COLORADO RIVER RECOVERY PROGRAM RECOVERY PROGRAM
FY 2013 ANNUAL PROJECT REPORT (Population Estimates) PROJECT NUMBER: 131

I. Project Title: **Population Estimate of Humpback Chub in Black Rocks.**

II. Bureau of Reclamation Agreement Number(s): R10PG40052 and R13PG40018

Project/Grant Period: Start date (Mo/Day/Yr): 6/3/2013
End date: (Mo/Day/Yr): 9/30/2017
Reporting period end date: 10/01/2012 to 9/30/2013
Is this the final report? Yes ____ No _X__

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IV. Abstract: Robust population estimates are now critical to monitor recovery of the humpback chub population (USFWS 2001). Recovery goals require estimates of population size at regular intervals to measure population response to management activities under the Recovery Program. A population estimate was made for the 1998–2000 time period (McAda 2002), 2003–2004 time period (McAda 2007) and 2007–2008 time period (Francis and McAda 2011). This report summarizes the work directed at a fourth estimate of population size for humpback chub in Black Rocks during the 2011–2012 time period. These final reports can be found at http://www.coloradoriverrecovery.org/documents-publications/technical-reports/research-monitoring.html

V. Study Schedule: *FY 2011 – FY 2013*

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

VII. Accomplishment of FY 2013 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

Sampling for this study is conducted in September and October; therefore sampling overlaps two fiscal years. Sampling in calendar year 2011 overlapped into FY 2012 and

sampling in calendar year 2012 overlapped into FY 2013. Data analysis for 2011 was conducted in FY 2012 and data analysis for 2012 and the final report is late with completion now scheduled in FY 2014. Therefore, this report will be segregated into calendar years 2011 and 2012.

2011:

Four sampling trips were conducted in September and October. The last sampling trip was made during the final week of October.

Electrofishing was used more heavily than in 2008. The entire Black Rocks reach was sampled with electrofishing during one morning and one afternoon of each trip. Trammel nets could not be set on the mornings that electrofishing was used. Electrofishing did capture quite a few roundtail chubs, a few humpback chubs, and numerous age-1+ juvenile *Gila* spp. Trammel nets with 1-in inner mesh were used with similar results to 2008. Fewer nets (four to five) were set overall to minimize the time between net checks. Attempts were made to keep net sets to 1 to 1.25 hr long.

A total of 78 individual humpback chubs were captured during fall 2011 (Figure 1); eight of those fish were subsequently recaptured in a different sampling rotation of this study. Recapture rate improved generally over previous years. In addition to within year recaptures, a total of ten humpback chub were captured that had also been collected during previous years sampling. Two of those fish were originally tagged in Westwater Canyon by Utah Division of Wildlife Resources in 2004 and 2008. The remaining eight fish were originally tagged in Black Rocks by the U.S. Fish and Wildlife Service: two were tagged in 1998, one was tagged in 2003, three were tagged in 2007, and two were tagged in 2008. One humpback chub with a positive recapture was not found in the database.

A total of 152 individual age one juvenile *Gila* spp. were collected during fall 2011 (Figure 3). While morphological distinction is very difficult to determine in the field, I am sure that some proportion of these fish are humpback chub. This number is promising as only one was captured during the 2007-2008 sampling period.

A total of 511 individual roundtail chubs were collected from Black Rocks in fall 2011 (Figure 2). All roundtail chub were also implanted with PIT tags in 2011; 22 of those fish were recaptured in a subsequent sampling rotation. In addition to within year recaptures, a total of fifteen roundtail chub were captured that had also been collected during previous years sampling. Two of those fish were originally tagged in Westwater Canyon by Utah Division of Wildlife Resources in 2005 and 2008. The remaining thirteen fish were originally tagged in Black Rocks by the U.S. Fish and Wildlife Service: six were tagged in 2007, and seven were tagged in 2008. Three roundtail chub with positive recaptures were not found in the database.

2012:

Four sampling trips were conducted during alternating weeks in September and October 2012. The first trip occurred the week of September 10th and the last sampling trip was made during the week of October 22nd.

Low base flows in the Colorado River (during 2012) made it impractical and unsafe to drive large jet boats to Black Rocks. Thus, electrofishing was not used as a sampling technique in 2012. However, baited (with razorback sucker grower feed) 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. We had hoped to compare the catch of these nets with that of electrofishing; however, this will not be possible during this estimate period. Baited hoop nets provided 263 roundtail chub (*Gila robusta*) captures, 32 humpback chub (*Gila cypha*) captures, and 22 age-1+ juvenile *Gila* spp. captures.

Seventy five foot trammel nets continue to be the primary method used that successfully captures all *Gila* species. Four to five trammel nets, with one inch inner mesh, were set to minimize the time between net checks. Attempts were made to keep net sets to 1 to 1.25 hour long. Trammel nets provided 401 roundtail chub captures, and 104 humpback chub captures.

Experimental PIT tag antennas (that could only detect 134 khz tags) were deployed during the third pass (week of October 9th). Baited antennas were deployed for similar intervals as baited hoop nets, and one baited hoop net was activated as an antennae. While this method biases our sampling towards marked fish, these additional sightings should provide valuable insights to post handling survival.

Fifty three unique tags were detected by antennas. Thirteen of these tags were inserted into humpback chub, eight of which were not traditionally captured (trammel or hoop net) in 2012. Of the five humpback chub detected by the antennas that were traditionally handled, two were handled during a pass other than the third pass. Four of these humpback chub were originally tagged in 2008 (two in Black Rocks and two in Westwater Canyon), five were tagged in 2011 (Black Rocks), and four were tagged in 2012 (Black Rocks). Thirty eight of the tags were inserted into roundtail chub, twenty three of which were not traditionally captured in 2012. Of the fifteen roundtail chub detected by the antennas that were traditionally handled, three were handled in a pass other than the third pass. Three of these roundtail chub were originally tagged in 2007 (Black Rocks), four were tagged in 2008 (Black Rocks), twenty were tagged in 2011 (seventeen in Black Rocks, and three in Westwater Canyon), ten were tagged in 2012 (Black Rocks), and one was tagged at an unknown time and location. One tag detected was inserted into a juvenile *Gila* spp. in Black Rocks 2011. The final tag detected belongs to a fish that has not been reported to the Upper Colorado River Recovery Program (UCRRP) database.

A record setting total of 112 individual humpback chub were captured during fall 2012 (Figure 1); eleven of those fish were subsequently recaptured in a different sampling pass of fall 2012. Recapture rate improved generally over previous years.

In 2012, a total of twenty one humpback chub were captured that had also been collected during previous years sampling. Five of those fish were originally tagged in Westwater Canyon by Utah Division of Wildlife Resources in 2004 (n=1) and 2007 (n=4). The remaining sixteen fish were originally tagged in Black Rocks by the U.S. Fish and Wildlife Service: one was tagged in 1999, one was tagged in 2007, two were tagged in 2008, and twelve were tagged in 2011.

In 2012, a total of twenty two individual age one juvenile *Gila* spp. were collected (Figure 3). While morphological distinction is very difficult to determine in the field, certainly some proportion of these fish are humpback chub. These figures are promising as only one was captured during the 2007–2008 sampling period.

In 2012, 622 individual roundtail chub were collected (Figure 2); fifteen of these fish were captured in a subsequent pass.

In 2012, a total of forty five roundtail chub were captured that had also been collected during previous years sampling. Five of those fish were originally tagged in Westwater Canyon by Utah Division of Wildlife Resources in 2005 (n=3) and 2007 (n=2). The remaining forty fish were originally tagged in Black Rocks by the U.S. Fish and Wildlife Service: three were tagged in 2007, eight were tagged in 2008, and twenty eight were tagged in 2011. One roundtail chub with a positive recapture was not found in the database.

Population Estimates:

A detailed discussion of these methods and results will be included in the final report. It is important to recognize these data as preliminary and to utilize the final report for management decisions.

Gary C White and Kevin Bestgen, of the Department of Fish, Wildlife, and Conservation Biology at CSU, utilized program MARK to generate population and survival estimates and capture probabilities for adult (total length greater than 200 mm) humpback chub captured since the inception of abundance estimate studies in both Westwater Canyon and Black Rocks from 1998 through 2012. The top model in both localities was a multivariate model with total length ('TL'), location ('state', Westwater or Black Rocks), year and pass used as individual covariates to model detection probabilities across all years. Model averaging was used to generate the estimates if the model included total length. These **preliminary** estimates from program MARK are presented below.

Top Model:

{S(state+TL^2) psi(state) p(state*year*pass) DM ID}

Additional Models used for N-hat averaging:

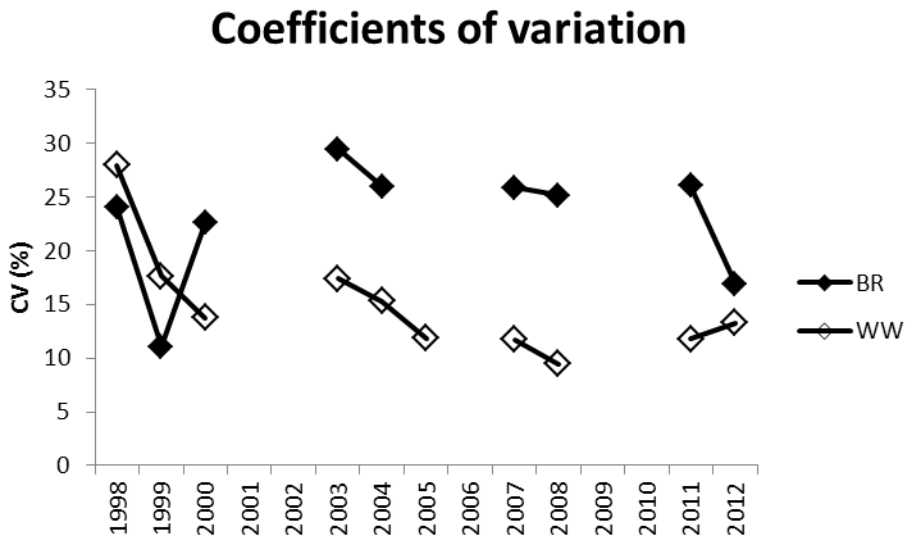
{S(state+TL) psi(state) p(state*year*pass) DM ID}
{S(state+TL) psi(state) p(state*year*pass+TL) DM ID}
{S(state+TL^2) psi(state*TL) p(state*year*pass) DM ID}

N-hat Estimates:

State	Year	M(t+1)	Estimate	SE	LCI	UCI	C
Blackrocks	1998	183	879.58	211.78	571.93	1430.57	1.790994
	1999	291	994.22	109.91	809.62	1244.53	1.35594
	2000	68	736.76	166.28	481.80	1148.80	1.616132
	2001	0	0.00	0.00	0	0	
	2002	0	0.00	0.00	0	0	
	2003	69	581.77	171.34	340.01	1039.20	1.892082
	2004	74	558.75	145.33	346.77	935.47	1.777156
	2005	0	0.00	0.00	0	0	
	2006	0	0.00	0.00	0	0	
	2007	61	283.12	73.18	179.39	477.72	1.876119
	2008	71	394.69	99.14	250.98	653.14	1.798452
	2009	0	0.00	0.00	0	0	
	2010	0	0.00	0.00	0	0	
	2011	78	379.30	98.74	239.11	641.46	1.870129
	2012	117	403.46	68.23	297.77	570.96	1.584705

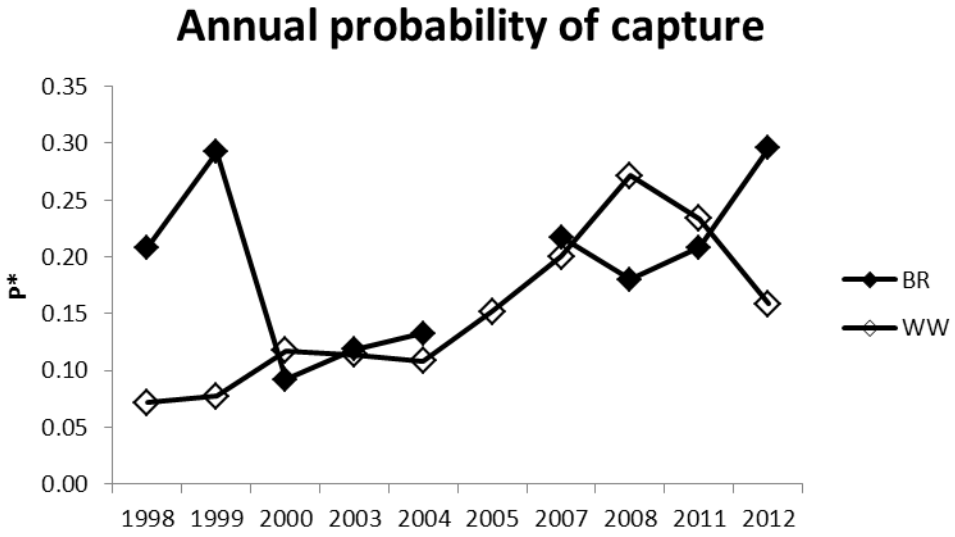
State	Year	M(t+1)	Estimate	SE	LCI	UCI	C
Westwater	1998	483	6746.81	1884.38	4000.93	11635.95	1.780539
	1999	272	3519.75	620.27	2513.13	4978.50	1.449157
	2000	267	2265.73	311.69	1742.06	2975.31	1.355015
	2001	0	0.00	0.00	0	0	
	2002	0	0.00	0.00	0	0	
	2003	288	2520.33	437.58	1813.72	3554.20	1.463135
	2004	296	2724.44	417.44	2034.08	3689.01	1.397198
	2005	305	1999.67	236.45	1595.89	2529.74	1.31279
	2006	0	0.00	0.00	0	0	
	2007	245	1212.11	141.79	971.67	1532.10	1.330877
	2008	311	1139.21	107.68	953.59	1378.45	1.288861
	2009	0	0.00	0.00	0	0	
	2010	0	0.00	0.00	0	0	
	2011	344	1466.79	173.24	1175.25	1860.56	1.350714
	2012	209	1314.63	174.75	1021.64	1713.25	1.360538

Coefficient of variations:



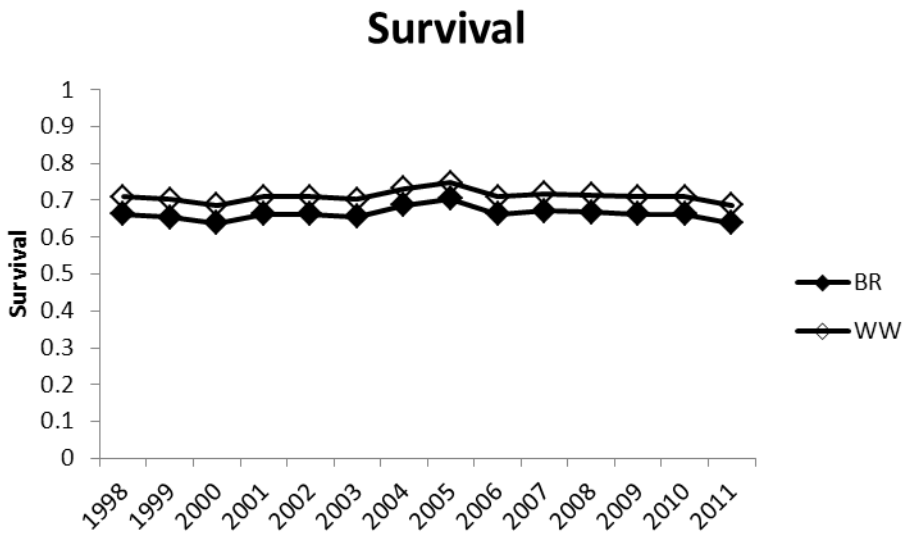
BR = Black Rocks
WW = Westwater

Probability of capture:



BR = Black Rocks
WW = Westwater

Survival:



VIII. Additional noteworthy observations:

While 2012 sampling produced a record catch of individual humpback chub; alarmingly, it also produced a record catch of largemouth bass (n=78, *Micropterus salmoides*) and gizzard shad (n=78, *Dorosoma cepedianum*). This is an alarming tenfold increase when compared to our 2011 catch of seven largemouth bass and zero gizzard shad.

IX. Recommendations:

- Continue data analysis and final report writing.
- During fall 2014 collect YOY and age 1+ *Gila spp.* for a refuge population to be reared at the Snooks Bottom Native Species Hatchery.
- During future years sampling (next estimate scheduled for the fall of 2015 & 2016) increase the number of baited hoop nets, and utilize baited antennae.
- Continue working with UDWR Moab and CSU so the same multivariate models are used for comparing the two populations' abundance and survival while being informed by all of the data collected in the past.
- Develop a monitoring program for larval and YOY *Gila* to compare with ISMP work conducted by UDWR Moab in the 1990's.
- Consider one netting trip a year (during the off years of this study) to control and monitor centrarchids in Black Rocks.

X. Project Status: Project is slightly behind schedule. With office personnel turnover – and sequestration hampering filling behind these individuals, my workload has greatly increased. Additional funding is not necessary.

X. FY 2013 Budget Status

A. Funds Provided: 44,336
B. Funds Expended: 44,336
C. Difference: *-0-*
D. Percent of the FY 2013 work completed, and projected costs to complete: 70% complete, $0.00 to complete
E. Recovery Program funds spent for publication charges: -0-

XI. Status of Data Submission (Where applicable): Data have been included in UCRRP database.

XII. Signed: Travis Francis 11/13/2013
Principal Investigator Date

APPENDIX:

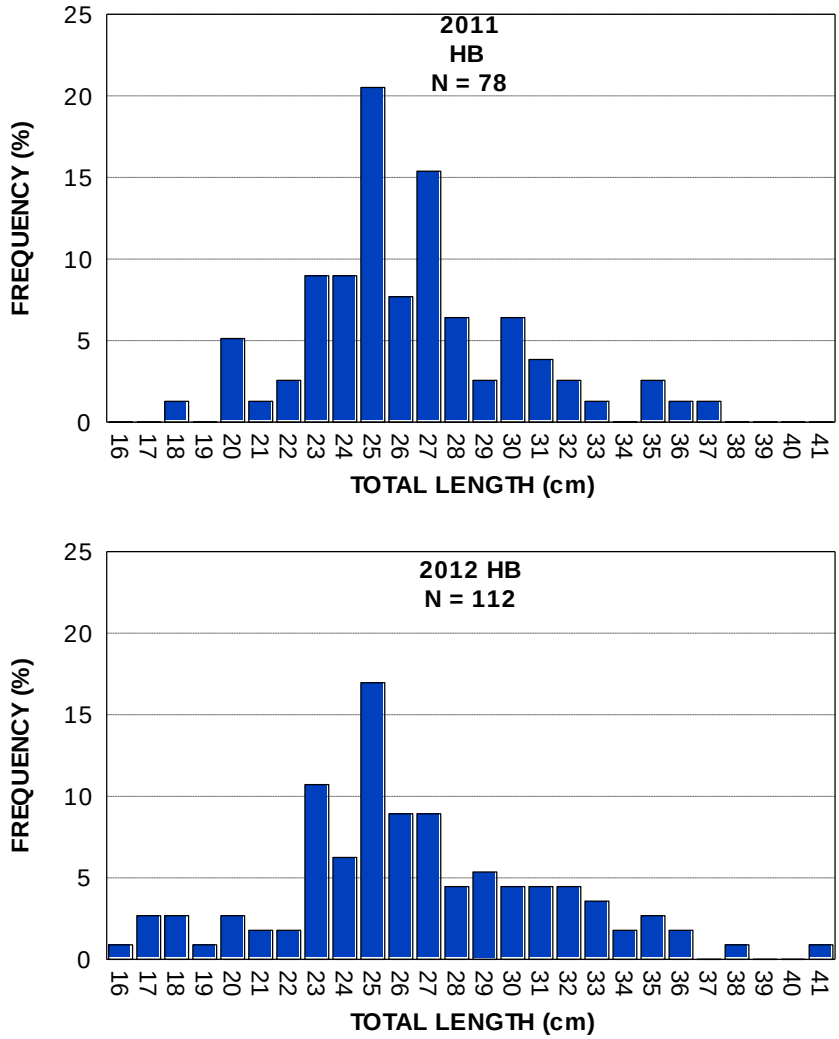


Figure 1. Length Frequency of Humpback chub captured in Black Rocks, Colorado River, autumn, 2011 and 2012.

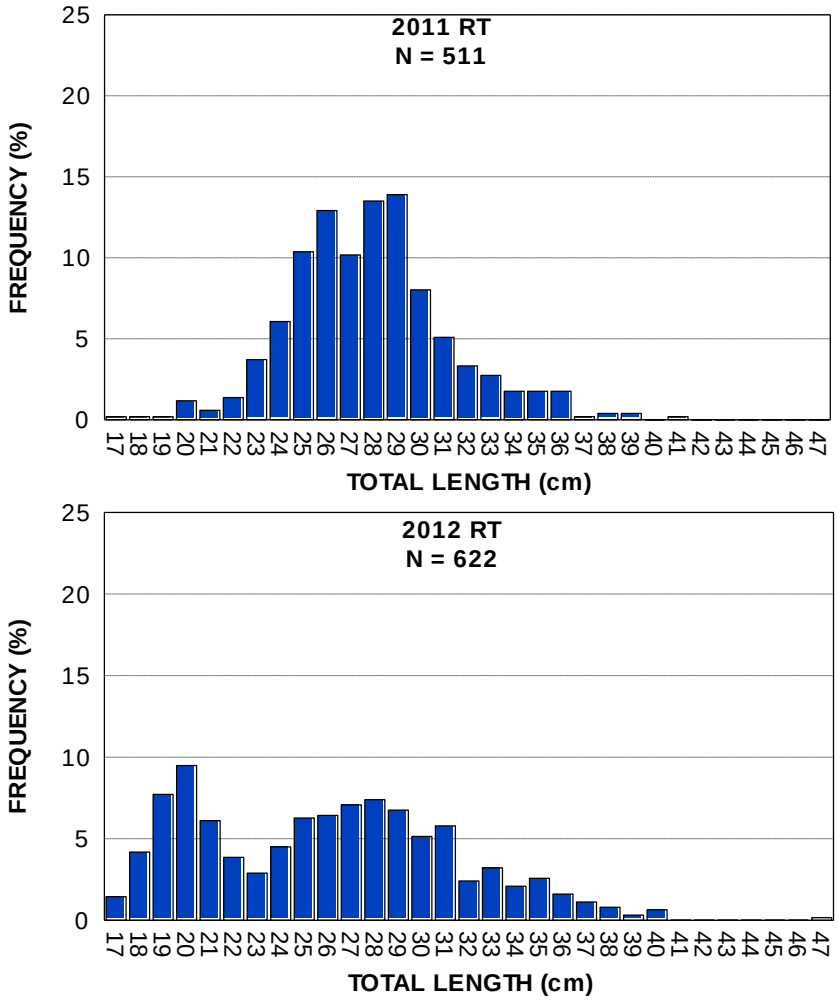


Figure 2. Length frequency of roundtail chub captured in Black Rocks, Colorado River, autumn, 2011 and 2012.

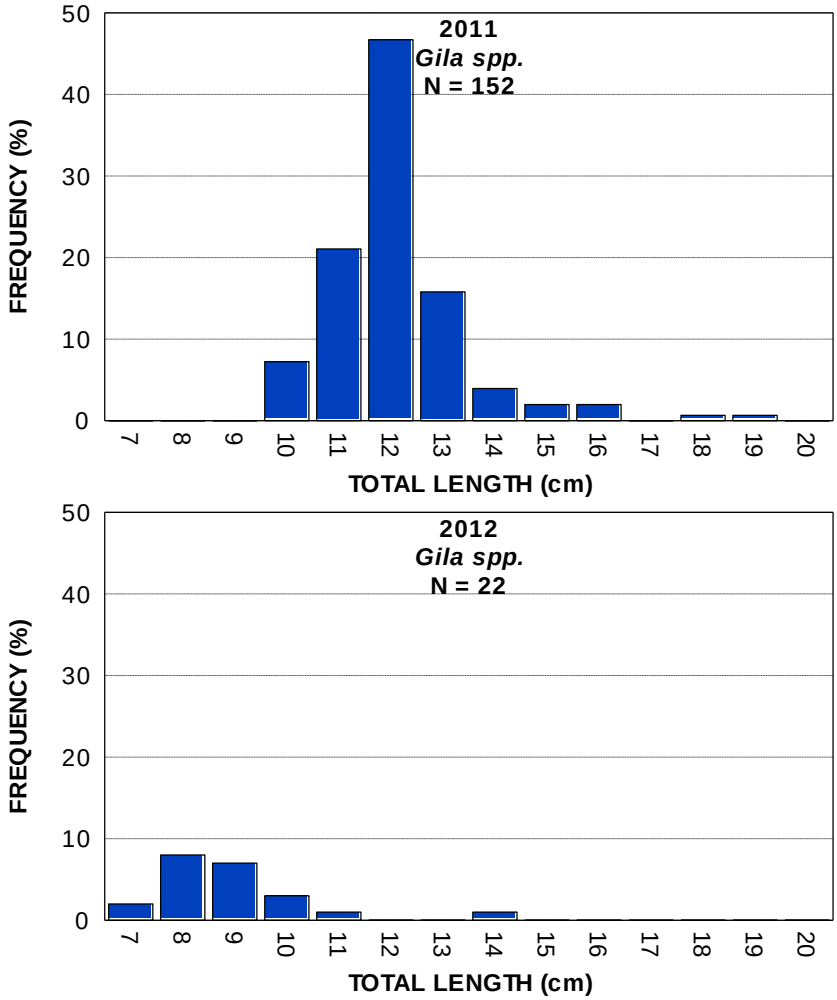


Figure 3. Length frequency of juvenile *Gila spp.* captured in Black Rocks, Colorado River, autumn, 2011 and 2012.