

I. Project Title: **Humpback chub population estimates for Desolation/Gray Canyons, Green River Utah.**

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III. Project Summary:

Humpback chub population trends were monitored annually through a standardized protocol (ISMP) from 1991-1999. In 2002 an amended recovery plan for humpback chub identified objective and measurable recovery criteria for the downlisting and delisting of humpback chub. To measure progress toward recovery, beginning in 2001, annual point estimates for the Desolation/Gray Canyon humpback chub population were calculated using 3 pass, mark-recapture methods. During 2001–2003 and 2006–2007 twelve sites were sampled annually and all mark-recapture data from these sites were combined to develop one annual point estimate. During 2010–2011 only five to six sites were sampled and mark recapture data from each site was used to calculate site specific estimates. During the first two years of point estimates (2001–02), sampling occurred during June and July when humpbacks were more active, thus increasing the probability of mixing between sites. However, from 2003 on, sampling was moved to September and October due to fish mortality and stress concerns. During the fall months, it has been observed that site fidelity for humpback chubs ranges from 90–100% within Desolation/Gray Canyons.

An important factor in determination of how past estimates relate to the actual population size is the very high site fidelity observed during fall sampling. High site fidelity results in no mixing between sites within a sampling period, thus the resulting recaptures relate to sample sites and not the entire reach. This results in significant underestimation of the total population size in Desolation/Gray Canyons. Individual sample site estimates can be made from mark-recapture data and then extrapolated across a determined number of available sites within the Desolation/Gray Canyon reach; this was completed for the 2006–2007 data. Determination of the physical bounds of a site was based on the characteristics of a fall/winter habitat and not a linear distance. In general, fall/winter habitats are defined by an upstream rapid entering into a deep pool, a series of eddies, and the downstream pool tail or run. The downstream end of a habitat is typically defined by another rapid or an extended low velocity run. The estimated number of fall/winter habitats, within the 75 miles of Desolation/Gray Canyon, where humpback

chub may occur is 63 (Personal Obs.).

IV. Study Schedule: Initial year 2010 – Final year 2011

V. Relationship to RIPRAP:

Green River Action Plan: Mianstem

*V.B.1. Conduct population estimates for humpback chub in Desolation/Gray Canyons.*

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

Task 1 – Complete three sampling trips in Desolation/Gray Canyon from August-September:

Three sampling passes were completed through Desolation/Gray canyons on August 23–27, September 3–7, and September 14–18. Mean daily flows during sampling ranged from 5,200–4,740 cfs (USGS gage #09315000, Green River at Green River gage). Average temperatures during each pass were 20.4° C, 18.1° C and 16.7° C respectively.

A total of 6 sites were sampled throughout the canyons including three long-term trend sites and three sites previously sampled for 2001-7 population estimates. The sites were located at river miles (RM) 185, 174.4, 167, 160.4, 151, and 148 (Figure 1). It is estimated that there are a total of 63 sites in Desolation/Gray Canyons having comparable qualities and a high probability of maintaining humpback chub through the fall and winter. The six sites sampled in 2011 represent approximately 10% of the available sites.

Total effort included 1,013 trammel net hours and 6.4 hours of electrofishing over three passes (Table 1). Sampling efforts resulted in capture of 55 adult humpback chub and one juvenile *Gila*. Trammel net catch per unit effort (CPUE) for each site and pass averaged equaled 0.050 humpbacks/hour and ranged from 0.017 to 0.083. The mean trammel net sampling CPUE for 2011 is significantly lower than observed between 1990 and 2003; mean of 0.123 fish/hour, but not significantly different from the 2006–7 and 2010 catch rates (Figure 1). Since the initiation of annual catch rate monitoring in 1985, humpback chub catch rates have exhibited a declining trend which is not statistically significant ( $p=0.349$ ,  $r^2=0.04$ ). Over the last 10 years, the trammel net CPUE for adult humpback chub in Desolation/Gray has shown a significant declining trend ( $p=0.007$ ,  $r^2=0.723$ , Figure 2).

Although mean catch rates in 2011 were very similar to those of 2010, the recapture rate for fish marked this year was insufficient to allow for a population estimate at any of the sampling sites. This year, 52 individuals were captured and 17 of those were tagged in previous years, while only 4 were recaptured between passes within 2011.

In 2006–07 and 2010, site specific population estimates were calculated due to very high

fall site fidelity among humpback chubs. The site specific estimates were then used to determine an average site density for each year. The average site density was extrapolated across the 63 available habitats found in Desolation/Gray Canyons to provide a total population estimate for each year (Table 2). This recalculation resulted in a six-fold increase in annual estimates versus those using all captures and recaptures combined and assuming that all fish were mixing between sample sites during each sampling occasion. Estimates from 2001–03 were not recalculated or examined in terms of site fidelity rates for this report. I suggest that the June/July estimates from 2001–02 are under estimates of the actual population size, due to the distance between sample locations relative to the potential home range of humpbacks during that time of year. The data will have to be examined specifically for movement between sample locations to determine if adequate mixing was occurring. The estimate data for 2003 was also not reexamined, but because it was sampled in the fall, it is probable that site fidelity was very high and the total estimate from previous reports was an under estimate on the same scale as the 2006–07 total estimates.

Observed site fidelity by humpback chub during the 2011 sampling was again 100%. All within year and between year recaptures occurred in their site of original capture.

The length frequencies of *Gila* spp. captured in 2011 covered a similar spectrum to that observed in past years (Fig. 4). One small juvenile (160 mm) was captured via electrofishing and no other subadults were captured. The metric of first-year adults (200–220 mm) as a percentage of total adults captured continues to be used as a measure of recruitment. In 2011, first-year adults represented 6.4% of the total adult catch; this is a slight decline from 2010 (7.3%), but significantly lower than the average (13.0%) observed from 2006–2007 and 2001–2003.

Task 2 – Data will be entered into a database on the computer and transferred to the UCRRP database manager by January 15 each year.

Data entry is complete and will be transferred to the UCRRP database manager by the end of December 2011.

Task 3 –An annual progress report submitted Nov 14, 2011.

Task 4 – Complete a collection trip for young-of-year *Gila* and transport fish to Ouray National Fish Hatchery. This task will be complete with assistance from hatchery personnel.

Twenty-five humpback chub were captured during a separate trip in October of 2009. Fish health was maintained during transport by boats equipped with live-wells utilizing an oxygen supply and a re-circulating pump system. Fish were transported to a hatchery truck, acclimated to water temperature and conditions, tempered with salt, and transported to the Ouray National Fish Hatchery. In 2010 and 2011 no *Gila* were removed for salvage.

VII. Recommendations:

- Trammel net sampling should continue as the primary sampling tool for adult humpbacks. Electrofishing should continue to provide relative catch rates for juvenile *Gila*.
- Consider shifting sampling back to one annual monitoring trip in the fall of each year and increase the number of sites sampled to seven. A stratified random selection of viable sites could be used each year to assure coverage of both canyons while capturing the full range of variation between sites.
- Current estimates of the number of fall/winter habitats within Deso/Gray canyons need to be refined through examination of detailed maps, past geomorphology or habitat reports, and discussion with other investigators familiar with the reach.
- Estimates from 2001–2003 should be examined in terms of site fidelity and mixing of individuals between passes within each year. If sufficient mixing is not found, then site specific estimates should be calculated and extrapolated as they were for 2006–2007.
- Compile all individual recapture histories for humpback chubs in Desolation/Gray Canyons dating back to 1990 to determine if annual estimates of survival, growth, or growth to age relationships can be developed. Our current understanding of age-length relationships, combined with limited success in capturing juvenile *Gila*, has limited our ability to measure recruitment within this reach of the Green River.

VIII. Project Status: Project is on track and ongoing.

IX. FY 2011 Budget Status

- A. Funds Provided: \$65,167
- B. Funds Expended: \$65,167
- C. Difference: \$0
- D. Percent of the FY 2011 work completed, and projected costs to complete: 100%
- E. Recovery Program funds spent for publication charges: \$0

X. Status of Data Submission: *Expected to be submitted by the end of December 2011.*

XI. Signed: Paul Badame 11/14/2011  
Principal Investigator Date

Table 1. Summary of effort for each gear type and total number of humpback chub (HBC) collected during population sampling in Deso/Gray Canyon 2001-2003, 2006-2007 and 2010. This data includes all captures at all sites.

Year	Months	Passes completed	# Sites sampled	Trammel		Shock Hours	Hoop Net and Minnow Trap		Total HBC
				Net Hours	Total HBC		Hours	Total HBC	
2001	Jun-Jul	3	12	2,803	214	8	3	0	-
2002	Jun-Jul	2	12	2,008	239	22.5	38	1,440	7
2003	Sep-Oct	3	12	3,042	236	11.0	1	1,946	5
2006	Sep-Oct	3-4	12	3,289	119	16.4	12	729	9
2007	Sep-Oct	3	12	2,727	130	0.0	-	988	6
2010	Sep-Oct	3	5	1,163	68	7.0	5	0	-
2011	Sep-Oct	3	6	1,013	55	6.4	8	0	-

Table 2. Summary of population estimates (N) for Desolation/Gray Canyons 2001–2011. Column headings include the 95% confidence interval (C.I.), probability of capture (p-hat), and coefficient of variation (C.V.). Methods of estimation prior to 2006 combined all annual capture data into one population estimate and likely underestimated the population size significantly. An estimate could not be calculated for 2011 so the number of individuals captured is presented.

Year	N	95% CI	C.V.	p-hat
2011	55	-	-	-
2010	1,625	1,023–5,465		0.173
2007	1,108	1,071–4,914		0.188
2006	2,578	1,151–9,736		0.141
2003	937	636–1,520	0.21	0.083
2002	2,612	1,477–8,509	0.36	0.045
2001	1,254	733–2,697	0.31	0.053

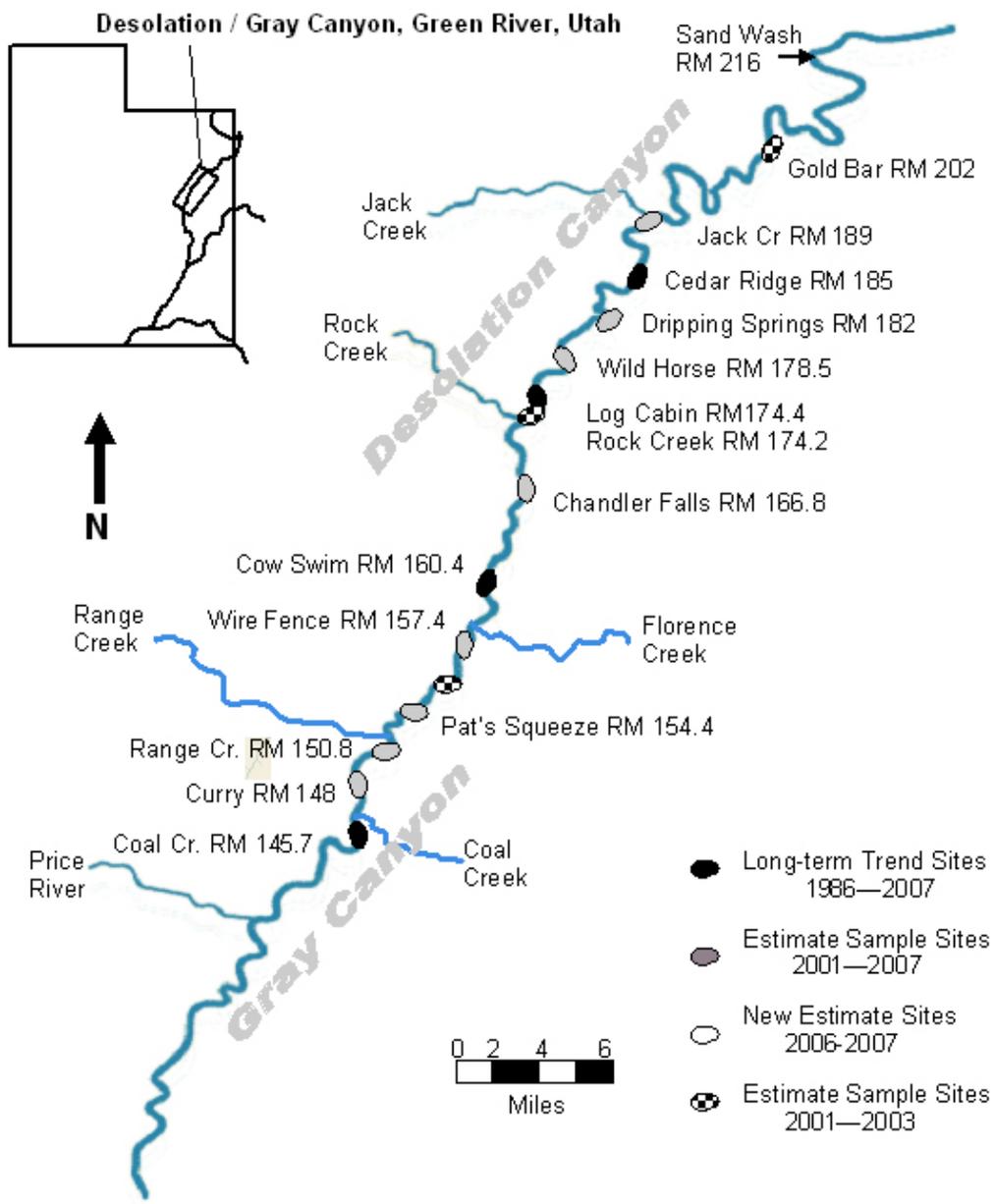


Figure 1. Fifteen sample sites located within Desolation and Gray Canyons of the Green River.

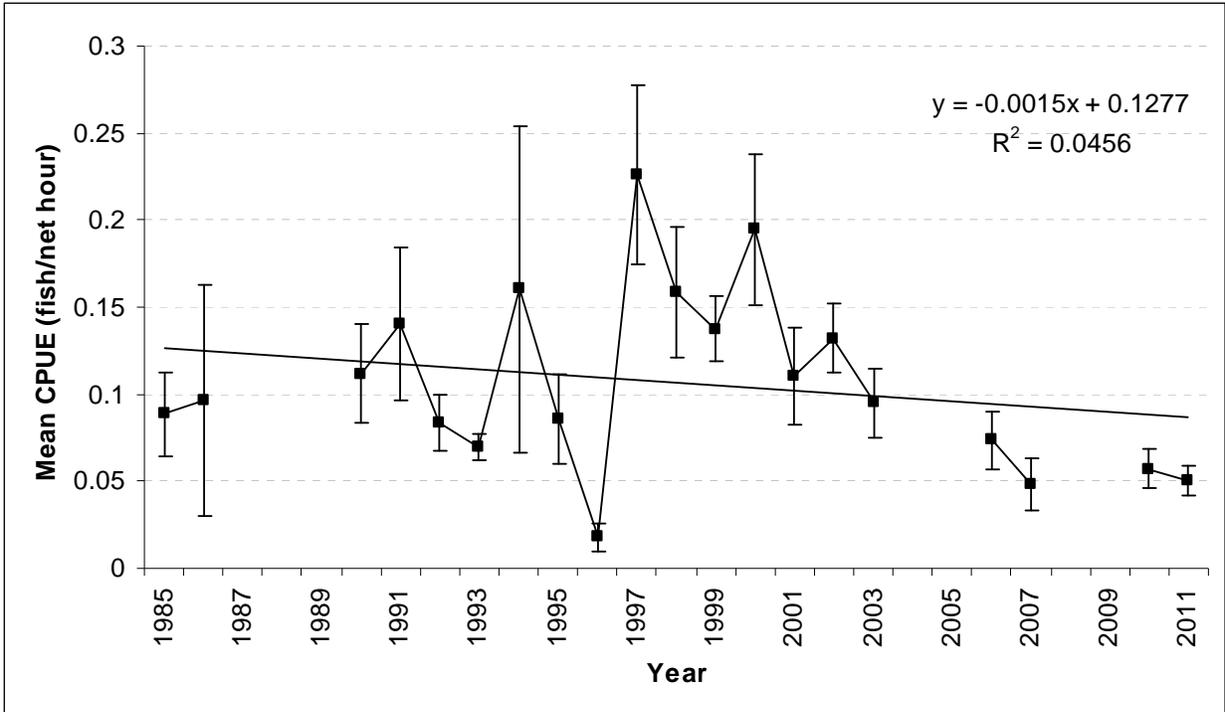


Figure 2. Desolation/Gray long term trend site mean CPUE for all humpback chub by year for 1985-1986, 1990-2003, 2006-2007, and 2010. The 1989 data point has been excluded as an outlier (0.59) to maintain scale. Error bars represent one standard error.

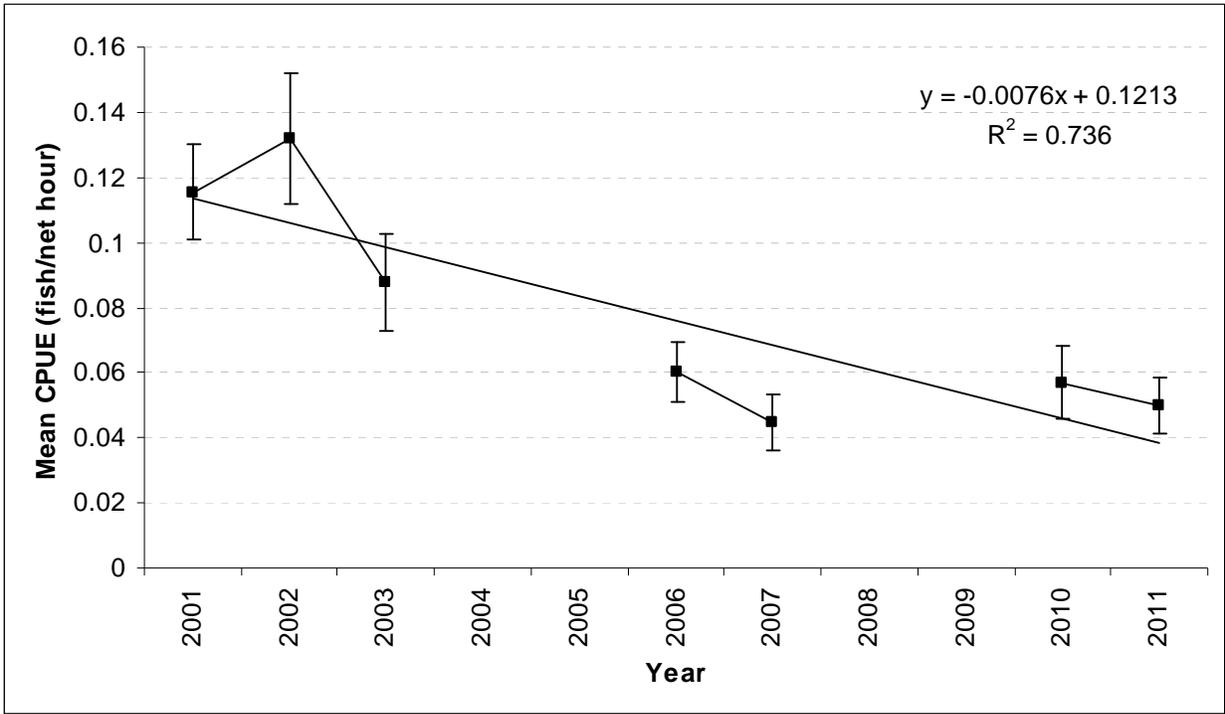


Figure 3. Desolation/Gray site mean CPUE for all humpback chub by year for 2001–2003, 2006–2007, and 2010–11. Error bars represent one standard error. The trend line is based on a linear regression with a significance of  $p=0.007$  and  $r^2=0.736$ .

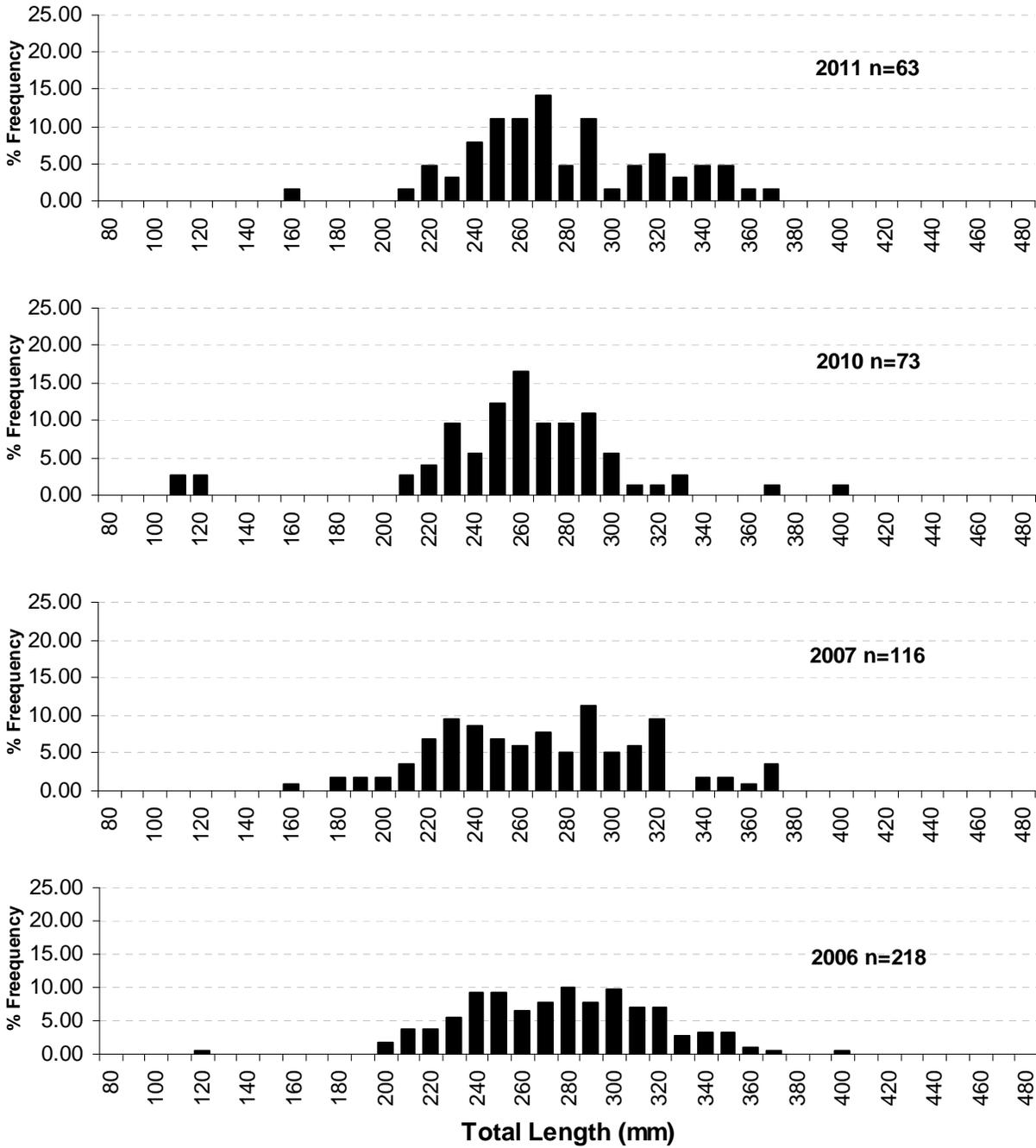


Figure 4. Desolation/Gray Canyon humpback chub length frequency histograms for 2006–07 and 2010–11. Represents all humpback and *Gila* spp. captured via electrofishing and trammel netting. Chubs greater than 199 mm are considered adults and those between 200 and 220 mm are considered first year adults.

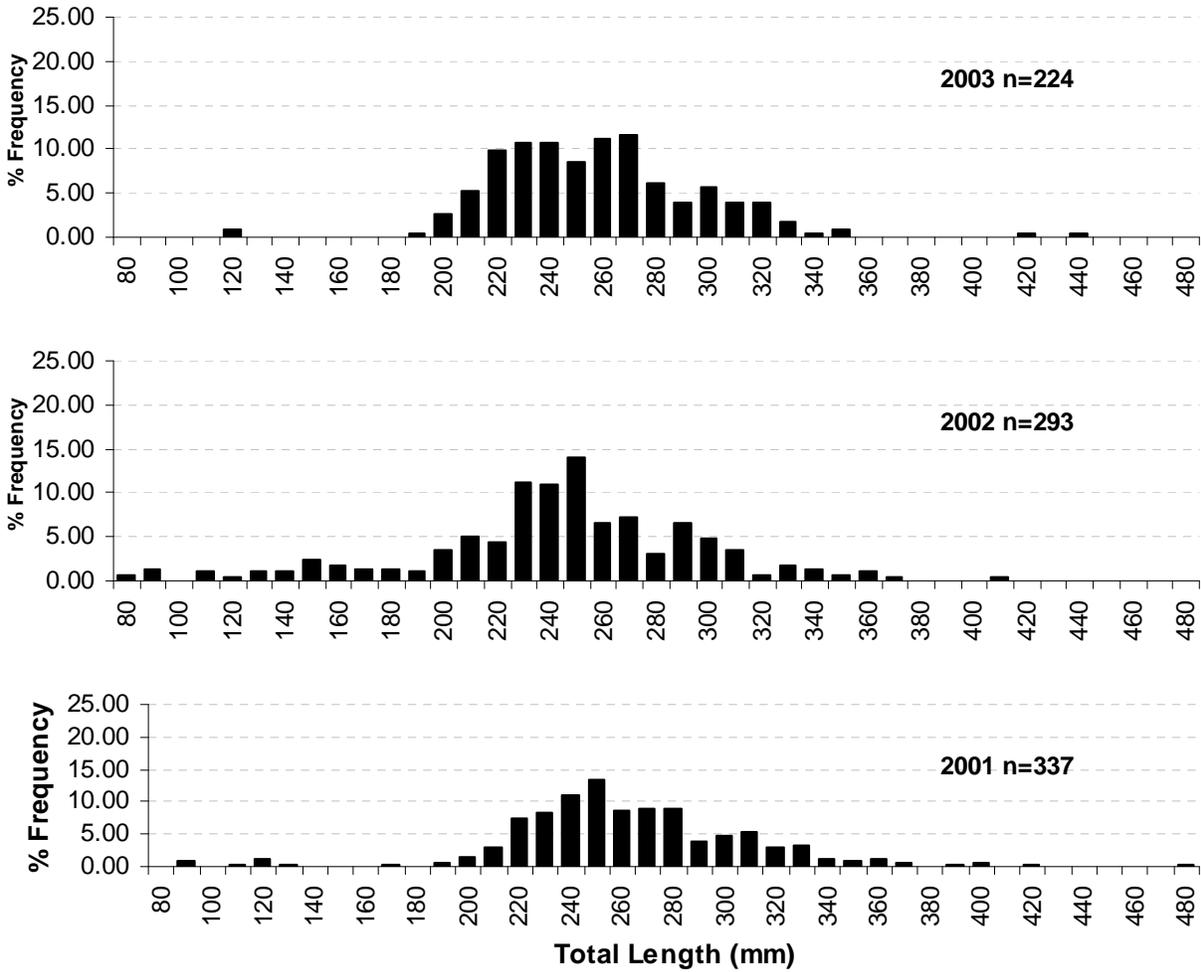


Figure 4 (Continued). Desolation/Gray Canyon humpback chub length frequency histograms for 2003–01. Represents all humpback and *Gila* spp. captured via electrofishing and trammel netting. Chubs greater than 199 mm are considered adults and those between 200 and 220 mm are considered first year adults.