

I. Project Title: **Population monitoring of humpback and bonytail chub in Cataract Canyon.**

II. Bureau of Reclamation Agreement Number: R14AP00007

Project/Grant Period: Start date: 05/01/2014  
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Is this the final report? Yes \_\_\_\_\_ No  X

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IV. Abstract:

Recovery goals for the six populations of the endangered humpback chub *Gila cypha* include a criterion of no net loss in the Cataract Canyon population of the Colorado River in Utah. Since 2008, humpback chub abundance in Cataract Canyon is tracked by trammel net catch per unit effort (CPUE).

In 2017, Utah Division of Wildlife Resources recorded the highest annual CPUE for humpback chub since sampling began in 1991. Moreover, increased use of hoop nets - a recent addition to the project - yielded unprecedented numbers of juvenile *Gila spp.* and offered a more complete view of this population.

V. Study Schedule: 2008-ongoing.

VI. 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.

## 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.3. Cataract Canyon

### VII. Accomplishment of FY 2017 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

#### Task 1: Complete one sampling trip in Cataract Canyon in fall of 2017:

Biennial sampling occurred from 20-29 October 2017 at three long-term monitoring sites and one additional site (Figure 1). Estimated daily mean flows were low and stable throughout the sampling period (Figure 2), while on-site water temperatures ranged from 11.5-13.3 degrees Celsius.

Trammel net, scented hoop net, and electrofishing samples were collected at all four sites, with Sites 1-3 being sampled for two days each, and Site 4 sampled for a single day. Planned sampling at an additional site between the Big Drop Rapids and Imperial Canyon was cancelled due to time constraints.

#### *Annual Chub Catch Rates*

Trammel nets were deployed at each site for a total of 435 net-hours. Canyon-wide trammel net catch rate for humpback chub (0.04 fish/hr.) exceeded all other annual catch rates since sampling began in 1991 (Table 1). Annual humpback chub catch rates continue to show no significant trend (Figure 3,  $p = 0.19$ ). Trammel netting also yielded two unique bonytail, one of which was a large adult without a PIT tag (Photo 1).

Hoop nets were deployed at each site for a total of 3,025 net-hours, nearly double the preceding trip's effort (Table 1). Single-throated nets were scented (i.e. containing bait inaccessible to fish per Stone, 2005) using Purina Aquamax sport fish food contained in a perforated plastic container suspended between the throat and the cod end. Typical sets were anchored to shore with mouth oriented down-current (presumably the same direction as drifting scent). These sets captured two adult ( $\geq 200$  mm) and six juvenile ( $< 200$  mm) humpback chubs, plus an unprecedented number of unspecified juvenile chubs (*Gila spp.*,  $n=46$ ).

Electrofishing was conducted at each site for a total of 3.7 hours. A minimum of one pass per shoreline was completed at each site, yielding one *Gila sp.* with total length of 167 mm. Overall captures of target species (endangered and euthanized non-native fishes) are summarized by gear type in Figure 4.

### *Population Size Structure*

Excellent trammel net catch rate and increased hoop net captures provide an increasingly complete picture of size structure in Cataract Canyon. Length frequencies of humpback chub and *Gila spp.* < 200 mm TL take a multimodal distribution depicting young-of-year, juvenile and adult size classes (Figure 5). Trammel CPUE is largely attributable to recent recruits (190-220 mm TL, n=13, 68% of trammel capture, Photo 2). Moreover, captures at Site 1 strongly influence this pattern: of the 11 unique fish captured at Site 1 by trammel net, 82% (n=9) were under 220 mm.

Large adult humpback chub (> 250 mm TL) are represented less strongly in 2017 trammel net captures than in preceding years (Figure 5). Additionally, no humpback chub captured in 2017 were recaptures from previous sampling. While the lack of humpback chub recaptures and relative dearth of large individuals encountered in 2017 could indicate mortality and shifting population structure, it may instead represent random variation or other phenomena (e.g. net avoidance), and concern should be moderated by the relatively small sample sizes included in analysis. Persistence of larger size classes and recapture frequencies will continue to be monitored.

### *Longitudinal Distribution*

Adult humpback chubs and *Gila spp.* < 200 mm in length were collected at all four sampling sites, at locations between river miles -4.5 and -9.6. Site 1 had by far the highest trammel net catch rate, and was dominated by recent recruits as described earlier. CPUE at other sites was within normal historic ranges for canyon-wide catch rates (Figure 7a). The pattern of exceedingly high abundance at Site 1 was not reflected in hoop net CPUE (Figure 7b), perhaps as a result of bias toward smaller fish. Bonytail were only captured at Site 1.

#### Task 2: Data entry:

Data have been entered and quality checked and will be submitted to database manager by 15 January 2018.

#### Task 3: Annual Reporting:

An annual progress report summarizing the 2017 data is completed herein.

### VIII. Additional noteworthy observations:

The following notable species were also encountered:

- five unique juvenile Colorado pikeminnow, none of which were previously marked with PIT tags.
- five unique razorback sucker, all of which were previously marked with PIT tags.

- two unique adult roundtail chub and one unspecified adult chub with intermediate morphology characteristic of both humpback and roundtail chub (*Gila robusta*) (*Gila sp.*). None were previously marked with PIT tags.
- six walleye ranging from 388-476 mm in total length which were euthanized, scanned for PIT tags (none found), and gut contents examined for native fishes (none identifiable).
- Black bullhead (*Ameiurus melas*), black crappie (*Pomoxis nigromaculatus*), gizzard shad (*Dorosoma cepedianum*) and yellow bullhead (*Ameiurus natalis*) were encountered and euthanized. Flannelmouth sucker (*Catostomus latipinnis*), bluehead sucker (*Catostomus discobolus*), channel catfish (*Ictalurus punctatus*) and common carp (*Cyprinus carpio*) were encountered and released alive. All captures are reported in Table 2.

IX. Recommendations:

- Continue monitoring of humpback and bonytail chub distribution, size structure and relative abundance via a single biennial sampling pass.
- Deploy scented hoop nets in lieu of electrofishing as primary sampling method for juvenile chubs.
- Continue trammel netting as primary sampling method for adult chubs.
- Refine and evaluate hoop netting as an adult capture method. While trammel nets are undeniably effective, the potential for delayed mortality following trammel net entanglement and handling (Hunt et al. 2012) merits consideration of alternative methods, particularly in light of recent hoop netting success. Simultaneous sampling via these two methods may provide a “bridge” of comparable catch rates to facilitate a decrease in use of entanglement gear.
- Sample suitable riverine habitat between the Big Drop Rapids and Lake Powell to assess chub distribution in sites made available by decreased reservoir elevation. Failure to achieve this objective in 2015 and 2017 has been a logistical problem; i.e. additional whitewater travel slowing operations (at least seven significant rapids now exist below the Big Drops). Additional sampling in this reach will require either: reallocation of time away from existing sites under the current schedule, extension of the biennial trip by 1-2 days, or a short dedicated trip in an off-year.

X. Project Status: On track and ongoing.

XI. FY 2017 Budget Status

A.	Funds Provided:	\$36,017
B.	Funds Expended:	\$36,017
C.	Difference:	\$ 0
D.	Percent of the FY 2017 work completed:	100%
E.	Recovery Program funds spent for publication charges:	\$ 0

XII. Status of Data Submission: Data have been entered and quality checked and will be submitted to database manager by 15 January 2017.

XIII. Signed: Zach Ahrens 6 November 2017  
Principal Investigator Date

XIV. Literature cited:

Hunt TA, Ward DL, Propper CR, Gibb AC. 2012. Effects of capture by trammel net on Colorado River native fishes. *Journal of Fish and Wildlife Management* 3(1):133–141; e1944–687X. doi: 10.3996/122011-JFWM-070

Stone, Dennis M. 2005. Effect of Baiting on Hoop Net Catch Rates of Endangered Humpback Chub *North American Journal of Fisheries Management* 25:640–645, 2005. doi: 10.1577/M04-091.1

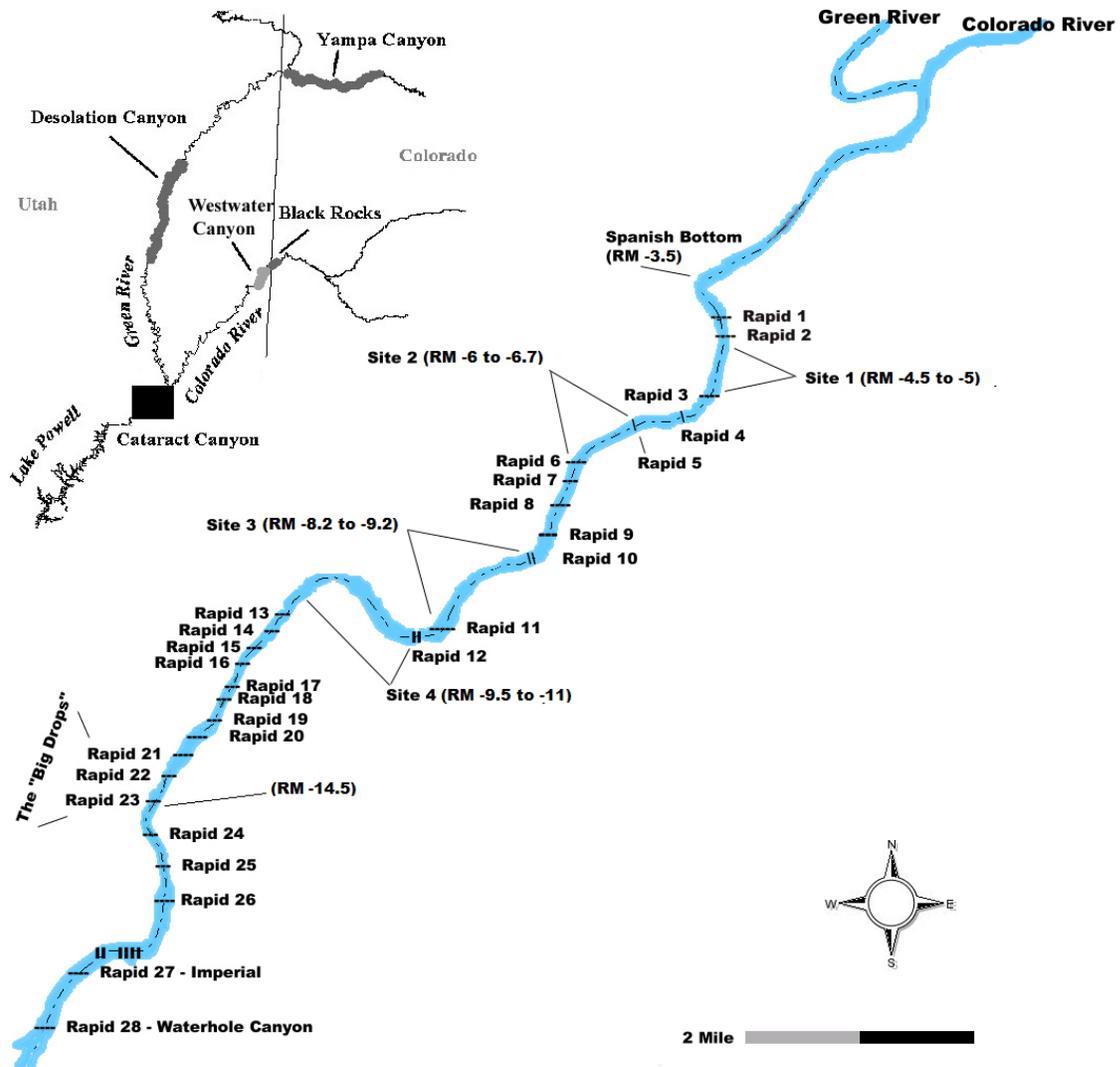


Figure 1. Map depicting Upper Basin humpback chub population distributions, Cataract Canyon sampling sites, rapids and other landmarks.

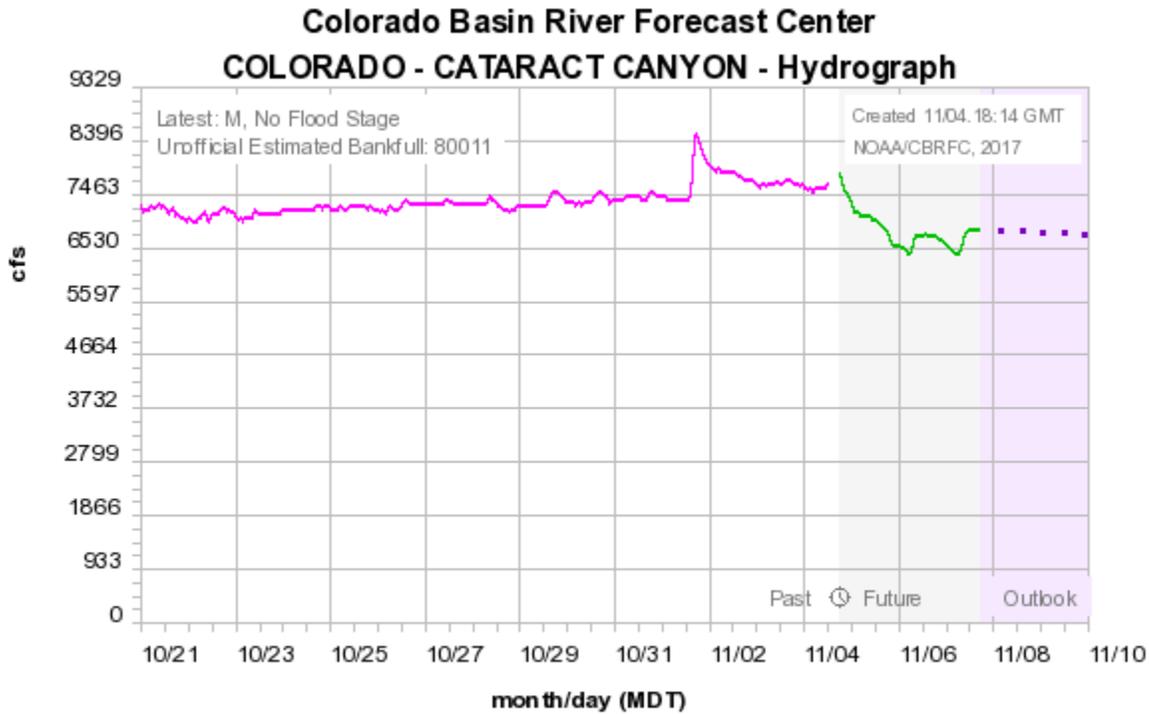


Figure 2. Simulated discharge in Cataract Canyon, late October and early November 2017. Note low, stable flows during trip dates October 20-29 2017. Figure courtesy of N.O.A.A. Colorado Basin River Forecast Center.

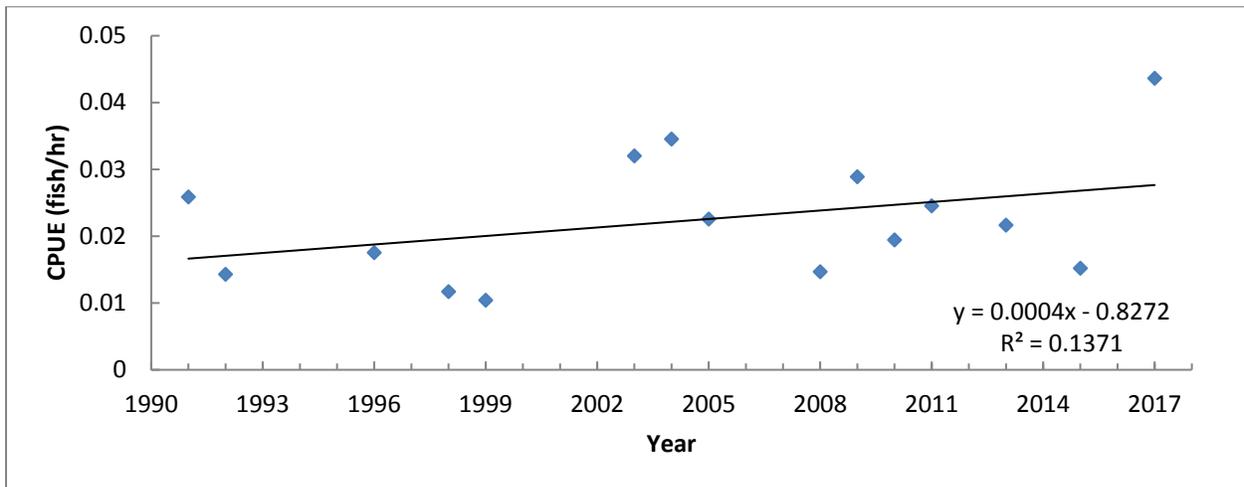


Figure 3. Annual trammel net catch per unit effort (CPUE) for adult humpback chubs in Cataract Canyon, 1991 – 2017.

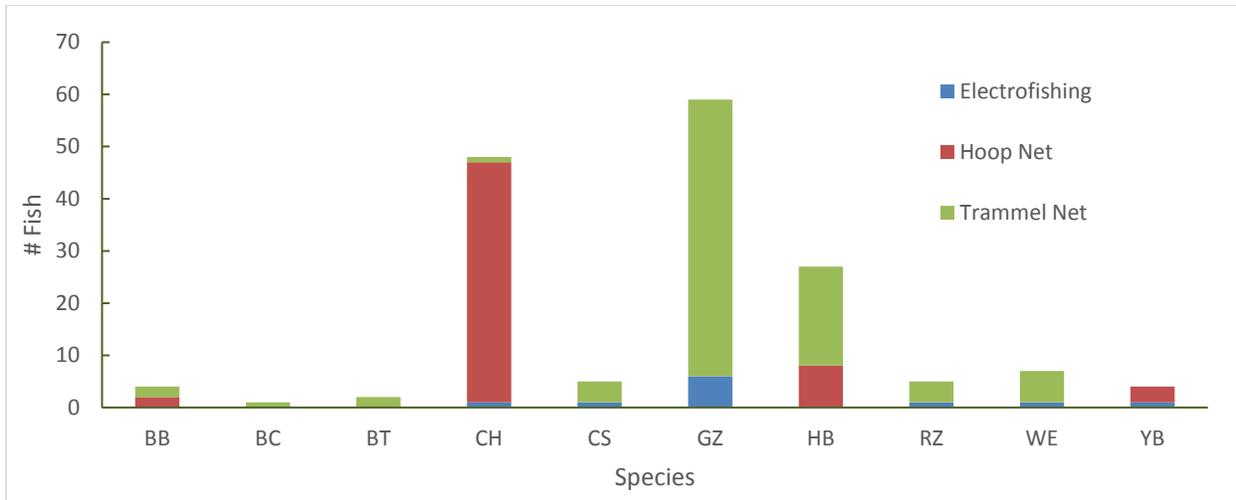


Figure 4. Abundance of target species (endangered native and euthanized non-native fishes only) by gear type, October 2017.

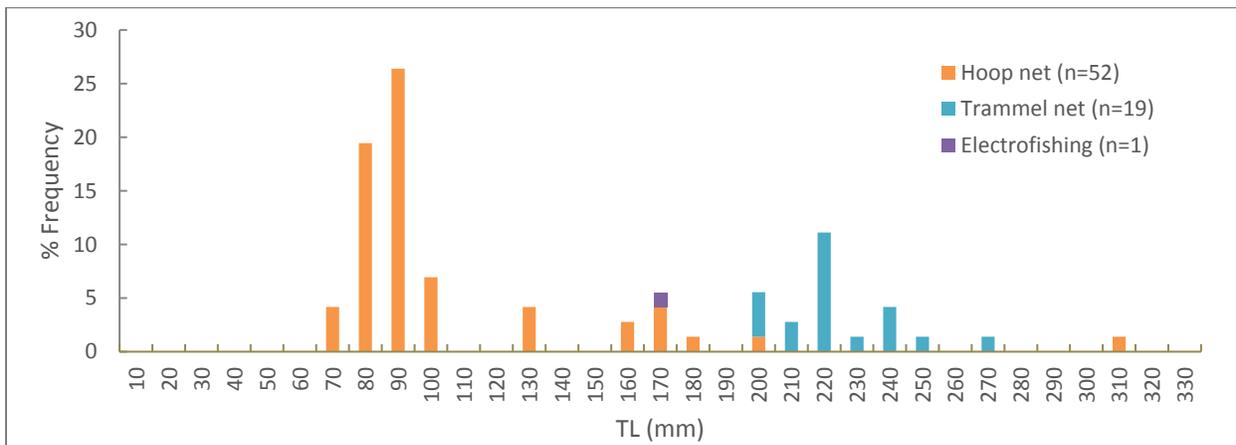


Figure 5. Length frequency distribution of humpback chubs and juvenile *Gila spp.* (TL < 200 mm) captured in Cataract Canyon, October 2017. Stacked bar colors represent gear types.

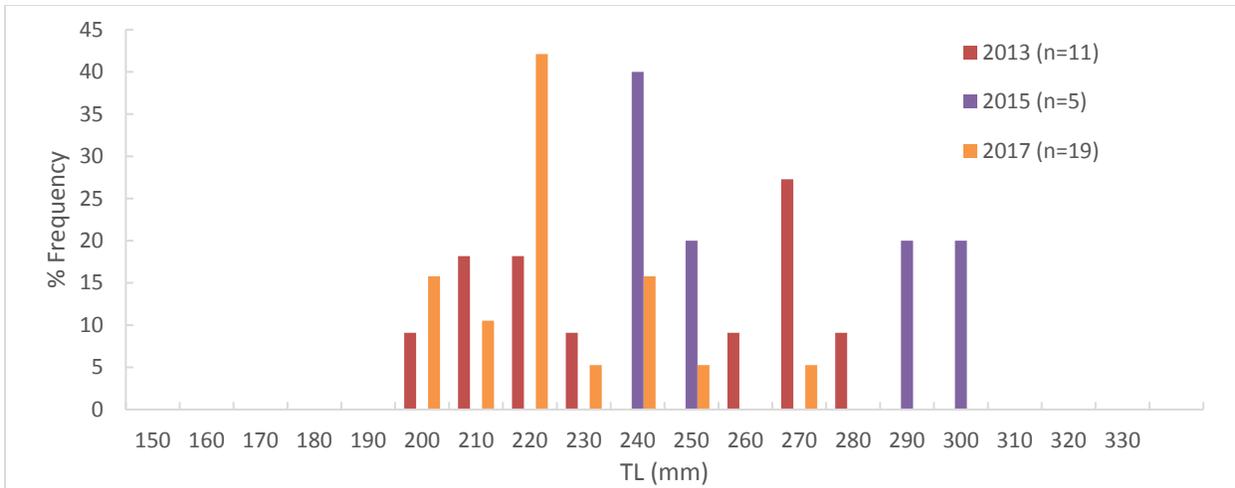
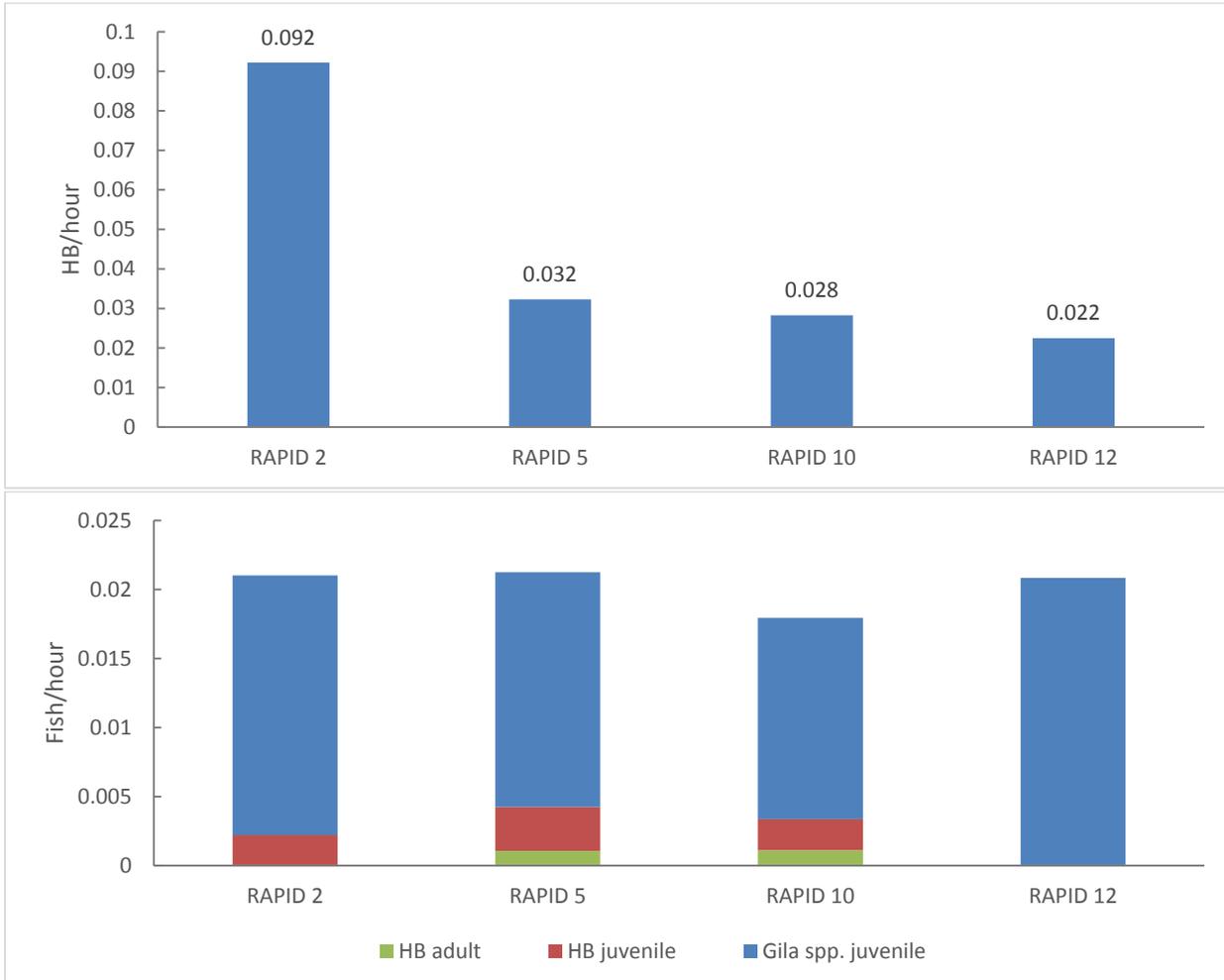


Figure 6. Length frequency distribution of trammel net captured humpback chubs, 2013, 2015 2017. Note relatively low frequency of individuals > 250 mm in 2017.



Figures 7a-b. Humpback CPUE in trammel nets (above), Humpback chub and unspecified juvenile *Gila spp.* CPUE in hoop nets (below). Cataract Canyon, 2017. Sites arranged upstream to downstream from left to right of figures.



Photo 1. Unmarked bonytail chub captured in trammel net between Rapids 2 & 3 (Site 1).



Photo 2. A recent recruit to the adult humpback chub size class at Site 1. Photo: C. Gibson

Table 1. Comparison of methods, years sampled, effort, and catch rates for humpback chub, bonytail, and unspecified juvenile chubs (*Gila spp.* <200 mm) for all sites combined, Cataract Canyon, 2003-2017. Reports annual and overall totals of captures and effort plus annual CPUEs averaged for each species and gear type.

Method	Year	# <i>Gila</i>			Effort (hrs)	fish/hr		
		HB	BT	juvenile <i>Gila spp.</i>		HB	BT	juvenile <i>Gila spp.</i>
Trammel netting	2003	44	20	0	1375	0.032	0.008	0
	2004	43	1	0	1245	0.035	0.001	0
	2005	31	5	0	1375	0.022	0.003	0
	2008	6	0	0	409	0.015	0	0
	2009	18	1	0	623	0.029	0.002	0
	2010	11	2	0	566.2	0.019	0.004	0
	2011	9	0	0	366.8	0.024	0	0
	2013	11	0	0	508.3	0.022	0	0
	2015	5	0	0	329.2	0.015	0	0
	2017	19	2	0	435.5	0.044	0.005	0
<b>Total/Average</b>		<b>197</b>	<b>31</b>	<b>0</b>	<b>7233</b>	<b>0.026</b>	<b>0.002</b>	<b>0</b>
Electrofishing	2003	2	2	0	8.9	0.225	0.225	0
	2004	0	0	0	7.5	0	0	0
	2005	0	0	0	8.2	0	0	0
	2008	0	0	0	1.5	0	0	0
	2009	2	0	5	5.5	0.364	0	0.909
	2010	0	0	3	4.1	0	0	0.730
	2011	0	0	0	0	0	0	0
	2013	0	0	0	3.5	0	0	0
	2015	0	0	0	0	0	0	0
	2017	0	0	1	3.7	0	0	0.270
<b>Total/Average</b>		<b>4</b>	<b>2</b>	<b>9</b>	<b>42.9</b>	<b>0.059</b>	<b>0.023</b>	<b>0.191</b>
Seine netting	2003	0	0	0	0	0	0	0
	2004	0	0	0	0	0	0	0
	2005	0	0	0	0	0	0	0
	2008	0	0	0	184	0	0	0
	2009	0	0	0	56	0	0	0
	2010	0	0	0	0	0	0	0
	2011	0	0	0	0	0	0	0
	2013	0	0	0	0	0	0	0
	2015	0	0	0	0	0	0	0
	2017	0	0	0	0	0	0	0
<b>Total/Average</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>240</b>	<b>0</b>	<b>0</b>	<b>0</b>
Minnow trap & Hoop Netting	2003	0	0	0	9.9	0	0	0
	2004	0	0	0	0	0	0	0
	2005	0	0	0	0	0	0	0
	2008	0	0	0	0	0	0	0
	2009	0	0	1	76.5	0	0	0.013
	2010	0	0	0	0	0	0	0
	2011	0	0	0	0	0	0	0
	2013	0	0	0	30	0	0	0
	2015	0	1	8	1683	0	0.001	0.005
	2017	8	0	46	3025	0.003	0	0.015
<b>Total/Average</b>		<b>8</b>	<b>1</b>	<b>55</b>	<b>4824</b>	<b>0.000</b>	<b>0.000</b>	<b>0.003</b>

Table 2. All fish captures by gear type, October 2017.

Species	Number of fish			Total
	Trammel net	Hoop net	Electrofishing	
channel catfish <i>Ictalurus punctatus</i>	200	21	15	236
gizzard shad <i>Dorosoma cepedianum</i>	53	-	6	59
unidentified native chub <i>Gila spp.</i>	1	46	1	48
sand shiner <i>Notropis stramineus</i>	-	-	31	31
humpback chub <i>Gila cypha</i>	19	8	-	27
bluehead sucker <i>Catostomus discobolus</i>	22	-	-	22
common carp <i>Cyprinus carpio</i>	12	1	7	20
fathead minnow <i>Pimephales promelas</i>	-	-	11	11
flannelmouth sucker <i>Catostomus latipinnis</i>	8	-	1	9
walleye <i>Sander vitreus</i>	6	-	1	7
red shiner <i>Cyprinella lutrensis</i>	-	1	5	6
Colorado pikeminnow <i>Ptychocheilus lucius</i>	4	-	1	5
razorback sucker <i>Xyrauchen texanus</i>	4	-	1	5
black bullhead <i>Ameiurus melas</i>	2	2	-	4
yellow bullhead <i>Ameiurus natalis</i>	-	3	1	4
bonytail <i>Gila elegans</i>	2	-	-	2
roundtail chub <i>Gila robusta</i>	2	-	-	2
speckled dace <i>Rhinichthys osculus</i>	-	2	-	2
black crappie <i>Pomoxis nigromaculatus</i>	1	-	-	1