Project Title
Monitoring of Humpback Chub in Cataract Canyon

Bureau of Reclamation Agreement Number:
R19AP00059

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 _X_

Principal Investigator:
Zach Ahrens, Biologist
Utah Division of Wildlife Resources
Moab Field Station
1165 S. US Hwy 191 Suite 4
Moab, UT 84532
Phone: (435) 259-3781
Fax: (435) 259-3785
Email: zachahrens@utah.gov

Abstract:
The purpose of this project is to track humpback chub *Gila cypha* (HB) population dynamics via biennial monitoring of catch rates, population size structures, and longitudinal distributions. 2022 sampling shows a recent decline by multiple metrics. Trammel net catch per unit effort (CPUE) for adult HB was the lowest in over 20 years, but may have been influenced substantially by environmental conditions. Hoop net CPUE indicates a recent decline in juvenile recruitment to the population, but a less dire decline in adults than the trammel net metric.

Study Schedule:
2019-2024

Relationship to RIPRAP:

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

Task 1: Complete one biennial fall monitoring trip in Cataract Canyon (2022).
Exploratory sampling of lake-affected sites below the Big Drops occurred in 2021 in lieu of standard monitoring (some sparse data were collected at Rapid 2 as time allowed). In 2022, one sampling pass was completed October 19-28, 2022. River temperatures measured on site ranged from 11.6-16.3 degrees Celsius. Estimated river discharge ranged from 5,500 to 7,900 cubic feet per second. Fluctuating river discharge caused continual mobilization of driftwood and other floating debris. This phenomenon impeded optimal deployment of trammel nets and impaired function of nets already deployed, and is not uncommon (see FY 2015 Annual Report).

Long-term sites at Rapids 2, 5, and 10 were sampled as planned, but sampling at Rapid 12 was omitted in order to allow time for increasingly complex boat extractions at the North Wash takeout.

Catch rates and size structures of target species

- Only four individuals were captured during monitoring. One sub-adult (176 mm TL) and three unique adult HB (220-251 mm TL) were captured during the trip.
- Adult HB trammel net catch rate was lowest in over 20 years (Figure 1) but may have been influenced by environmental conditions described above.
- Adult HB hoop net catch rates (Table 1) also show a recent decline, but perhaps less dire than trammel net declines. Adult hoop net catch rates remain higher than 2015 levels.
- Two adult roundtail chub (*G. robusta*) and one adult bonytail (*G. elegans*) were also captured.
- No juvenile *Gila* of any species were encountered, continuing a recent declining trend in evidence of reproduction and recruitment (Figure 2).

Longitudinal distribution of target species

- Humpback chub were encountered at Rapids 2 and 5, but not Rapid 10. Rapid 10 is typically a reliable site for HBC, but trammel net effort was significantly reduced and impaired at Rapid 10 due to floating debris.

Ancillary Captures

- Two unique juvenile (< 400mm TL) Colorado pikeminnow (*Ptychocheilus lucius*) were captured via trammel nets. Both individuals were in poor condition following entanglement, but were released alive after extended captivity in a salted and aerated live well. In the interest of reducing additional handling stress, one pikeminnow was not PIT tagged prior to release.
- No novel or unusual species were encountered. Complete ancillary captures may be found in Table 2.

Task 2: Data entry, analysis, reporting.

A subset of fish data (associated with trammel net captures at Rapid 10) were lost due to a presumed DataPlus Mobile malfunction. Numbers of fish represented here are accurate via physical data sheet tallies. No HB or newly-implanted PIT tag data were lost. Data will be submitted to the database manager by the end of December, 2022.

Additional noteworthy observations:

The infrequency and brevity of this effort relative to other Upper Basin HB populations – one pass on a biennial basis at best — make the trammel net CPUE metric particularly vulnerable to environmental bias in a given year. This may prevent accurate inferences regarding shorter-term HBC abundance trends (i.e., apparent declines) which might trigger management actions.

Recommendations:

- Create a final report of long-term data analysis and develop an analysis appropriate to project data. The mean annual CPUE metric as historically reported (Table 1 and Figure 1) would be appropriate to describe normally distributed data, but falls short as an analytical tool for the zero-inflated time series count/CPUE data collected in this project. A linear model also fails to

address the lack of independence of observations via temporal autocorrelation, thus the traditional trend line for Figure 1 is omitted in this report. Development of this analysis could be included as a one-time task in subsequent scopes of work.

- Continue monitoring via hoop nets and consider discontinuation of trammel net effort. As noted in *Additional noteworthy observations*, the degree to which trammel net CPUE reflects fish abundance versus environmental conditions is unclear. In contrast, hoop nets appear less susceptible to impairment by debris and may provide a more precise monitoring metric as a result. Moreover, hoop nets impose less stress on fish, which may result in lower post-capture mortality rates—a likely benefit to an already vulnerable population. In addition to enabling sampling at a wider range of temperatures without undue stress on fish, hoop nets require fewer person-hours per effort and thus may prove a more flexible and efficient monitoring tool.

Project Status:
Ongoing.

FY2022 Budget Status
Funds Provided: $40,469
Funds Expended: $40,469
Difference: -X-
Percent of the FY 2022 work completed, and projected costs to complete: 100%
Recovery Program funds spent for publication charges: -X-

Status of Data Submission
Data will be uploaded into STReaMS by the end of December 2022.

Signed:
Zach Ahrens
Principal Investigator
02 December 2022

Table 1.
Mean catch per unit effort of *Gila spp.* captured in Cataract Canyon, by size class and species, 2015-2022. CH = unidentified *Gila sp.* and HB = humpback chub. CPUE calculation includes in-trip recaptures.

Method	Year	Net hours	CPUE (fish/hr)					
			Juvenile		Subadult		Adult	
			CH	*HB*	*CH*	*HB*	*CH*	*HB*
Hoop net	2015	1683	0.005	0	0	0	0	0
	2017	3061	0.014	0.0007	0.0007	0.0016	0	0.0007
	2019	3760	0.005	0	0	0.0003	0	0.0008
	2022	2403	0	0	0	0.0004	0	0.0004
Trammel net	2015	343	0	0	0	0	0	0.017
	2017	433	0	0	0	0.0046	0.002	0.042
	2019	570	0	0	0	0	0.004	0.032
	2022	281	0	0	0	0	0	0.011

Table 2.
Total fish captures, all methods, Cataract Canyon 2022.

Species	Number of fish
black bullhead (*Ameiurus melas*)	6
bluehead sucker (*Catostomus discobolus*)	7
bonytail (*Gila elegans*)	1
channel catfish (*Ictalurus punctatus*)	440
common carp (*Cyprinus carpio*)	8
Colorado pikeminnow (*Ptychocheilus lucius*)	2
flannelmouth sucker (*Catostomus latipinnis*)	25
humpback chub (*Gila cypha*)	4
roundtail chub (*Gila robusta*)	2
walleye (*Sander vitreus*)	1
yellow bullhead (*Ameiurus natalis*)	5

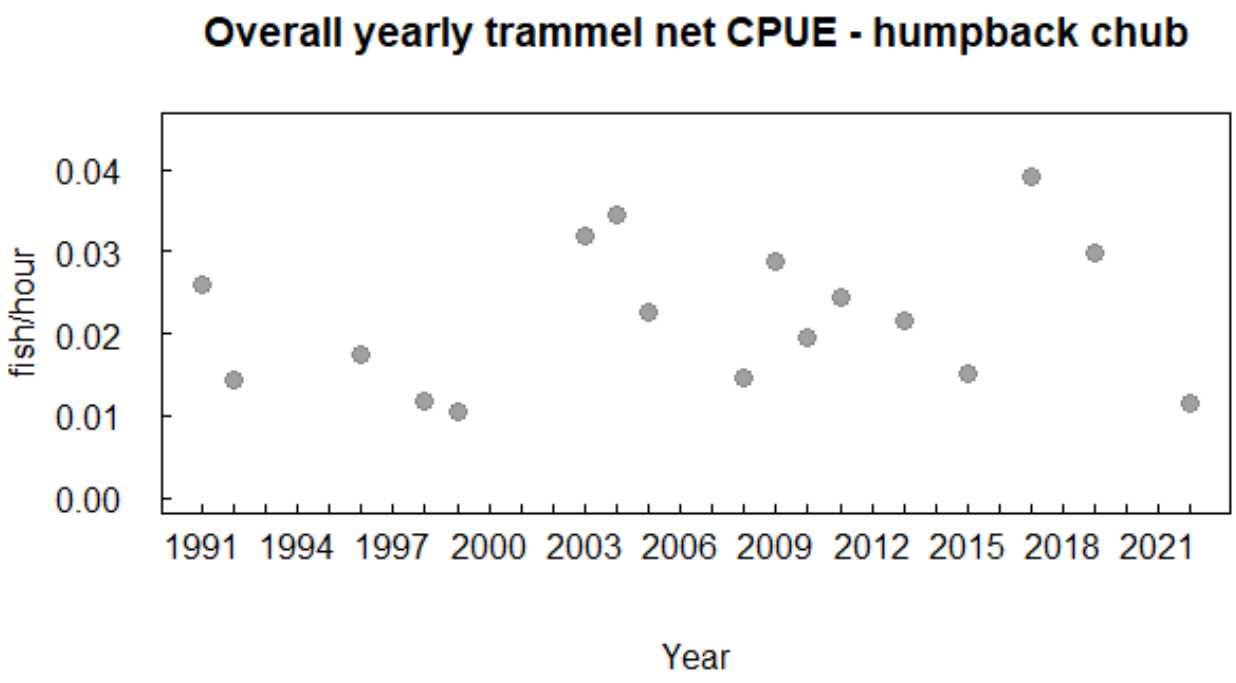

Figure 1.
Trammel net catch per unit effort (CPUE) of humpback chub in Cataract Canyon, 1991-2022.

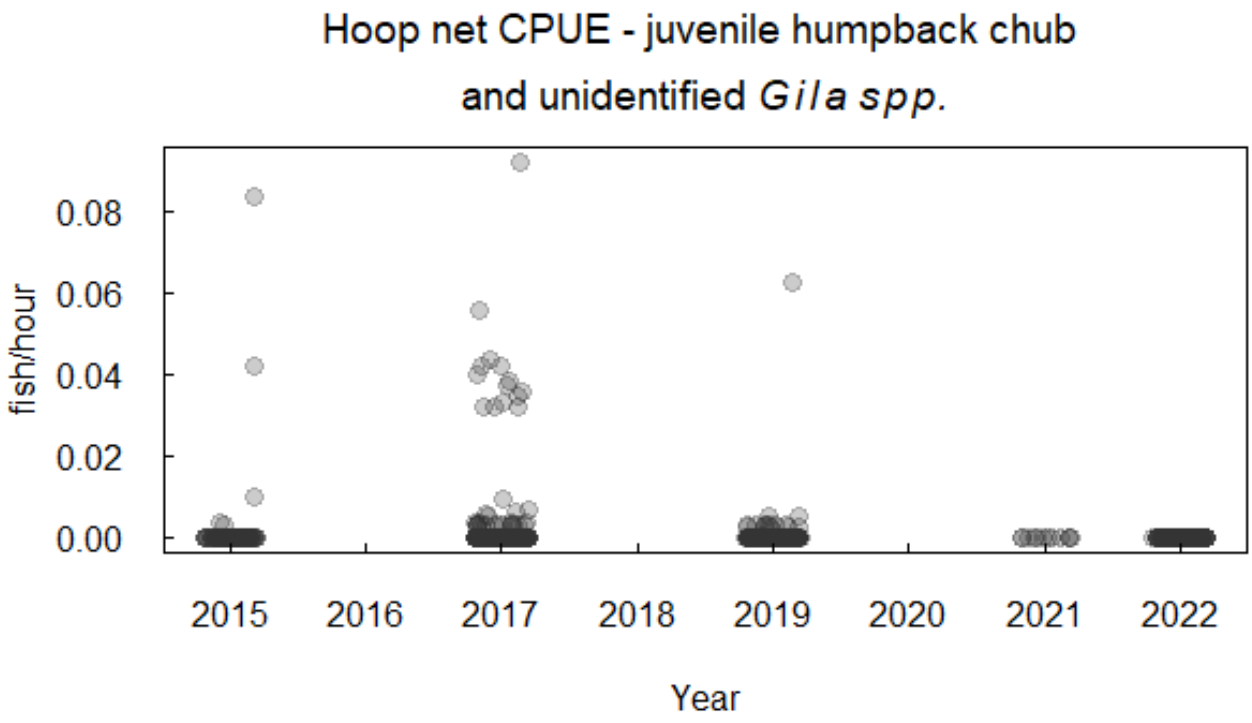

Figure 2.
Raw per-sample hoop net CPUE data for juvenile humpback chub and unidentified *Gila* (included as possible *G. cypha* unless identified otherwise in the field). A small degree of variance is induced to data values to better illustrate densities (e.g., 2021 and 2022 have a different number of samples, but all with value of zero. Note the apparent declining trend since 2017, a complete lack of any captures since 2019, and majority of samples overall having catch rate of zero. Includes 2021 data collected from long-term trend sites only, not exploratory sampling of lake-affected zones.