

I. Project Title: Population estimate of humpback chub in Westwater Canyon, Colorado River, Utah.

II. Principal Investigator:

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III. Project Summary:

Westwater Canyon on the Colorado River contains one of the five remaining populations of the endangered humpback chub in the Upper Colorado River Basin. Recovery goals identified by the RIP require maintaining several populations of humpback chub within the Upper Colorado River Basin. Monitoring efforts are conducted to evaluate the population status of humpback chub in Westwater Canyon. In 2011, trammel net sampling and electrofishing were used to capture and PIT tag humpback chub and roundtail chub in Westwater Canyon. Population estimates were calculated for both species using Program Mark.

IV. Study Schedule:

- a. Initial year: 2011
- b. Final year: 2012

V. Relationship to RIPRAP:

Colorado River Action Plan: Mainstem
V.C. Estimate humpback chub populations
V.C.2. Westwater

VI. Accomplishments of FY 2011 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

In 2011, three sampling trips were conducted through Westwater Canyon: September 24 – October 1, October 6 - 13, and October 19-26. Four sites were sampled: Miners Cabin (RM 123.5), Upper Cougar (RM 122.5), Little Hole (121.5), and Hades Bar (RM 120). The Hades Bar site was not sampled during the third trip due to outboard motor issues.

Mean daily flows and mean daily temperature for each pass was recorded by USGS gage #09163500 (Colorado River near Colorado-Utah State Line). Mean flow for the first pass was 4,865 cfs (4,580 – 5,350 cfs), and temperature ranged from 17.4 –18.0 °C. Mean flow for the second pass was 4,666 cfs (5,290 - 6,130 cfs), and temperature ranged from 11.7 – 14.3 °C. Mean flow for the third pass was 4,599 cfs (4,560 - 4,660 cfs), and temperature ranged from 11.4 – 12.8 °C.

Sampling was conducted for two nights at the Miners Cabin, Upper Cougar and Little Hole sites and for one night at the Hades site during each of the first two passes. The Hades Bar site was not sampled in the third trip due to mechanical issues with an outboard motor. Humpback chub and roundtail chub were sampled using trammel nets and electrofishing. Trammel nets were set in the afternoon each day, checked approximately every two hours until approximately 10:00 pm. The nets were reset the next morning prior to dawn, checked approximately every two hours and pulled late-morning. Four to six trammel nets were set per site depending upon habitat availability and speed at which fish could be removed from the nets. Electrofishing was conducted prior to nets being set in the afternoon and subsequent to trammel nets being pulled in mid-morning. Chubs were identified to species when possible, scanned for a PIT tag, PIT tagged (if necessary), measured (total length and standard length; mm), weighed (g), principle dorsal and anal fin rays counted and released.

Sampling efforts in 2011 results include 344 adult humpback chub captures and 1076 adult roundtail chub captures. Ten subadult humpback chubs, 28 subadult roundtail chubs and 119 subadult *Gila spp.* with intermediate characteristics were also captured. Fish identified simply as *Gila* were either too small to reliably identify in the field or displayed characteristics of both species. Eight razorback suckers were also captured. Average total length of humpback chub caught via trammel nets was 272.6 mm with a range of 192-375 mm. Average total length of humpback chub caught via electrofishing was 267.8 with a range of 149-383. Average total length of roundtail chub caught via trammel nets was 283.4.3 mm with a range of 224-389 mm. Average total length of roundtail chub caught via electrofishing was 252.5 with a range of 125-370. All chub less than 192 mm TL were collected by electrofishing.

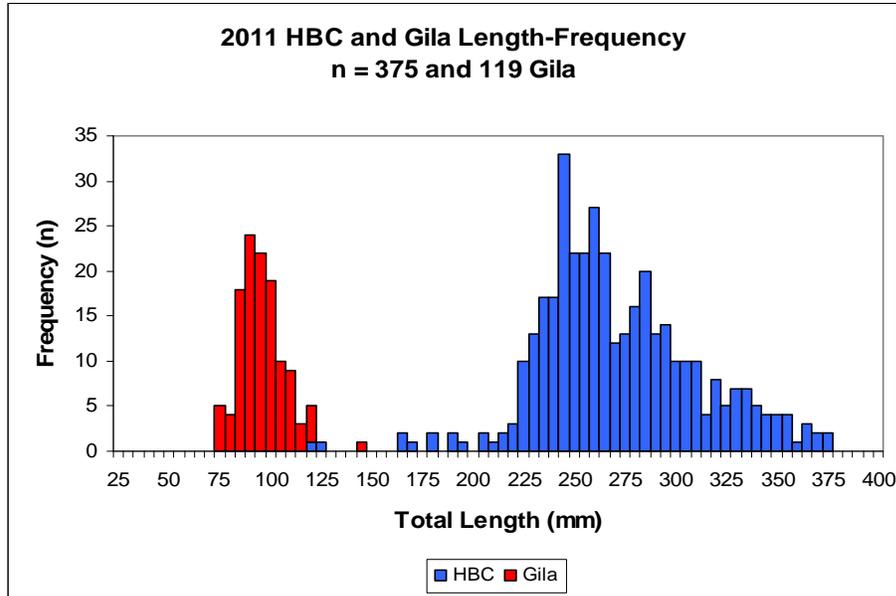


Figure 1. Length-frequency histogram for 2011 humpback chub in Westwater Canyon. Subadults in red were identified as *Gila* and are represented in the humpback chub and roundtail chub histograms.

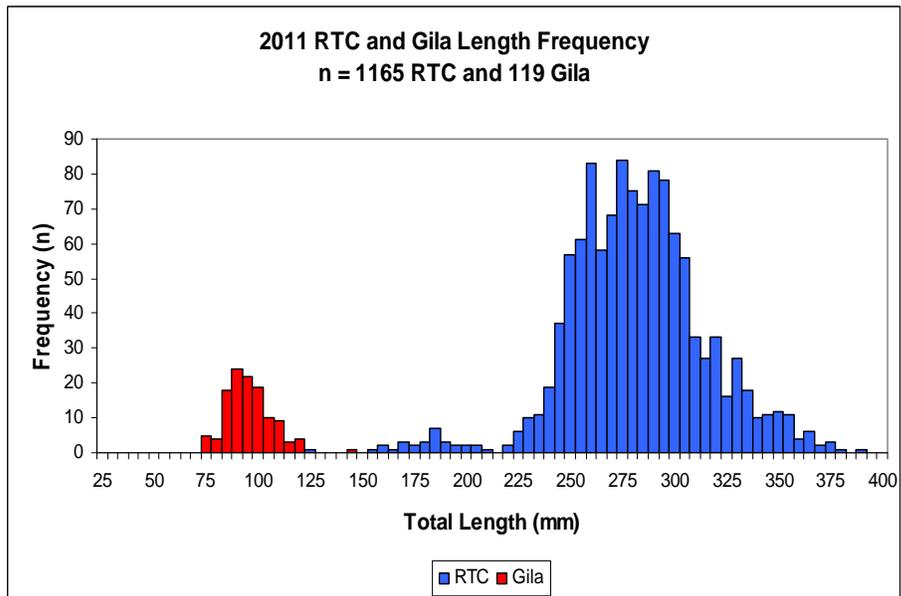


Figure 2. Length-frequency histogram for 2011 roundtail chub in Westwater Canyon. Subadults in red were identified as *Gila* and are represented in the humpback chub and roundtail chub histograms.

Trammel netting resulted in 1279 hours of effort and electrofishing was conducted for 11.6 hours total. Two hundred sixty-four chubs were collected electrofishing, and one thousand, four hundred eighty chubs were captured via trammel netting. Electrofishing proved particularly effective at collecting

subadult fish as all but one chub < 200 mm total length was collected by electrofishing.

Catch per unit effort (CPUE) is presented for each species by sampling gear (Table 1). Trammel net CPUE values for both humpback and roundtail chub in 2011 are higher than values observed in 2003, 2004, 2005, 2007 and 2008. Electrofishing CPUE of humpback and roundtail chubs from 2011 is lower than values from most previous years. The electrofishing CPUE of chubs classified as *Gila* was higher than in 2007 and 2008 but is similar to observed rates in years 2004 and 2005. The electrofishing catch rate in 2003 was the highest ever recorded by the Utah Division of Wildlife Resources since monitoring began in Westwater Canyon for humpback and roundtail chub.

Table 1. Catch per unit effort (CPUE) for humpback chub, roundtail chub and *Gila* by sampling approach for Westwater Canyon in 2003-2005, 2007-2008, and 2011.

Year	Humpback Chub		Roundtail Chub		<i>Gila</i> spp.	
	Trammel Net CPUE	Electro-fishing CPUE	Trammel Net CPUE	Electro-fishing CPUE	Trammel Net CPUE	Electro-fishing CPUE
2003	0.168	8.824	0.468	34.804	0.004	40.196
2004	0.164	7.901	0.496	27.901	0.013	9.382
2005	0.176	3.322	0.379	15.813	0.020	8.205
2007	0.134	3.046	0.380	16.156	0.000	2.666
2008	0.199	2.065	0.541	11.140	0.000	6.822
2011	0.263	2.937	0.835	9.545	0.000	10.934

The number of long-term recaptures of humpback chub and roundtail chub in 2011 were lower than values observed in 2007 and 2008 but were higher than values prior to 2007 (Table 2). Within-year recaptures during 2011 for humpback chub and roundtail chub were similar values in most prior years.

Table 2. Adult humpback chub and roundtail chub captures, long-term recaptures, and within-year recaptures for Westwater Canyon 1998-2000, 2003-2005, 2007-2008 and 2011.

Year	HBC	Long-term Recaps	Within-year Recaps	RTC	Long-term Recaps	Within-year Recaps
1998	488	54	14	389	42	9
1999	281	65	10	486	70	13
2000	279	76	6	527	73	18
2003	298	50	12	636	43	9
2004	290	41	11	817	48	56
2005	292	38	24	763	40	44
2007	285	86	26	962	114	89
2008	358	113	26	1051	166	75
2011	344	69	21	1076	134	56

A mark/recapture population estimate was calculated for both humpback chub (Table 3) and roundtail chub (Table 4) in 2011. Chub captures from both electrofishing and trammel netting were used in the population estimate. Population estimates for both humpback chubs and roundtail chubs were higher than the population estimates in 2007 and 2008, but profile likelihood intervals overlap with many previous years, indicating no significant difference. The null model was selected for humpback chub, and the time dependant model was selected for roundtail chub as \hat{p} varied between sampling trips.

Year	Model	Estimate	SE	PLI	CV	p-hat
1998	Mo	4,744	1,089	3,760 -14,665	0.23	0.04
1999	Mo	2,215	625	1,608 - 7,508	0.28	0.04
2000	Mo	2,201	626	1,335 - 4,124	0.28	0.04
2003	Mt	2,973	941	1,710 - 6,042	0.31	0.03, 0.05, 0.02
2004	Mt	1,729	424	1,121 - 2,967	0.24	0.10, 0.03, 0.04
2005	Mt	1,210	213	880 - 1,769	0.17	0.06, 0.10, 0.10
2007	Mt	1,757	470	1,097 - 3,173	0.27	0.08, 0.05, 0.02
2008	Mt	1,315	223	969 - 1,896	0.17	0.11, 0.08, 0.06
2011	Mo	2,159	435	1,502 - 3,323	0.20	0.06

Table 3. Population estimate (N) for adult humpback chub (>200 mm) in Westwater Canyon. Standard error (SE), profile likelihood interval (PLI), coefficient of variation (CV), and probability of capture (p-hat) are included for each estimate.

Year	Model	Estimate	SE	PLI	CV	p-hat
1998	Mo	5,005	1,500	3,586 -19,781	0.3	0.03
1999	Mo	4,234	973	3,349 -12,917	0.23	0.04
2000	Mo	4,971	1,249	3,824 -16,641	0.25	0.03
2003	Mt	3,288	507	2,458 - 4,469	0.15	
2004	Mt	3,867	444	3,124 - 4,912	0.11	0.09, 0.05, 0.08
2005	Mt	4,317	565	3,390 - 5,673	0.11	0.05, 0.06, 0.07
2007	Mt	5,696	863	4,310 - 7,828	0.15	0.05, 0.04, 0.06
2008	Mt	3,940	397	3,266 - 4,851	0.10	0.07, 0.08, 0.10
2011	Mt	7,177	888	5,670 - 9,298	0.12	0.05, 0.03, 0.07

Table 4. Population estimate (N) for adult roundtail chub (>200 mm) in Westwater Canyon. Standard error (SE), profile likelihood interval (PLI), coefficient of variation (CV), and probability of capture (p-hat) are included for each estimate.

VII. Recommendations

1. Maintain a similar sampling protocol for the remaining year of the project cycle.
2. Investigate options for a combined Black Rocks/Westwater humpback chub population estimate prior to project report in 2013.

VIII. Project Status:

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

IX. FY08 Budget:

A. Funds budgeted:	\$ 53,876
B. Funds expended/obligated:	\$ 53,876
C. Difference:	\$ 0
D. Percent FY2011 work completed:	100%
E. Recovery Program funds spent for publication charges:	\$ 0

X. Status of data submission:

Data will be transferred to USFWS by December 15, 2011.

XI. Signed: Darek Elverud Date: 11/07/2011