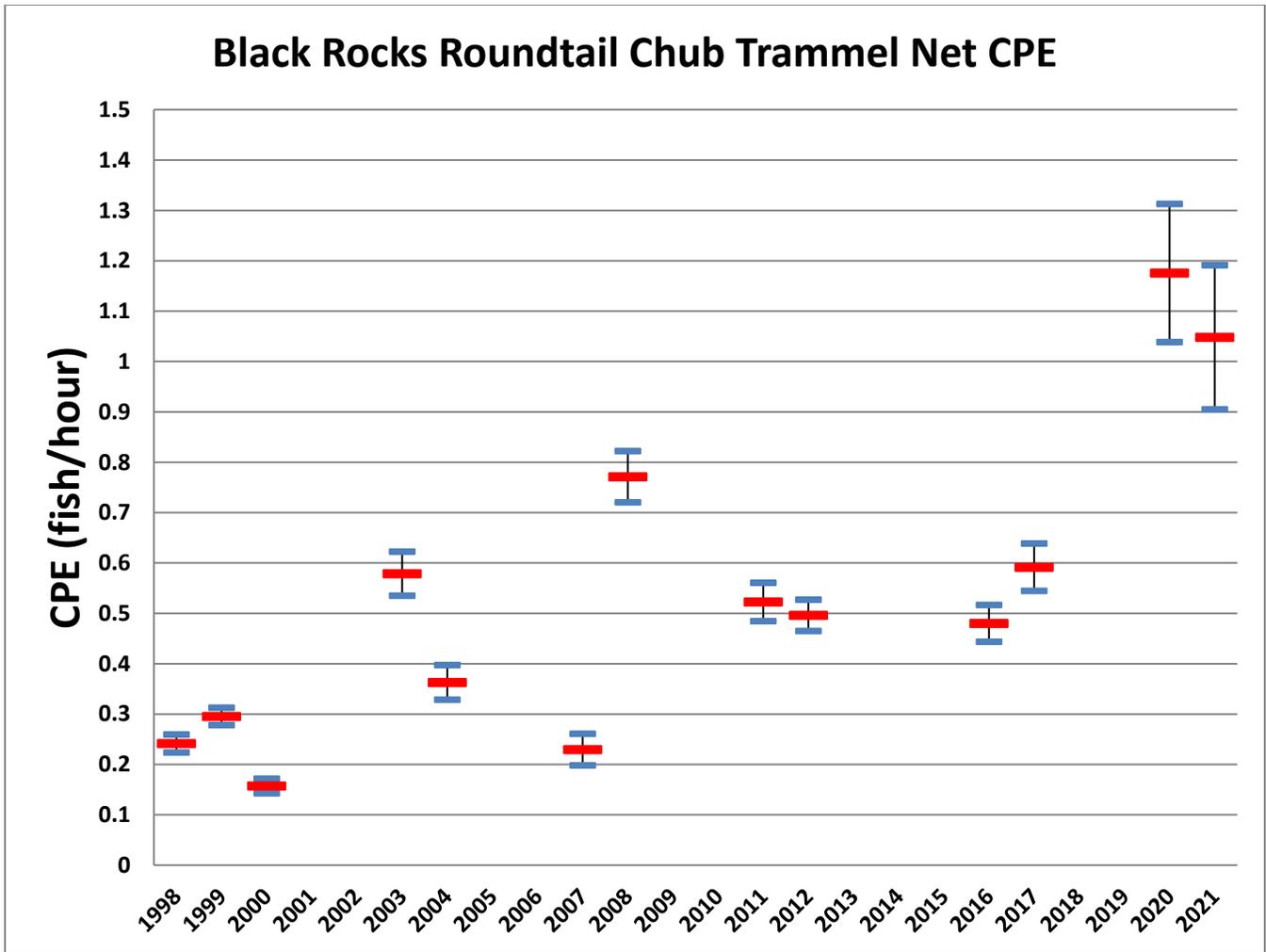


**Figure #3.** LN transformed mean CPE (fish/hr; 95% CI) for roundtail chub captured using hoop nets; 2012–2021.



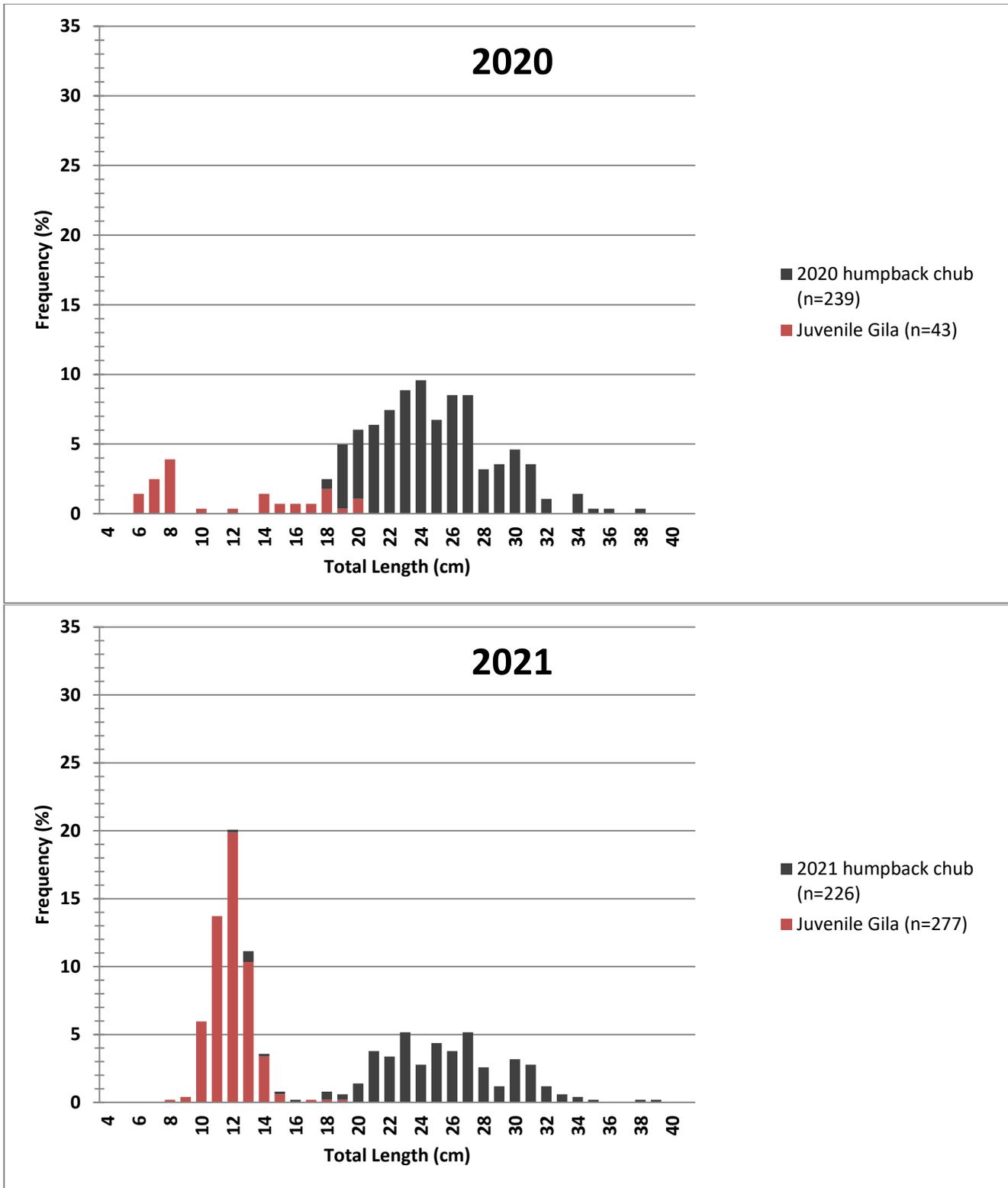
**Figure #4.**

LN transformed mean CPE (fish/hr; 95% CI) for humpback chub captured using trammel nets; 1998–2021.



**Figure #5.** LN transformed mean CPE (fish/hr; 95% CI) for roundtail chub captured using trammel nets; 1998–2021.

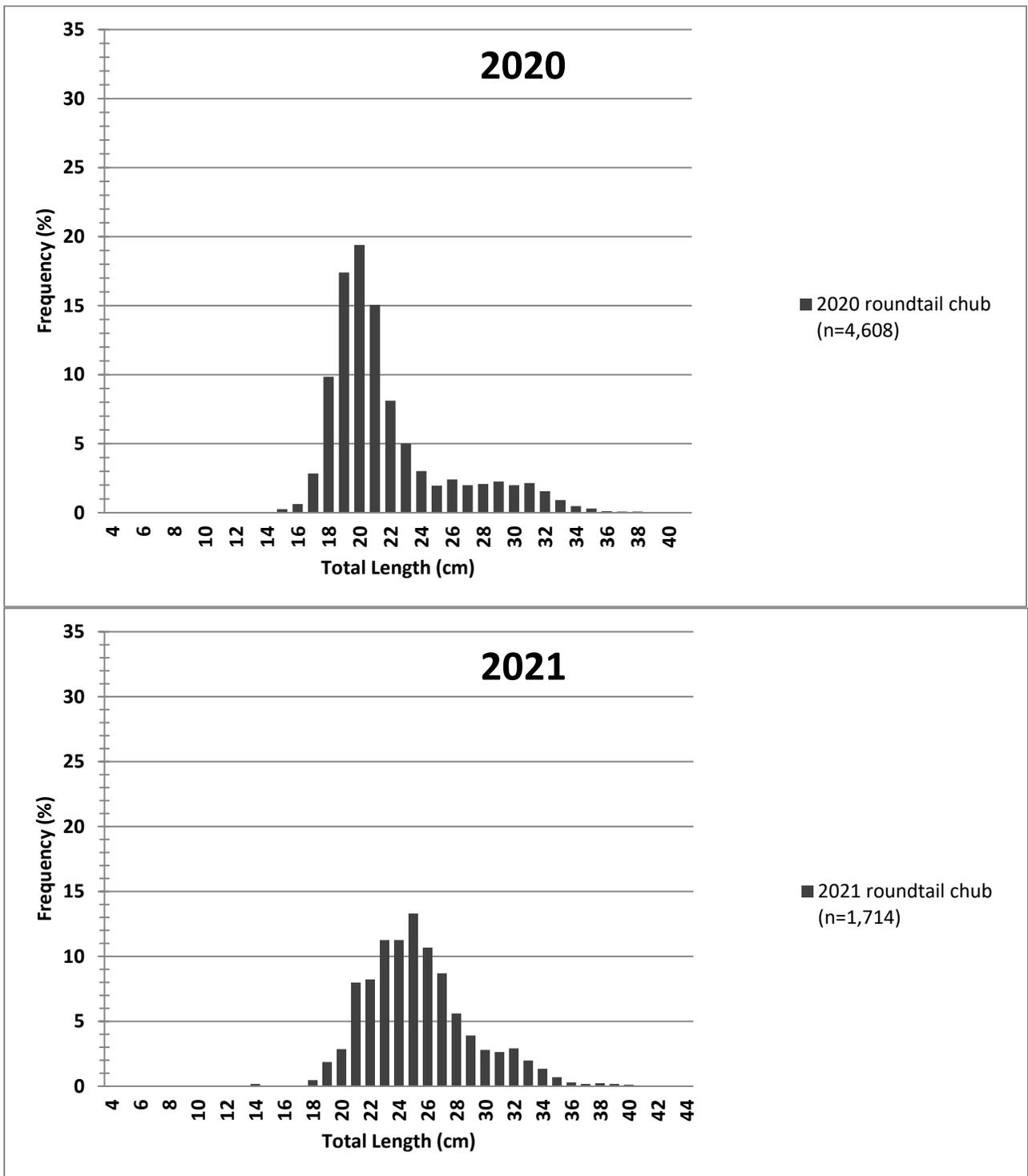
UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM



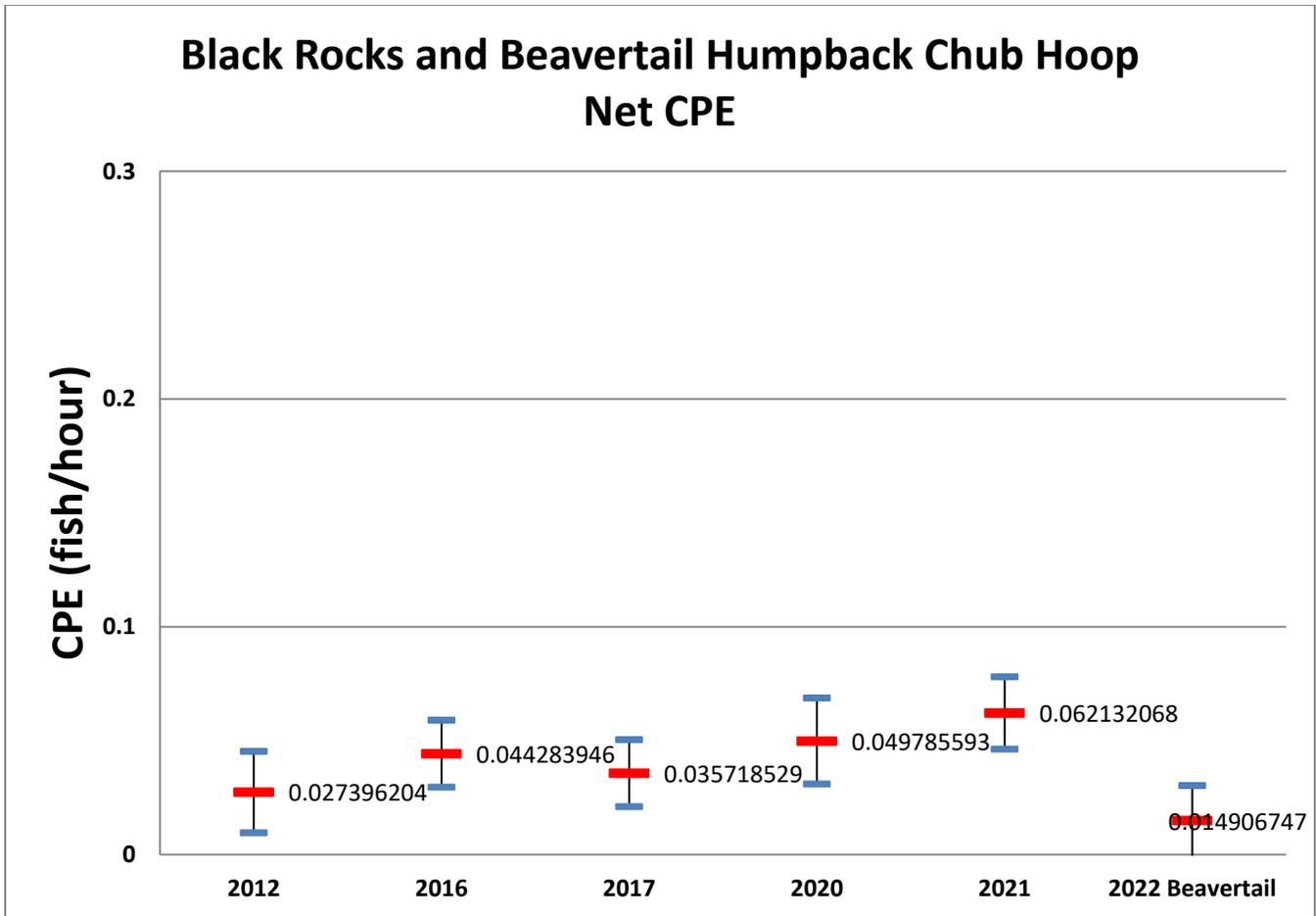
**Figure #6.**

Size structure of humpback chub in Black Rocks, 2020 and 2021. Red bars represent juvenile *Gila* spp. which couldn't be morphologically confirmed to species; black bars represent morphologically confirmed humpback chub.

UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM



**Figure #7.**  
Size structure of roundtail chub in Black Rocks, 2020 and 2021.



**Figure #8.**

LN transformed mean CPE (fish/hr; 95% CI) for humpback chub captured using hoop nets; 2012–2021 in Black Rocks and 2022 in Beavertail.

## UPPER COLORADO RIVER ENDANGERED FISH RECOVERY PROGRAM

### Literature Cited

- Francis, T.A. 2022. Annual Operation and Maintenance of the Fish Passage Structure at the Government Highline Diversion Dam on the Upper Colorado River and Price-Stubb Fish Passage. Annual Report from the U.S. Fish and Wildlife Service to the Upper Colorado River Endangered Fish Recovery Program, Project Number C4b-GVP. Grand Junction, Colorado.
- Francis, T.A., and C.W. McAda. 2011. Population size and structure of humpback chub, *Gila cypha* and roundtail chub, *G. robusta*, in Black Rocks, Colorado River, Colorado, 2007–2008. Final Report from the U.S. Fish and Wildlife Service to the Upper Colorado River Endangered Fish Recovery Program, Project Number 131. Grand Junction, Colorado.
- Francis, T.A., K.R. Bestgen, and G.C. White. 2016. Population status of humpback chub, *Gila cypha*, and catch indices and population structure of sympatric roundtail chub, *Gila robusta*, in Black Rocks, Colorado River, Colorado, 1998–2012. Larval Fish Laboratory Contribution 199. Final Report from the U.S. Fish and Wildlife Service to the Upper Colorado River Endangered Fish Recovery Program, Project Number 131. Grand Junction, Colorado.
- Francis, T.A., K.R. Bestgen, and G.C. White. 2022. Population status of humpback chub, *Gila cypha*, and catch indices and population structure of sympatric roundtail chub, *Gila robusta*, in Black Rocks, Colorado River, Colorado, 1998–2017. Larval Fish Laboratory Contribution 222. Final Report from the U.S. Fish and Wildlife Service to the Upper Colorado River Endangered Fish Recovery Program, Project Number 131. Grand Junction, Colorado.
- McAda, C. W. 2002. Population size and structure of humpback chub in Black Rocks, 1998–2000. Final report to the Upper Colorado River Fish Recovery Program, Project Number 22a3. U. S. Fish and Wildlife Service, Grand Junction, Colorado.
- McAda, C. W. 2007. Population size and structure of humpback chub in Black Rocks, 2003–2004. Final report to the Upper Colorado River Fish Recovery Program, Project Number 22a3. U. S. Fish and Wildlife Service, Grand Junction, Colorado.
- Valdez, R., P. Mangan, R. Smith, B. Nilson. 1982. Upper Colorado River Investigation (Rifle, Colorado to Lake Powell, Utah). U.S. Fish and Wildlife Service report to the U.S. Bureau of Reclamation.