

- I. Project Title: **Removal of Smallmouth Bass in the Upper Colorado River between Price-Stubb Dam near Palisade, Colorado, and Westwater, Utah.**

Note: Synthesis report of 2004, 2005, and 2006 due in March 2007.

- II. Principal Investigator(s): Chuck McAda, Project Leader
Bob D. Burdick, Fishery Biologist (LEAD)
Organization: Colorado River Fishery Project
Address: 764 Horizon Drive, Building B
Grand Junction, CO 81506-3946
Phone: (970) 245-9319
FAX: (970) 245-6933
E-mail: Chuck_McAda@FWS.GOV
Bob_Burdick@FWS.GOV

- III. Project Summary: The purpose of this study is to 1) remove as many smallmouth bass of all sizes in main channel riverine habitats in a 61-mile reach of the Upper Colorado River between Price-Stubb Dam and Westwater boat landing in eastern Utah. The goal is to reduce the abundance of smallmouth bass as quickly as possible in this reach which will ultimately benefit native listed fishes, and possibly contribute to their recovery.

Total number of fish collected with boat and raft-based electrofishing by species during the 2004 smallmouth bass removal were, smallmouth bass: 1,165; largemouth bass: 277; black crappie/green sunfish/bluegill in the aggregate: 761.

There did not appear to be an obvious reduction in the abundance using catch effort indices (fish/hour and fish/mile) for smallmouth bass, largemouth bass, or the three other centrarchid fishes (black crappie, bluegill, and green sunfish) during the 2-month removal period in 2004. Overall mean catch effort for all these fishes actually increased with each subsequent pass in 2004. Therefore, during the summer of 2004, we did not show a depletion for either smallmouth bass or largemouth bass in main channel habitats of the Colorado River in western Colorado and eastern Utah and the Lower Gunnison River in western Colorado.

We also concluded that there was no statistically significant ($\alpha=.05$) decline in the size (i.e., mean total length) of smallmouth bass over the four passes during the summer of 2004. Also, it was apparent from collections, that in some river segments (18-mile reach [Colorado/Gunnison River confluence to the Loma Boat Landing]), smallmouth bass reproduced during 2004.

The number of smallmouth bass recently collected as compared to those collected during investigations from previous years now leads researchers to believe that this species is quickly emerging as an abundant nonnative fish in the Grand Valley and Ruby and Horsethief canyons in the Upper Colorado River. And apparently, according to catch

effort analyses between 2003 and 2004, smallmouth bass abundance is still increasing in the Grand Valley and Ruby and Horsethief canyons of the Upper Colorado River. It also appears that the abundance of smallmouth bass and largemouth bass collected with electrofishing in main channel habitats during the summer of 2004 was considerably greater than the number collected during the channel catfish removal evaluation that was conducted in the summer of 2003 and during the population monitoring for Colorado pikeminnow performed in the spring of 2004.

Field activities are scheduled to continue in 2005 with a writeup of field results in 2006.

IV. Study Schedule:

- a. initial year: 2004
- b. final year: 2006

V. Relationship to RIPRAP:

Colorado River Action Plan: Mainstem

Colorado River Action Plan: Mainstem

III. Reduce negative impacts of nonnative fishes and sportfish management activities.

III.A. Develop and implement control programs in reaches of the Colorado River occupied by endangered fishes.

VI. Accomplishment of FY 2004 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

A. FY-2004 Tasks and Deliverables: Task 1

Task 1. Remove all sizes of smallmouth bass.

Task Completed.

Task 2. a) analyze data; b) prepare annual RIP reports.

Task completed. Preparation of the annual report also sufficed for the December 2004 nonnative fish workshop.

B. Findings (2004 Highlights)

General

The study area encompassed a 61-mile section of the Colorado River in western Colorado from the Price-Stubb Dam to the Westwater, Utah, BLM River Ranger Station, and a 2.3-mile section of the Lower Gunnison River from the Redlands Diversion Dam to the Colorado/Gunnison River confluence. The Lower Gunnison River was not identified as part of the removal area in the original scope of work. However, it was added because smallmouth bass were collected there in the spring of 2004 during the Colorado pikeminnow population monitoring.

The river segments from Price-Stubb Dam to the Loma Boat Landing include the 15- and 18-mile reaches. These river segments along with the Lower Gunnison River flow through a wide alluvial section of the Grand Valley. The river segments between the Loma Boat Landing and the Westwater Ranger station have different hydro-geomorphic features than the upstream segments. The river downstream from the Loma Landing flows through a canyon-bound area and is considered a quasi-alluvial section. For sampling logistics and data analyses purposes, the Colorado River was divided into eight different river segments and the Lower Gunnison River into one.

Four passes were made using aluminum boat and raft-based electrofishing to collect centrarchid fishes from 6 July to 28 August 2004. Two electrofishing craft were used in every river segment during passes 1, 2, and 3. One electrofishing craft was used in pass 4 (see Table 1). After the first three passes, it was determined that some river segments had higher densities of smallmouth bass. Therefore, pass 4 was dedicated to electrofishing the higher abundance areas, and was termed a “concentration pass”. Some river segments were not electrofished during pass 4 (e.g., Loma Boat Landing to the Westwater Ranger Station and Price-Stubb Dam to GVIC).

A 45-mile reach of the Upper Colorado River from the Rifle Bridge (river mile 240.7) to Beavertail Mountain in Debeque Canyon (river mile 195.7) was sampled with raft electrofishing between August 23–26. This river reach was outside the original defined removal area. However, there were unsubstantiated reports that anglers had encountered smallmouth bass in these upstream reaches, and it was determined that a “reconnaissance” sampling trip was warranted to confirm or refute these claims.

Although smallmouth bass were the target fish for removal in this project, all other centrarchid fishes encountered were collected. The reason for this was that the Colorado Division of Wildlife (CDOW) requested that the Fish and Wildlife Service remove and preserve all centrarchid fishes collected during the removal effort for their analyses of origin and bioenergetics studies. These fishes included largemouth bass, green sunfish, bluegill, and black crappie. All centrarchid fishes collected during the smallmouth bass removal project were handed over to Pat Martinez of the CDOW.

The number of individuals and total length were recorded for each smallmouth bass and largemouth bass collected. For all other centrarchids total length was recorded for those specimens that were greater than 100 mm. Capture date and corresponding river mile for each centrarchid fish collected were recorded along with actual time electrofished (seconds; converted to hrs fished).

Price-Stubb Dam – Westwater Ranger Station, Utah & Redlands Dam – Colorado/Gunnison River Confluence

Size Distribution–Length Frequency. Length frequency distribution of all sizes of smallmouth bass collected with electrofishing were plotted for each pass (Figures 1–4). Because sample sizes were small during some passes in some river segments, some river segments were combined. River segments were combined by hydro-geomorphic features (e.g., canyon-bound vs. alluvial). For the Colorado River, these combined segments

were: 1) Westwater Ranger Station, Utah, to the Loma Boat Landing (canyon-bound), 2) Loma Boat Landing to the Colorado/Gunnison River confluence (alluvial), and 3) the Colorado/Gunnison River confluence to Price-Stubb Dam (alluvial). For the Lower Gunnison River the one segment was from the Redlands Diversion Dam to the Colorado/Gunnison River confluence (alluvial).

Changes in size (i.e., length) have been used to detect changes in age composition of a fish population over time. In this instance, we are looking for an indice that could reliably be used to detect changes in the overall size [age] structure of smallmouth bass in the designated river segments over time. Size structure changes over time then could be used to evaluate whether mechanical removal is reducing the numbers of a particular size [length] group, and therefore, if this technique could be recommended as an effective management tool for removal.

The mean total length and confidence intervals were calculated for smallmouth bass for each pass in the aforementioned river segments. All smallmouth bass were used in this analyses to determine if there had been any change (increase or decrease) in the length structure of the smallmouth bass captured over the four passes during 2004. There was no significant difference ($\alpha=.05$) in the mean total length of smallmouth bass captured over the three passes between the Westwater Ranger Station in Utah and the Loma Boat Landing with electrofishing (Figure 6). In the Lower Gunnison River, the mean size actually increased over the four passes, but was not statistically significant ($\alpha=.05$)(Figure 7). Between the Loma Boat Landing and the Colorado/Gunnison River confluence river segment, the mean size (total length) of smallmouth bass collected gradually decreased from pass 3 to pass 4 and the change was significant ($\alpha=.05$)(Figure 6). However, in this river segment during pass 4 a high number (29 out of 97) of smallmouth bass were fish less than 100 mm (49–97). It was speculated that these were 2004 young-of-the-year fish. To determine what extent smallmouth bass smaller than 100 mm influenced the mean size within this sample group, fish less than 100 were eliminated. A two-sample t test was used to determine if these two groups were statistically different. The mean length for smallmouth bass 100 mm and greater was significantly greater ($P=0.001$) than the group that included all smallmouth bass collected including those fish less than 100 mm. When only fish 100 mm and larger were used in pass 4, there was no significant difference ($\alpha=.05$) in the mean total length of smallmouth bass among the previous three passes. There was a significant decline ($\alpha=.05$) in the mean length of smallmouth bass collected between passes 2 and pass 3 in the river reach between Price-Stubb Dam and the Colorado/Gunnison River confluence (Figure 7). However, the mean length increased significantly ($\alpha=.05$) between passes 3 and 4.

Therefore, we concluded that there was no statistically significant ($\alpha=.05$) decline in the size (i.e., mean total length) of smallmouth bass over the four passes during the summer of 2004.

All age groups of smallmouth bass (young-of-the-year, juveniles, and adults) were represented in our collections in the summer of 2004. These ranged from young (~ 50 mm) to adult (414 mm) fish. While it is not distinct, it appears that there were about

three length groups of smallmouth bass. Also, it was apparent from collections, that in some river segments (18-mile reach [Colorado/Gunnison River confluence to the Loma Boat Landing]), smallmouth bass reproduced during 2004. We cannot prove if these fish were produced in the river, or in off-channel habitats (e.g., ponds or irrigation returns that connect to the main river) and later escaped to the river.

Actual Numbers. Summary statistics for centrarchid fishes collected with boat and raft-based electrofishing during each of the four passes were tallied by individual river segment (Table 1). Total number fish collected by species during the 2004 smallmouth bass removal were, smallmouth bass: 1,165; largemouth bass: 277; black crappie/green sunfish/bluegill in the aggregate: 761.

Catch/Effort. Since all centrarchids captured were lethally removed, fish were not marked and thus a population estimate was not possible. However catch rate or catch effort can be used because it is directly proportional to abundance and is an index of the population size. To determine if densities of smallmouth bass and largemouth bass were being depleted as a result of the removal effort, we calculated and interpreted catch effort indices (e.g., fish/hour) over time (i.e., by pass) in each river segment (Tables 2 and 3; Figure 8). The number of smallmouth bass/river mile was also calculated for five river segments on the Colorado River and one segment on the Lower Gunnison River (Table 4).

Overall mean catch effort (Table 3) steadily increased over the four passes for both smallmouth bass and largemouth bass in 2004 (Figure 9). One explanation for this increase with each subsequent pass was that sampling crews became more knowledgeable about the habitats and in-river features and structures smallmouth inhabited. Thus, sampling crews may have become more skillful and efficient in catching centrarchids as the sampling season progressed. Thus, sampling efficiency was enhanced as workers (i.e., boat operators and netters) gained more experience. The same situation was noted during the 2003 channel catfish removal evaluation on the Colorado River. The highest abundance of smallmouth bass in main channel habitats was between Corn Lake and the Colorado/Gunnison River confluence, followed by the segment between the Colorado/Gunnison River confluence to Fruita State Park (Table 3). The 2.3-mile segment in the Lower Gunnison River had the third highest abundance of smallmouth bass. The highest abundance of largemouth bass was collected between the Colorado/Gunnison River confluence and Fruita State Park (Table 3). The overall mean catch effort for black crappie, green sunfish, and bluegill also steadily increased from pass 1 through pass 4 (Table 3).

The number of smallmouth bass recently collected as compared to those collected during investigations from previous years now leads researchers to believe that this species is quickly emerging as an abundant nonnative fish in the Grand Valley and Ruby and Horsethief canyons in the Upper Colorado River. In the spring of 2003, Fish and Wildlife researchers sampling the Colorado River in the 15- and 18-mile reaches of Grand Valley noted increased catches of smallmouth bass. Because of this, researchers collected and recorded information on both smallmouth bass and largemouth bass in the summer of 2003 during the channel catfish removal evaluation. From the numbers of

smallmouth bass collected in 2003, researchers concluded that the abundance of smallmouth bass in the Grand Valley and Ruby and Horsethief canyons of the Upper Colorado River had rapidly increased. And apparently, according to catch effort analyses between 2003 and 2004, smallmouth bass numbers are still increasing. It also appears that the abundance of smallmouth bass and largemouth bass collected with electrofishing in main channel habitats during the summer of 2004 was considerably greater than the number collected during the channel catfish removal evaluation that was conducted in the summer of 2003 (Tables 5, 6, and 7) and during the population monitoring for Colorado pikeminnow during the spring of 2004 (Table 8).

Overall catch effort (fish/hour and fish/mile) for both smallmouth bass and largemouth bass collected from main channel habitats in the Upper Colorado River in the 18-mile reach and Ruby and Horsethief canyon reaches was compared between the summer of 2003 and summer of 2004 (see Tables 5, 6, and 7). Smallmouth bass catch effort was 2.39 fish/hour in 2003 and 6.06 fish/hour in 2004, a 2.5 fold increase. As expected, the fish/mile increased from 1.09 to 1.56 in the same river reaches. For largemouth bass, the catch rate increased also (2.2 fold) from 0.86 fish/hour in 2003 to 1.88 fish/hour in 2004. Analyses of smallmouth bass catch effort by sampling pass illustrated the same general pattern: catch effort during the summer of 2004 exceeded that of the summer of 2003.

The same analyses was performed between smallmouth bass and largemouth bass collected during the spring 2004 Colorado pikeminnow population monitoring and summer 2004 smallmouth bass removal project (Table 8; Figures 11 and 12). River reaches within this analyses included the Redlands Diversion Dam to the Colorado/Gunnison River confluence in the Lower Gunnison River and Westwater Ranger Station in Utah to the Loma Boat Landing and Loma Boat Landing to the Price-Stubb Dam in the Colorado River. Catch effort for smallmouth bass in the spring was 2.84 fish/hour compared to 6.91 fish/hour in the summer. Likewise for largemouth bass, catch effort in the spring was only 0.03 fish/hour compared to 2.77 fish/hour in the summer (Table 8). It appears that even during spring runoff of drought years, these species are not as vulnerable or available for capture as they are during the summer months of July and August.

Therefore, during the summer of 2004, we did not show a depletion for either smallmouth bass or largemouth bass numbers in main channel habitats of the Colorado River in western Colorado and eastern Utah and the Lower Gunnison River in western Colorado. Rather, abundance of both species actually increased throughout the sampling period.

Rifle Bridge – Beavertail Mountain

Only 21 smallmouth bass were collected in the designated critical habitat river reaches between the Rifle Bridge and Beavertail Mountain (Table 9; Figure 5). The Rifle Bridge to Beavertail Mountain in Debeque Canyon includes reaches that are both in alluvial and canyon-bound settings. Twenty of these smallmouth bass were collected in a 10.7-mile reach between Rifle and Rulison. Forty-two largemouth bass were collected within this same reach (Table 9). One walleye pike (total length 610 mm) was collected between Rifle and Rulison. Further sampling is required in this reach to determine population

trends for centrarchid fishes.

VII. Recommendations:

1. Continue to collect and lethally remove all centrarchids from the Colorado and Gunnison rivers during all station sampling studies which includes the spring population monitoring for Colorado pikeminnow.
2. Suspend all electrofishing operations when it is determined that Colorado pikeminnow show signs of preparing to spawn, e.g., mid- to late-June. Electrofishing will be suspended during this period to eliminate the likelihood of harassment, interference, and injury to spawning Colorado pikeminnow.
3. Electrofishing should commence following cessation of spawning of Colorado pikeminnow which should be sometime in mid- to late-July.
4. Increase the number of electrofishing passes in river segments that have higher concentrations of smallmouth bass, if possible, in 2005. This should maximize catches of centrarchid fishes while at the same time minimizing harassment and negative impacts to native fishes in reaches where centrarchid abundance is low.
5. Target specific in-river features that provide habitat for centrarchid fishes. These include but are not limited to beaver lodges, tree stumps and logs, rock piles, and concrete rip-rap. Sampling these features with electrofishing may increase catches of centrarchid fishes.
6. If time allows, sample the Upper Colorado reaches from the Rifle Bridge to Beavertail Mountain in Debeque Canyon. This is necessary to build upon the existing fishery community database and monitor abundance of nonnative centrarchid fishes in these reaches which is within critical habitat for Colorado pikeminnow and razorback sucker. Include fish sampling the Colorado River in Garfield County upstream through designated critical habitat to the bridge at Rifle, Colorado, in the 2005 Colorado scientific collection permit.

VIII. Project Status:

- A. "On track and ongoing".
- B. Study direction and sampling design for 2005 may be adjusted pending the outcome from the nonnative fish workshop in early-December 2004.

IX. FY 2004 Budget Status

- A. Funds Provided: \$ 73,400 + \$ 6,606 (overhead)
- B. Funds Expended: \$ 73,400 + \$ 6,606 (overhead)
- C. Difference: \$ -0-
- D. Percent of the FY 2004 work completed, and projected costs to complete: 100%.
- E. Recovery Program funds spent for publication charges: \$ -0-

X. Status of Data Submission (Where applicable): All endangered fish collected during this evaluation were checked for a PIT tag in the field. Those wild Colorado pikeminnow that did not have a PIT tag were implanted with one. All data associated with the capture and release of endangered fish were computerized. These data are available and will be electronically transmitted to the UCRB database coordinator in Grand Junction upon his request. Data recorded for all centrarchid fishes collected were computerized on entered on EXCEL spreadsheet. Electronic copies of these data were provided to both Patrick Martinez and Tom Nesler of the Colorado Division of Wildlife by the first of October 2004.

XI. Signed: Bob B. Burdick 10 November 2004
Principal Investigator Date

APPENDIX:

- A. More comprehensive/final project reports. If distributed previously, simply reference the document or report. None.
- B. Appendix A: 9 tables attached
12 figures attached

Appendix B: Figures, tables, and text presented on November 8, 2004, at the
Nonnative Fish Management Workshop in Grand Junction, Colorado

Prepared and compiled by Bob D. Burdick, 11/10/2004
Amended by Bob D. Burdick, 12/13/2004
Revised by Bob D. Burdick, 02/14/2005
04ColoR-smbass-rpt.wpd

APPENDIX A

Table 1. Numbers of centrarchid fishes collected during pass (P) 1, 2, 3, and 4 of the smallmouth bass removal project from main channel habitats on the Colorado and Lower Gunnison rivers in western Colorado and eastern Utah, July and August 2004. Note: n/s=not sampled; two electrofishing craft were used for passes 1, 2, and 3; one electrofishing craft was used for pass 4.

River (River Miles) River Segment	<u>No. of Centrarchids</u>															
	Smallmouth <u>Bass</u>				Largemouth <u>Bass</u>				Black Crappie/ Green Sunfish/ <u>Bluegill</u>							
	<u>P-1</u>	<u>P-2</u>	<u>P-3</u>	<u>P-4</u>	<u>P-1</u>	<u>P-2</u>	<u>P-3</u>	<u>P-4</u>	<u>P-1</u>	<u>P-2</u>	<u>P-3</u>	<u>P-4</u>				
Colorado River (RM 187.7–127.6)																
Price-Stubb ▶ GVIC Dam	9	16	5	n/s	0	0	0	n/s	1	18	9	n/s				
GVIC Dam ▶ Corn Lake	33	26	69	24	0	0	17	13	57	13	47	23				
Corn Lake ▶ Colo/Gunn River Confluence	64	52	100	54	3	3	35	16	16	4	101	31				
Colo/Gunn R. Confl. ▶ Fruita State Park	45	82	206	91	15	18	65	35	21	46	152	38				
Fruita State Park ▶ Loma Boat Landing	10	19	32	6	5	2	6	12	30	7	52	28				
Loma Boat Landing ▶ Salt Creek Wash	23	13	30	n/s	5	0	19	n/s	10	5	15	n/s				
Salt Creek Wash ▶ Utah/Colo Stateline	6	19	14	n/s	0	0	3	n/s	0	5	3	n/s				
Utah/Colo Stateline ▶ Westwater, Utah BLM Ranger Station	1	1	1	n/s	0	0	0	n/s	1	0	0	n/s				
Lower Gunnison River (RM 3.0–0.7)																
Redlands Div. Dam ▶ Colo/Gunn R. Confluence	28	28	47	11	0	0	1	4	6	7	5	11				
2004 Pass Totals	219	256	504	186	28	23	146	80	141	105	384	131				
2004 Species Totals					<i>1,165</i>				<i>277</i>				<i>761</i>			

Table 2. Amount of effort (electrofishing hours) expended during four passes of the smallmouth bass removal project sampling main channel habitats on the Colorado and Lower Gunnison rivers in western Colorado and eastern Utah, July and August 2004. Note: n/s=not sampled; two electrofishing craft were used for passes 1, 2, and 3; one electrofishing craft was used for pass 4.

River (River Miles) River Segment	<u>Electrofishing Effort (hr)</u>			
	<u>P-1</u>	<u>P-2</u>	<u>P-3</u>	<u>P-4</u>
Colorado River (RM 187.7–127.6)				
Price-Stubb▶GVIC Dam	2.275	2.438	2.656	n/s
GVIC Dam ▶ Corn Lake	5.432	4.943	8.273	2.920
Corn Lake ▶Colo/Gunn River Confluence	4.701	5.581	8.696	3.750
Colo/Gunn R. Confl. ▶ Fruita State Park	9.248	11.572	16.328	7.633
Fruita State Park ▶ Loma Boat Landing	2.902	3.172	4.496	1.949
Loma Boat Landing ▶ Salt Creek Wash	7.372	5.564	7.733	n/s
Salt Creek Wash ▶ Utah/Colo Stateline	6.029	6.988	7.295	n/s
Utah/Colo Stateline ▶ Westwater, Utah BLM Ranger Station	1.244	2.434	2.664	n/s

Lower Gunnison River (RM 3.0–0.7)				
Redlands Div. Dam ▶ Colo/Gunn R. Confluence	3.363	3.196	4.070	1.748

2004 Pass Totals	42.566	45.888	62.211	18.00

Table 3. Catch effort (fish/hour) of centrarchid fishes collected during pass (P) 1, 2, 3, and 4 of the smallmouth bass removal project from main channel habitats on the Colorado and Lower Gunnison rivers in western Colorado and eastern Utah, July and August 2004. Note: n/s=not sampled; two electrofishing craft were used for passes 1, 2, and 3; one electrofishing craft was used for pass 4.

River (River Miles) River Segment	Catch/Effort (fish/hr)											
	Smallmouth Bass				Largemouth Bass				Black Crappie/ Green Sunfish/ Bluegill			
	P-1	P-2	P-3	P-4	P-1	P-2	P-3	P-4	P-1	P-2	P-3	P-4
Colorado River (RM 187.7–127.6)												
Price-Stubb ▶ GVIC Dam	3.96	6.56	1.88	n/s	0.00	0.00	0.00	n/s	0.44	7.38	3.39	n/s
GVIC Dam ▶ Corn Lake	6.08	5.26	8.34	8.22	0.00	0.00	2.05	4.45	10.49	2.63	5.68	7.88
Corn Lake ▶ Colo/Gunn River Confluence	13.61	9.32	11.50	14.40	0.64	0.54	4.02	4.27	3.40	0.72	11.61	8.27
Colo/Gunn R. Confl. ▶ Fruita State Park	4.87	7.09	12.62	11.92	1.62	1.56	3.98	4.59	2.27	3.98	9.31	4.98
Fruita State Park ▶ Loma Boat Landing	3.45	5.99	7.12	3.08	1.72	0.63	1.33	6.16	10.34	2.21	11.57	14.37
Loma Boat Landing ▶ Salt Creek Wash	3.12	2.34	3.88	n/s	0.68	0.00	2.46	n/s	1.36	0.90	1.94	n/s
Salt Creek Wash ▶ Utah/Colo Stateline	1.00	2.72	1.92	n/s	0.00	0.00	0.82	n/s	0.00	0.72	0.82	n/s
Utah/Colo Stateline ▶ Westwater, Utah BLM Ranger Station	0.80	0.41	0.38	n/s	0.00	0.00	0.00	n/s	0.80	0.00	0.00	n/s
Lower Gunnison River (RM 3.0–0.7)												
Redlands Div. Dam ▶ Colo/Gunn R. Confluence	8.33	8.76	11.55	6.29	0.00	0.00	0.25	6.99	1.78	2.19	1.22	6.29
Mean of 2004 Passes	5.14	5.58	8.11	10.33	0.66	0.50	2.35	4.44	3.31	2.29	6.17	7.28
Mean of 2004 Species				6.91				1.64				4.51

Table 4. Number and catch effort (fish/mile) for smallmouth bass collected from main channel habitats with electrofishing in the Upper Colorado River from river mile 187.7–127.6 (Price-Stubb Dam to Westwater Ranger Station, Utah), and the Lower Gunnison River from river mile 3.0–0.7 (Redlands Diversion Dam to the Colorado/Gunnison River confluence) during July and August, 2004. Note: see Table 2 for the total electrofishing effort (hrs) sampled for each river segment; n/s=not sampled. Two electrofishing craft were used for passes 1, 2, and 3; one electrofishing craft was used for pass 4.

	Smallmouth Bass							
	No. of Fish				Fish/Mile			
	P-1	P-2	P-3	P-4	P-1	P-2	P-3	P-4
Colorado River								
Price-Stubb Dam- Colo/Gunn Confl. Segment Length: 16.7 miles Miles Sampled: 33.4	106	94	174	^a 78	3.2	2.8	5.2	5.5
Colo/Gunn Confl- Loma Boat Landing Segment Length: 18.4 miles Miles Sampled: 36.8	55	101	238	^b 97	1.5	2.8	6.5	5.3
Loma Boat Landing- Salt Creek Wash Segment Length: 8.4 miles Miles Sampled: 16.8	23	13	30	n/s	1.4	0.8	1.8	n/s
Salt Creek Wash- Utah/Colo Stateline Segment Length: 12.3 miles Miles Sampled: 24.6	6	19	14	n/s	0.3	0.8	0.6	n/s
Utah/Colo Stateline- Westwater Ranger Station, Utah Segment Length: 4.3 miles Miles Sampled: 8.6	1	1	1	n/s	0.1	0.1	0.1	n/s
Lower Gunnison River								
Redlands Div. Dam- Colo/Gunn Confl. Segment Length: 2.3 miles Miles Sampled: 4.6	28	28	47	^c 11	6.1	6.1	10.2	4.8

^a Price-Stubb Dam to GVIC Diversion Dam river segment was not sampled during pass 4. Only 14.3 miles were sampled: 185.3–171.0.

^b One electrofishing craft was used; miles sampled=18.4 for Pass 4.

^c One electrofishing craft was used; miles sampled=2.3 miles for Pass 4.

Table 5. Number and catch effort (fish/hr and fish/mile) for largemouth bass and smallmouth bass collected from main channel habitats in the Upper Colorado River with electrofishing from river mile 171.0 to 132.0 (Colorado/Gunnison River confluence to the Utah/Colorado stateline), 30 June to 31 October 2003 during the channel catfish removal evaluation. Note: data for the Upper Reach (Colorado/Gunnison River confluence to the Loma Boat Landing) and Lower Reach (Loma Boat Landing to the Colorado/Utah stateline) were combined. Total effort (hrs) = 132.82; total miles sampled = 293.

	Largemouth Bass			Smallmouth Bass			Effort	
	No.	Fish/hr	Fish/Mile	No.	Fish/hr	Fish/Mile	Hrs	Miles
Pass 1	8	0.27	0.11	39	1.34	0.53	29.15	72.9
Pass 2	13	0.42	0.17	41	1.31	0.54	31.18	75.0
Pass 3	6	0.06	0.14	33	1.94	0.76	17.05	43.6
Pass 4	41	1.43	0.70	96	3.35	1.63	29.66	58.6
Pass 5	46	1.72	1.07	109	4.07	2.54	26.78	42.9
Totals	114	0.86	0.39	318	2.39	1.09	132.82	293.0

Table 6. Number and catch effort (fish/hr and fish/mile) for largemouth bass and smallmouth bass collected from main channel habitats in the Upper Colorado River with electrofishing from river mile 171.0 to 132.0 (Colorado/Gunnison River confluence to the Utah/Colorado stateline), July and August 2004 during the smallmouth bass removal project. Note: data for the Colorado/Gunnison River confluence to the Loma Boat Landing and Loma Boat Landing to the Colorado/Utah stateline were combined. Total effort (hrs) =98.31; total miles sampled =381.2

	Largemouth Bass			Smallmouth Bass			Effort	
	No.	Fish/hr	Fish/Mile	No.	Fish/hr	Fish/Mile	Hrs	Miles
Pass 1	25	0.98	0.22	84	3.29	0.73	25.55	114.8
Pass 2	20	0.73	0.17	133	4.87	1.16	27.33	114.8
Pass 3	93	2.59	0.81	282	7.87	2.46	35.85	114.8
Pass 4	47	4.91	1.28	97	10.13	0.84	9.58	36.8
Totals	185	1.88	0.49	596	6.06	1.56	98.31	381.2

Table 7. Comparison of overall catch effort (fish/hr and fish/mile) for smallmouth bass and largemouth bass between the summer of 2003 (see Table 6–channel catfish removal evaluation) and the summer of 2004 (see Table 7–smallmouth bass removal project).

	Largemouth Bass			Smallmouth Bass			Effort	
	No.	Fish/hr	Fish/Mile	No.	Fish/hr	Fish/Mile	Hrs	Miles
2003 Totals	114	0.86	0.39	318	2.39	1.09	132.82	293.0
2004 Totals	185	1.88	0.49	596	6.06	1.56	98.31	381.2

Table 8. Comparison between the total number and overall catch effort (fish/hr) for largemouth

bass and smallmouth bass collected from main channel habitats in the Upper Colorado River from river mile 187.6 to 127.6 (Price-Stubb Dam to the Westwater Ranger Station, UT) and the Lower Gunnison River from river mile 3.0 to 0.7 (Redlands Diversion Dam to the Colorado/Gunnison River confluence) with electrofishing, April, May, and June 2004, during the spring (SPR) Colorado pikeminnow population monitoring and summer (SUM) smallmouth bass removal project. Passes within each project were combined.

	<u>Largemouth Bass</u>				<u>Smallmouth Bass</u>				<u>Effort (hrs)</u>	
	<u>No.</u>		<u>Fish/hr</u>		<u>No.</u>		<u>Fish/hr</u>		<u>SPR</u>	<u>SUM</u>
	<u>SPR</u>	<u>SUM</u>	<u>SPR</u>	<u>SUM</u>	<u>SPR</u>	<u>SUM</u>	<u>SPR</u>	<u>SUM</u>		
Colorado River										
Westwater-Loma Boat Landing	1	27	0.03	0.57	120	108	3.45	2.28	34.805	47.323
Loma Boat Landing-Price-Stubb Dam	2	245	0.03	2.25	178	943	2.54	8.65	70.000	108.965
Lower Gunnison River										
Redlands Dam-Colo/Gunn Confl.	0	5	0.00	0.40	24	114	2.84	9.21	8.444	12.377

Totals	3	304	0.03	2.77	322	1,165	2.84	6.91	113.249	168.665

Table 9. Summary statistics of centrarchids and percids collected during reconnaissance sampling in main channel habitats of the Upper Colorado River from Rifle, Colorado, to Beavertail Mountain in Debeque Canyon, August 23–26, 2004.

Reach: Rifle Bridge–Rulison Bridge

River Mile: 240.7–230.0; River Mile Length: 10.7

Number of Electrofishing Crafts: 2

Effort (hr): 10.26

Smallmouth Bass				Largemouth Bass				Green Sunfish			Walleye				
No. of Fish	Total Length (mm)			No. of Fish	Total Length (mm)			No. of Fish	Total Length (mm)			No. of Fish	Total Length (mm)		
	Min	Max	Mean		Min	Max	Mean		Min	Max	Mean		Min	Max	Mean
20	63	412	235	42	38	184	82	8	<100	112	~100	1	--	--	610

Reach: Rulison Bridge–Parachute Bridge

River Mile: 229.9–223.0; River Mile Length: 6

Number of Electrofishing Crafts: 2

Effort (hr): 2.17

Smallmouth Bass				Largemouth Bass				Green Sunfish			Walleye				
No. of Fish	Total Length (mm)			No. of Fish	Total Length (mm)			No. of Fish	Total Length (mm)			No. of Fish	Total Length (mm)		
	Min	Max	Mean		Min	Max	Mean		Min	Max	Mean		Min	Max	Mean
0	--	--	--	4	66	420	225	3	<100	<100	<100	0	--	--	--

Reach: Parachute Bridge–Debeque I-70 Bridge

River Mile: 223.0–209.7; River Mile Length: 13.3

Number of Electrofishing Crafts: 2

Effort (hr): 4.38

Smallmouth Bass				Largemouth Bass				Green Sunfish			Walleye				
No. of Fish	Total Length (mm)			No. of Fish	Total Length (mm)			No. of Fish	Total Length (mm)			No. of Fish	Total Length (mm)		
	Min	Max	Mean		Min	Max	Mean		Min	Max	Mean		Min	Max	Mean
1	--	--	53	8	43	93	63	19	<100	135	~104	0	--	--	--

Reach: Debeque I-70 Bridge–Beavertail Mountain (Debeque Canyon)

River Mile: 209.7–195.7; River Mile Length: 14.0

Number of Electrofishing Craft: 1

Effort (hr): 2.94

Smallmouth Bass				Largemouth Bass				Green Sunfish			Walleye				
No. of Fish	Total Length (mm)			No. of Fish	Total Length (mm)			No. of Fish	Total Length (mm)			No. of Fish	Total Length (mm)		
	Min	Max	Mean		Min	Max	Mean		Min	Max	Mean		Min	Max	Mean
0	--	--	--	11	85	189	113	6	90	117	99	0	--	--	--

Colorado River
Westwater Ranger Station, UT-Loma Boat Landing--2004
3 Passes

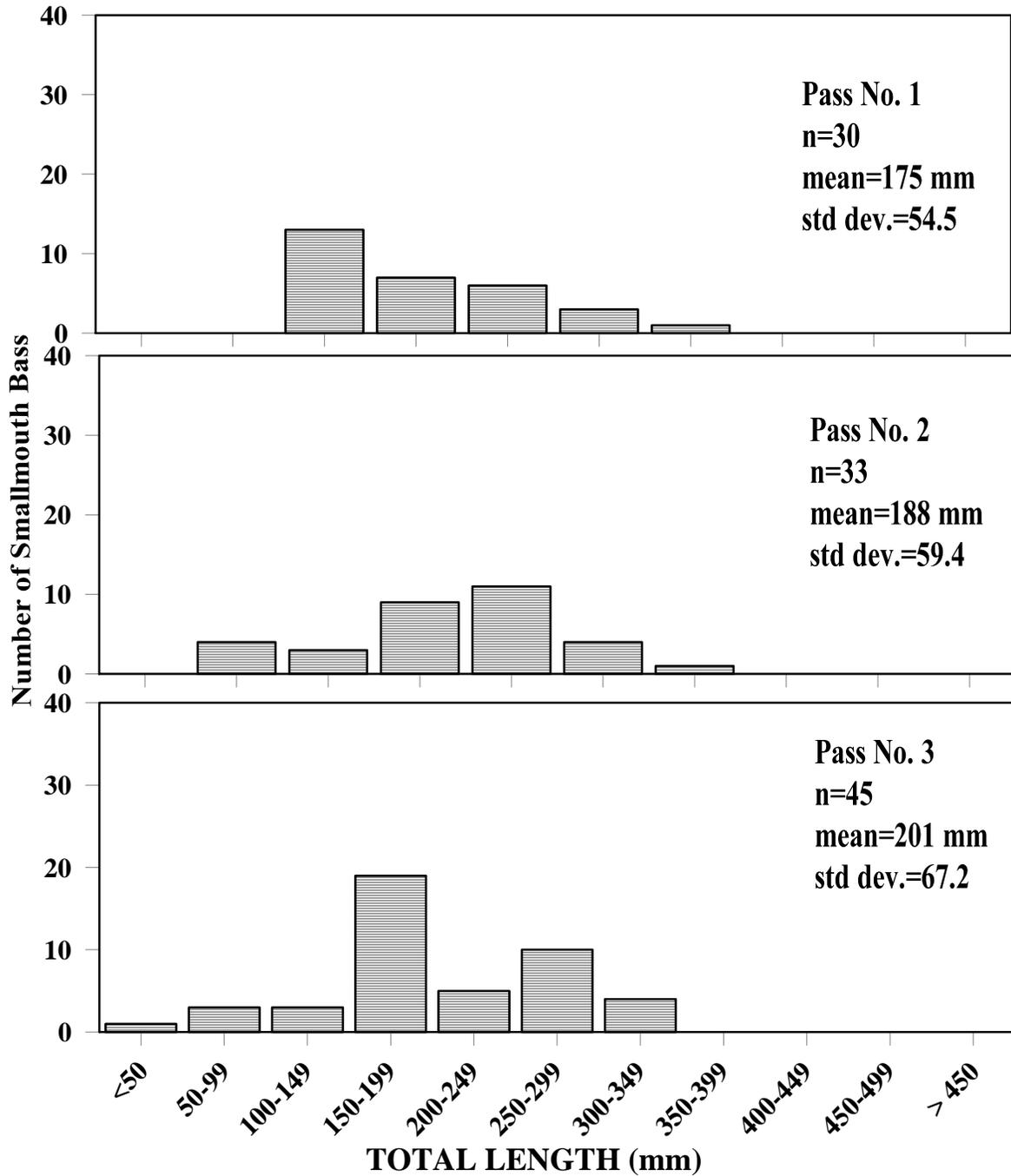


Figure 1.

Total length frequency of all smallmouth bass collected with electrofishing during three passes from Westwater Ranger Station, UT, to the Loma Boat Landing to the Colorado/Gunnison River confluence (river mile 127.6–152.6) in the Colorado River, July and August 2004.

**Colorado River
Loma Boat Landing-Colo/Gunn River Confluence--2004
4 Passes**

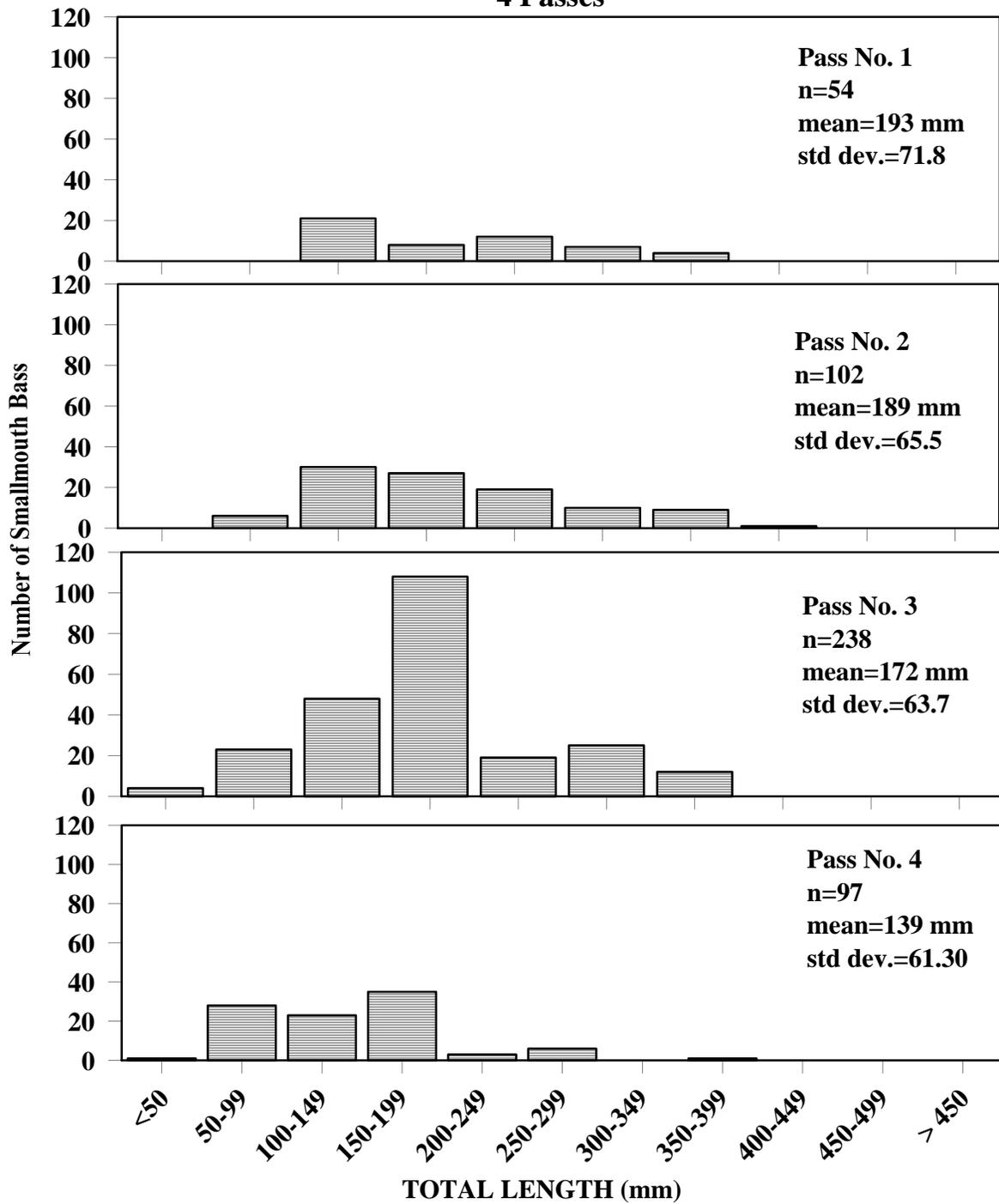


Figure 2. Total length frequency of all smallmouth bass collected with electrofishing during four passes from the Loma Boat Landing to the Colorado/Gunnison River confluence (river mile 152.6–171.0) in the Colorado River, July and August 2004.

**Colorado River
 Colo/Gunn River Confluence-Price-Stubb Dam--2004
 4 Passes**

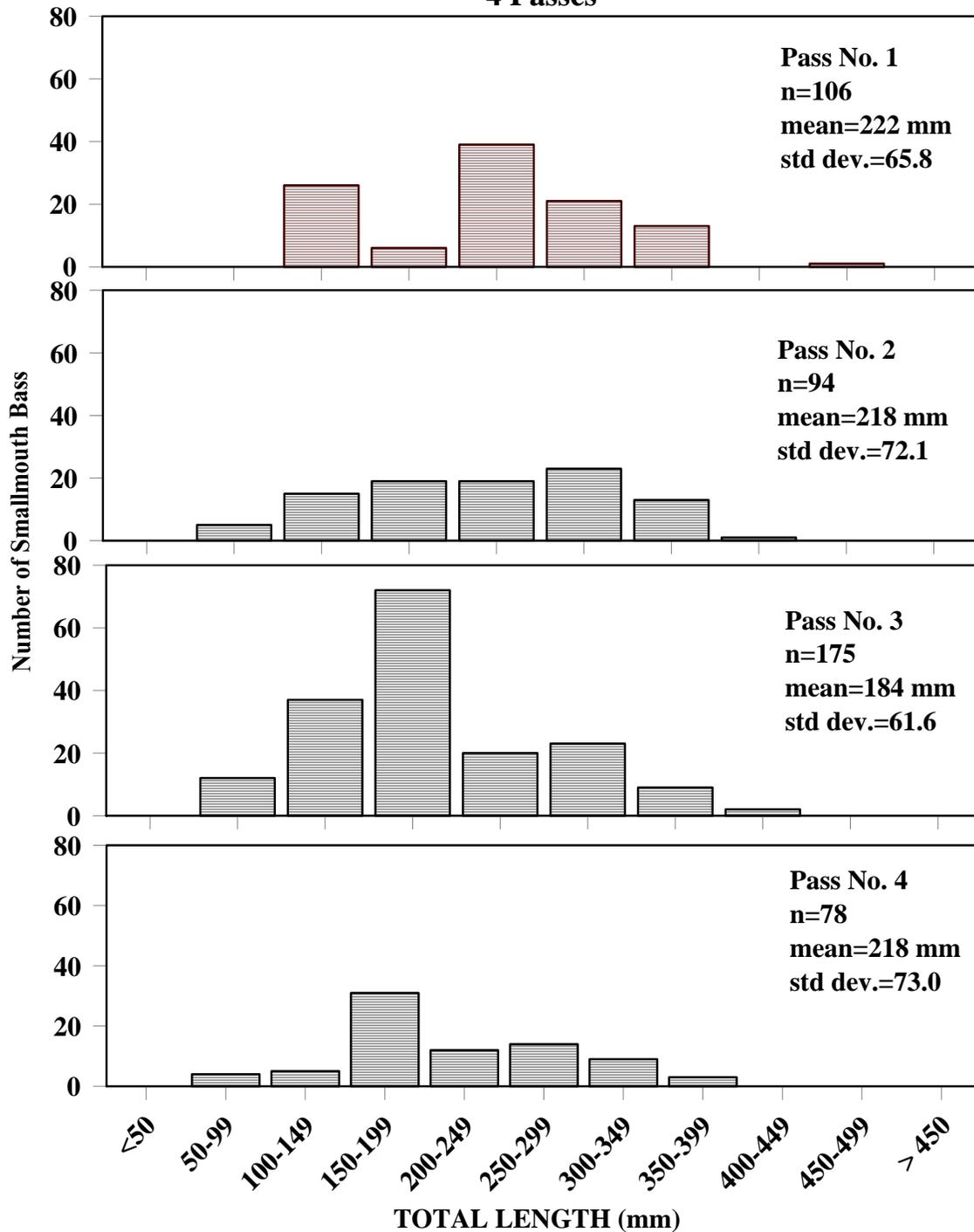


Figure 3. Total length frequency of all smallmouth bass collected with electrofishing during four passes from the Colorado/Gunnison River confluence to immediately downstream from Price-Stubb Dam (river mile 171.0–187.7) in the Colorado River, July and August 2004.

**Lower Gunnison River--2004
Redlands Dam-Colo/Gunn River Confluence
4 Passes**

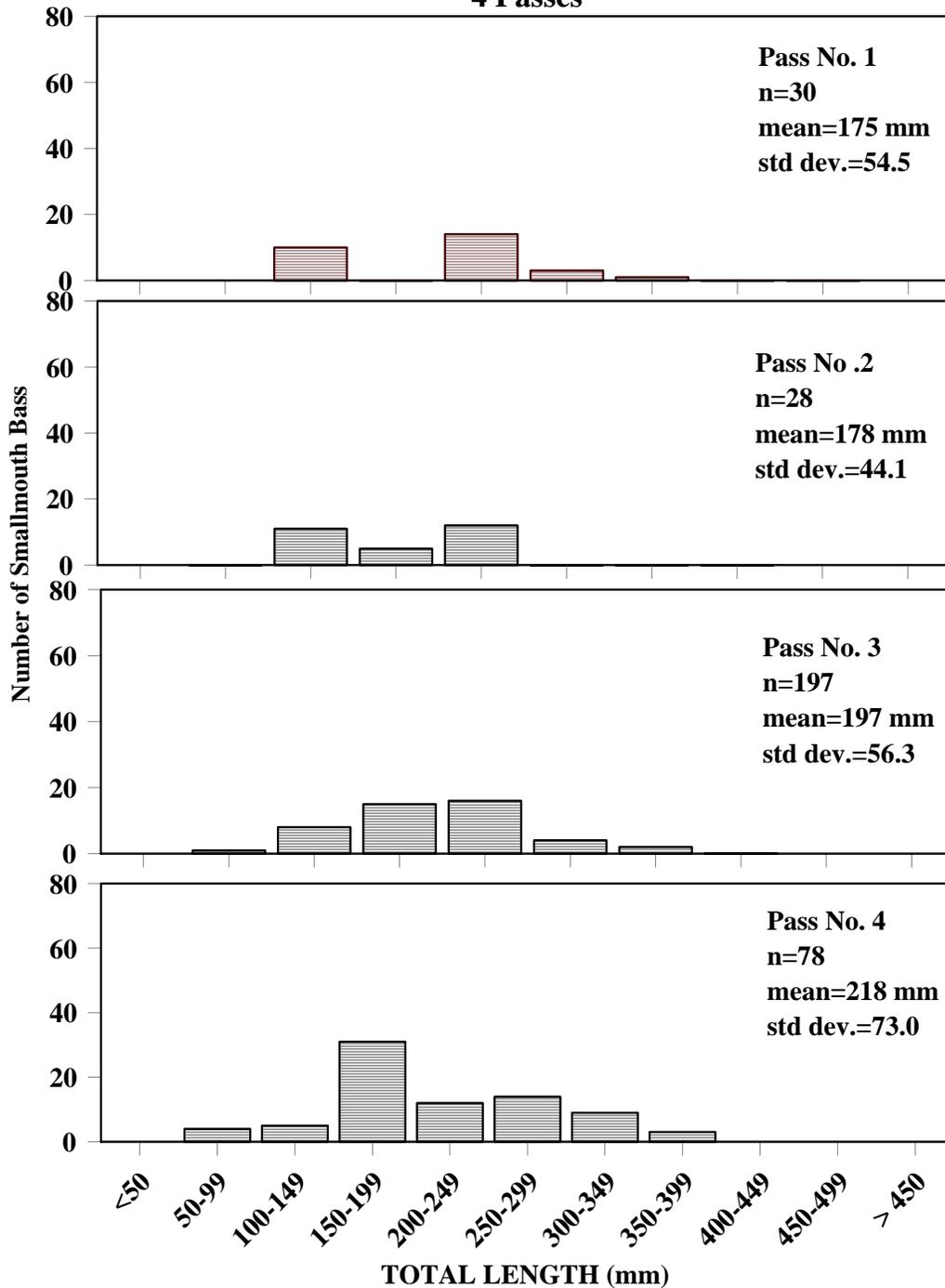


Figure 4. Total length frequency of all smallmouth bass collected with electrofishing during four passes from the Redlands Diversion Dam to the Colorado/Gunnison River confluence (river mile 3.0–0.7) in the Lower Gunnison River, July and August 2004.

**Colorado River
Rifle Bridge-Beavertail Mountain (Debeque Canyon)--2004
Reconnaissance Sampling
1 Pass**

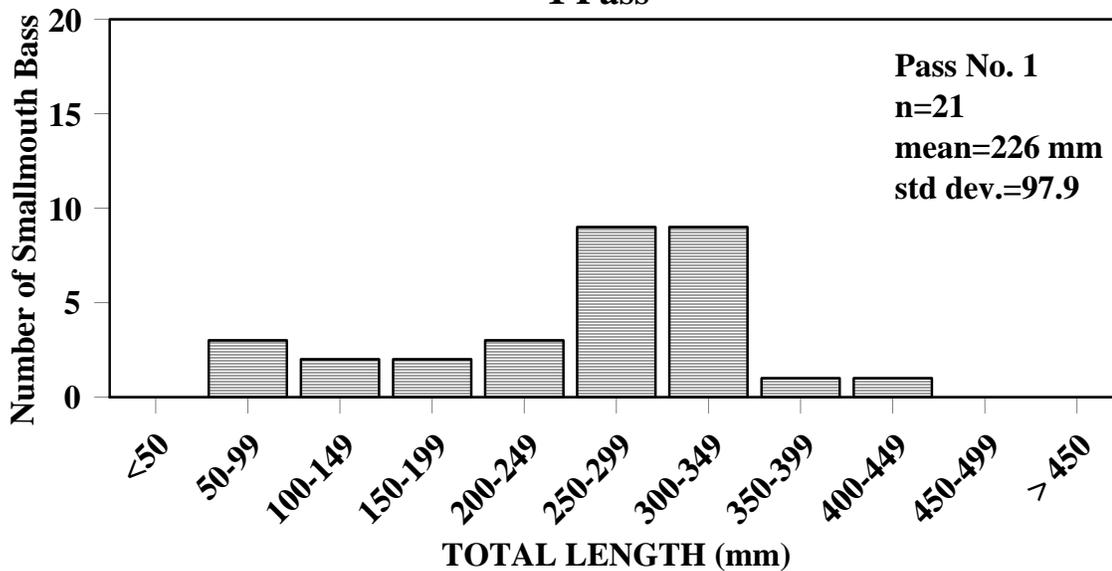


Figure 5. Total length frequency of all smallmouth bass collected with electrofishing during one pass from the Rifle Bridge to Beavertail Mountain in Debeque Canyon (river mile 240.7–195.7) in the Upper Colorado River, late-August 2004.

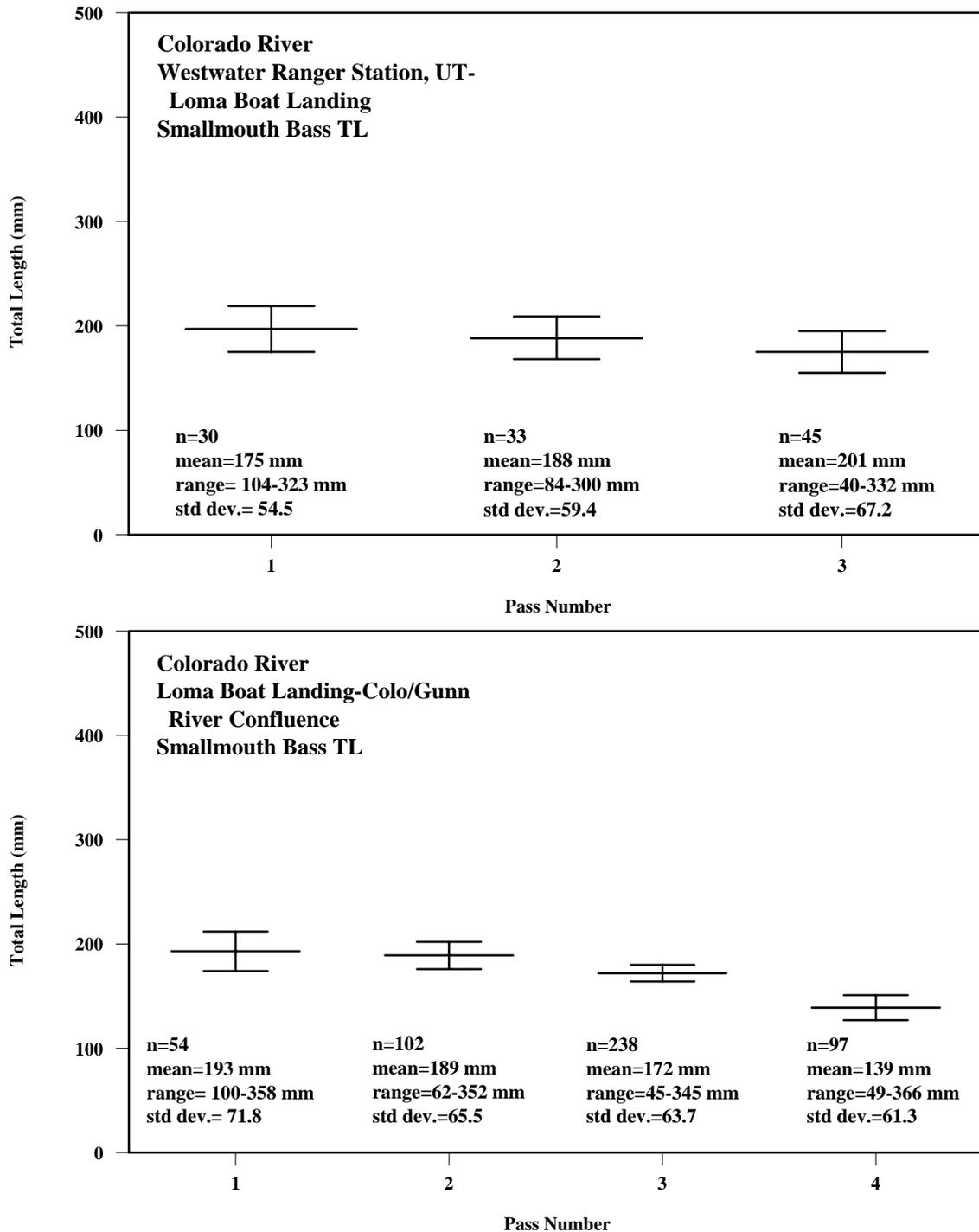


Figure 6. Mean total length and 95% confidence interval for all smallmouth bass that were collected with electrofishing from Westwater Ranger Station, UT, to the Loma Boat Landing (three passes; TOP figure) and from the Loma Boat Landing to the Colorado/Gunnison River confluence (four passes; LOWER figure) in the Colorado River, July and August 2004. The mean is the middle horizontal line; the 95% confidence intervals are represented by the error bars ($\tau \perp$).

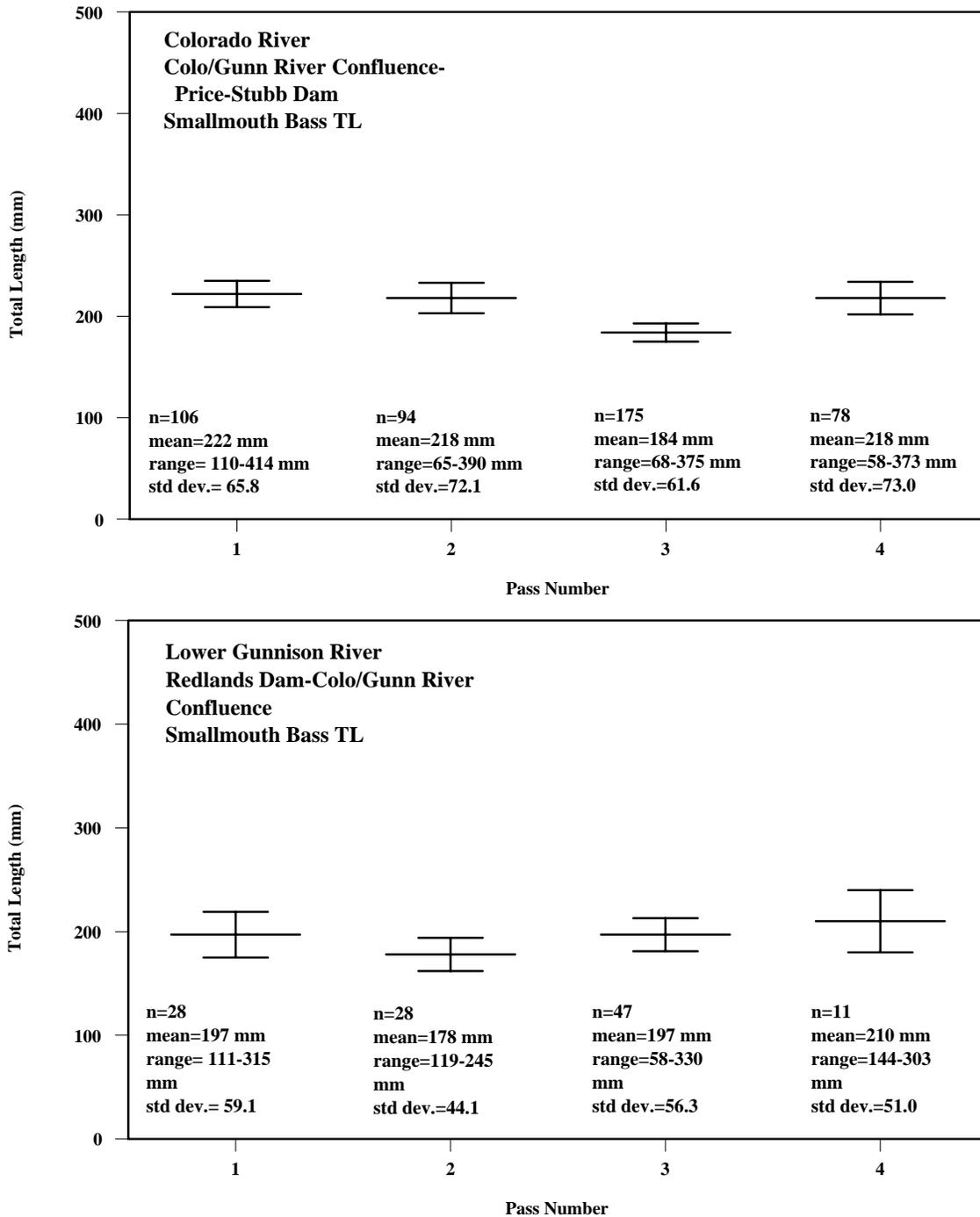


Figure 7. Mean total length and 95% confidence interval for all smallmouth bass that were collected with electrofishing from the Colorado/Gunnison River confluence to immediately downstream from the Price-Stubb Dam (four passes; TOP figure) in the Colorado River and from the Redlands Diversion Dam to the Colorado/Gunnison River confluence (four passes; LOWER figure) in the Lower Gunnison River, July and August 2004. The mean is the middle horizontal line; the 95% confidence intervals are represented by the error bars ($\tau \perp$).

2004--Smallmouth Bass Colorado River

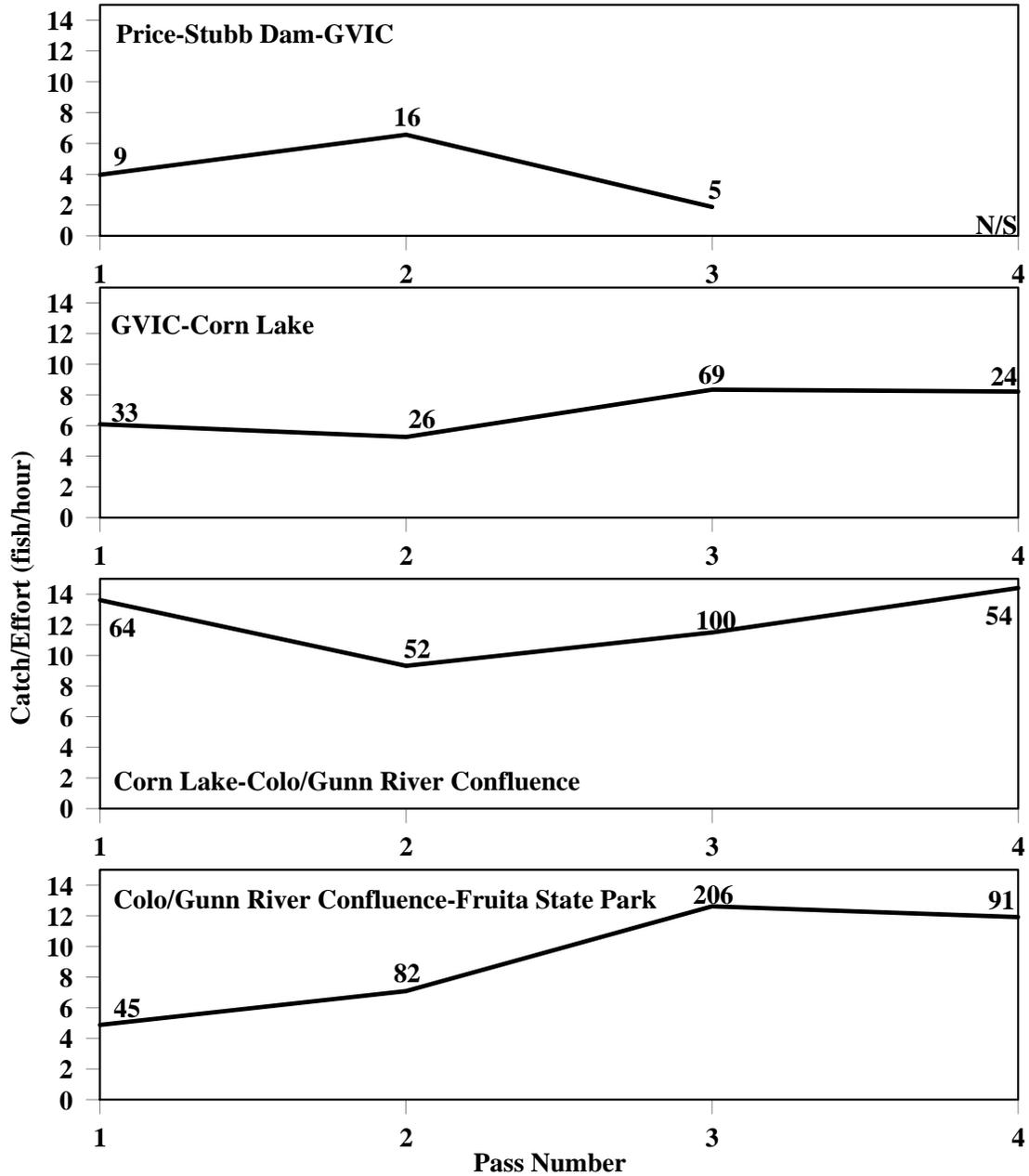


Figure 8. Catch effort (fish/hr) by pass and by river segment for smallmouth bass collected from main channel habitats in the Upper Colorado River from river mile 187.7 to 127.6 (Price-Stubb Dam to the Westwater, UT, Ranger Station) and in the Lower Gunnison River from river mile 3.0–0.7 (Redlands Dam to the Colorado/Gunnison River confluence), July and August 2004 with electrofishing. Note: The number immediately above the bar is the total number of fish collected; N/S=not sampled. See Tables 1, 2, and 3 for statistics regarding numbers of fish and catch effort by sampling pass and river segment.

2004--Smallmouth Bass Colorado River

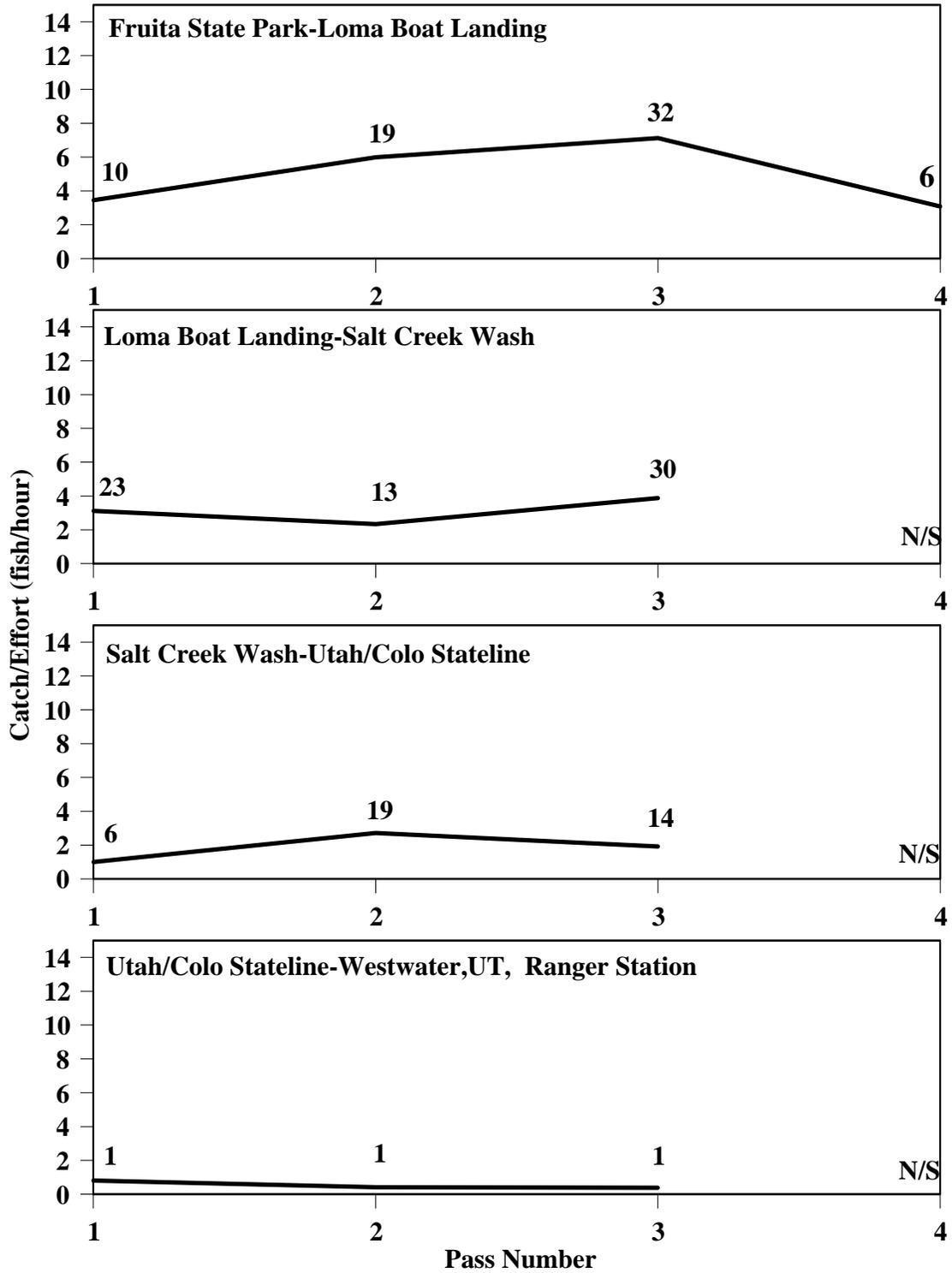


Figure 8. (cont'd).

**2004--Smallmouth Bass
Lower Gunnison River**

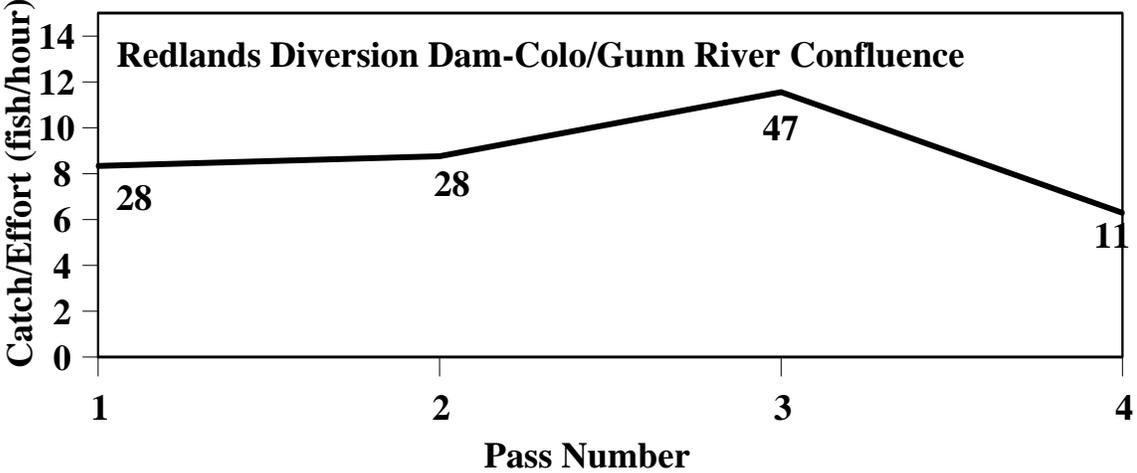


Figure 8. (cont'd).

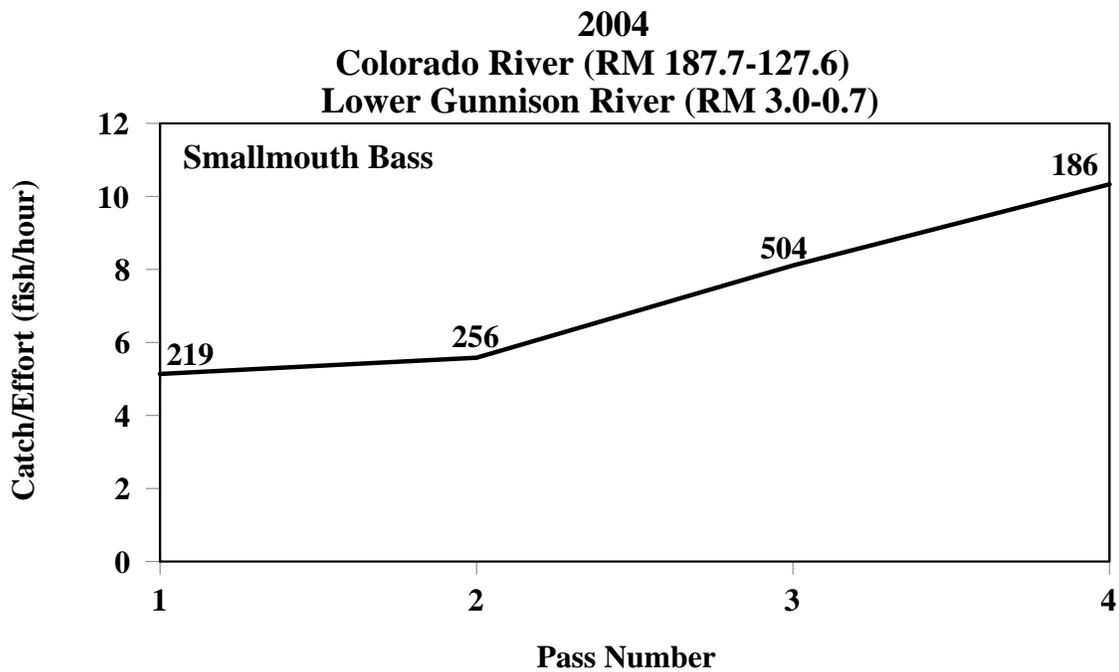
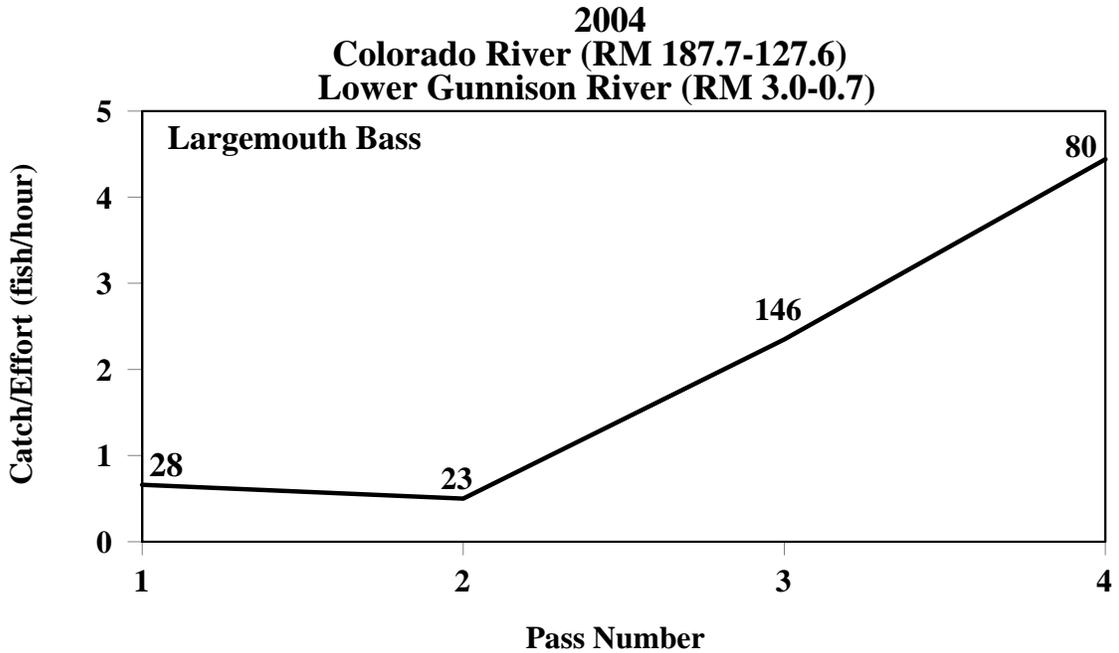
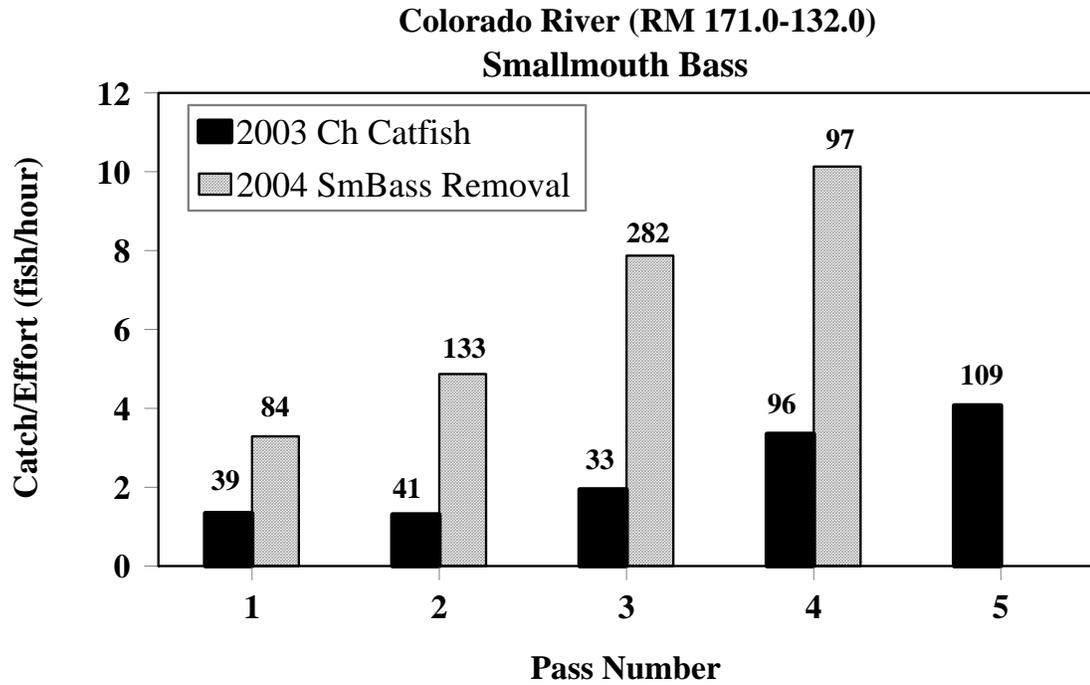
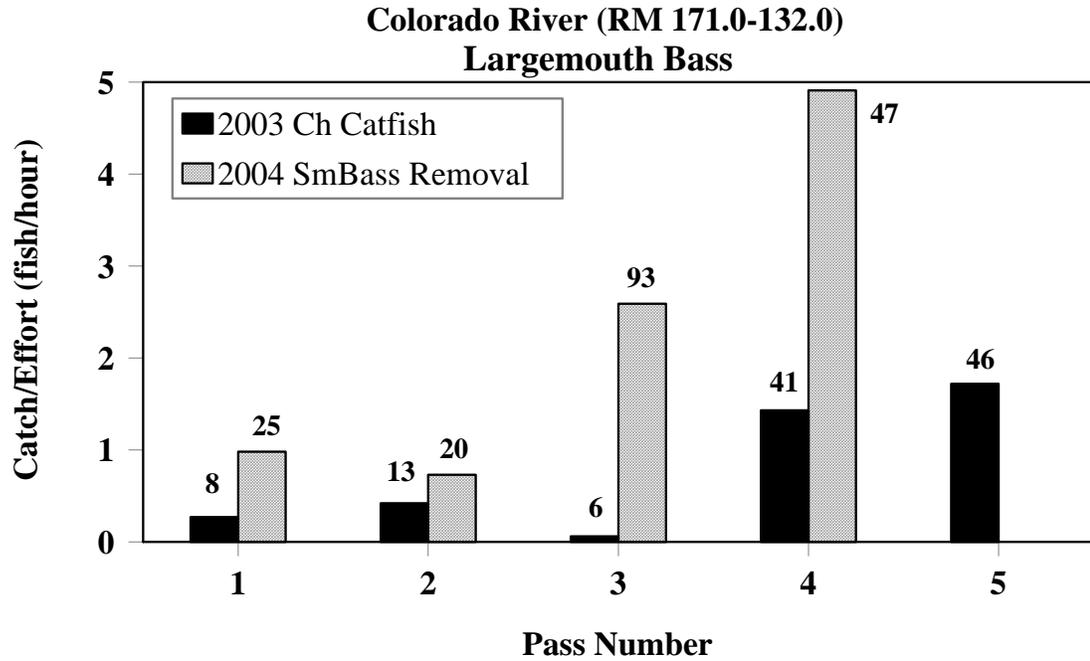


Figure 9. Overall catch effort (fish/hr) for largemouth bass (TOP) and smallmouth bass (LOWER) collected from main channel habitats in the Upper Colorado River with electrofishing from river mile 187.7 to 127.6 (Price-Stubbs Dam to the Westwater, UT, Ranger Station) and in the Lower Gunnison River from river mile 3.0–0.7 (Redlands Dam to the Colorado/Gunnison River confluence), July and August 2004 for four passes during the smallmouth bass removal project. Note: The number immediately above the bar is the total number of fish collected. See Table 3 for statistics regarding overall numbers of fish and overall catch effort.



F
Figure 10. Overall catch effort comparison (fish/hr) by sampling pass for largemouth bass (TOP) and smallmouth bass (LOWER) collected with boat-based electrofishing from main channel habitats in two different river segments in the Colorado River (Colorado/Gunnison River confluence to the Utah/Colorado Stateline) during the 2003 summer channel catfish removal evaluation and 2004 smallmouth bass removal project. Note: the number immediately above the bar is the total number of fish collected.

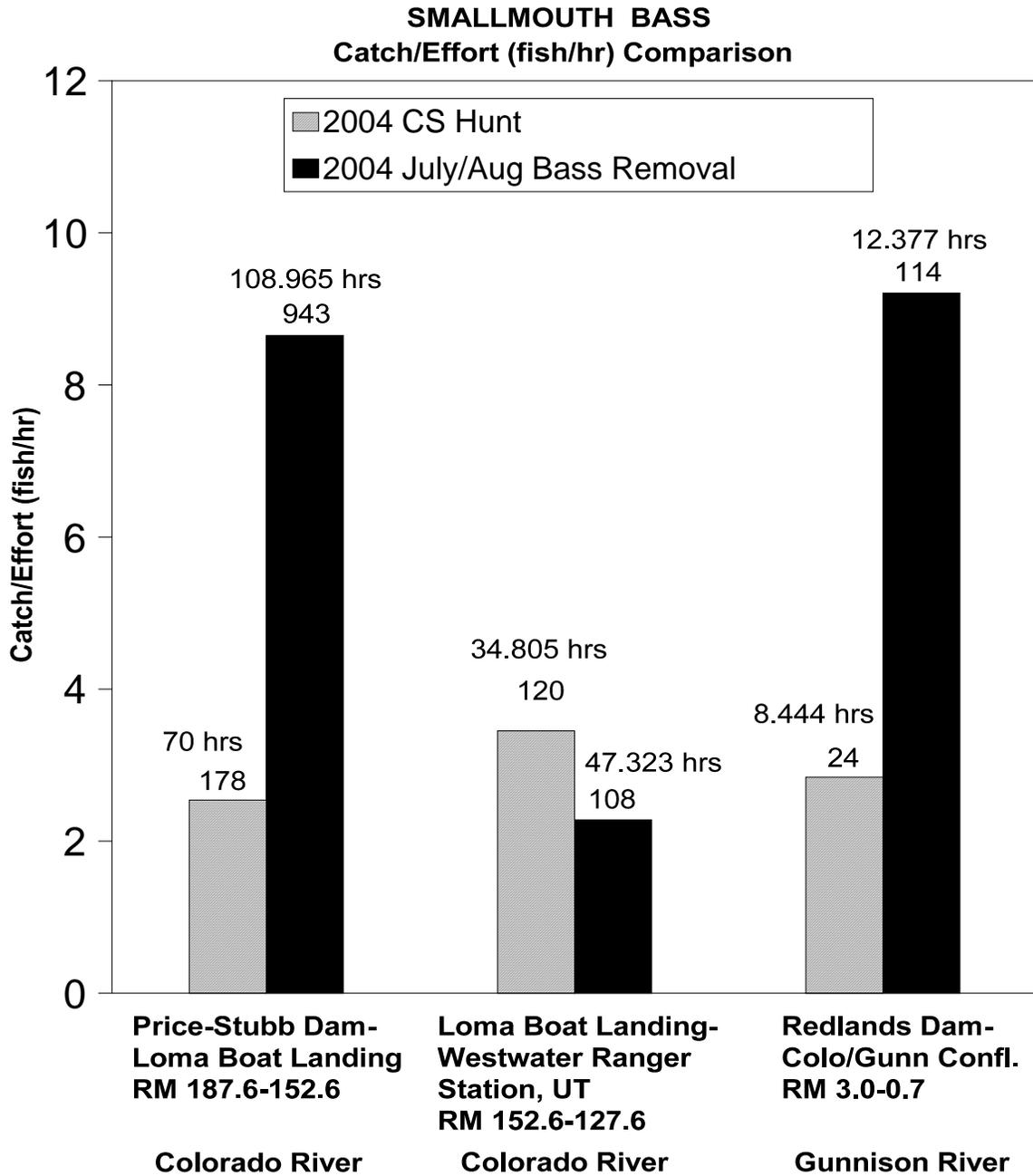


Figure 11. Overall catch effort comparison (fish/hr) for smallmouth bass collected with boat-based electrofishing in main channel habitats in two different river segments in the Colorado River (Price-Stubb Dam to the Loma Boat Landing and Loma Boat Landing to the Westwater Ranger Station, UT) and one river segment in the Lower Gunnison River (Redlands Dam to the Colorado/Gunnison River confluence) during the 2004 spring Colorado pikeminnow population monitoring and the 2004 summer smallmouth bass removal project. Note: passes within project were combined. The number immediately above the bar is the total number of fish collected; effort is given in hours electrofished.

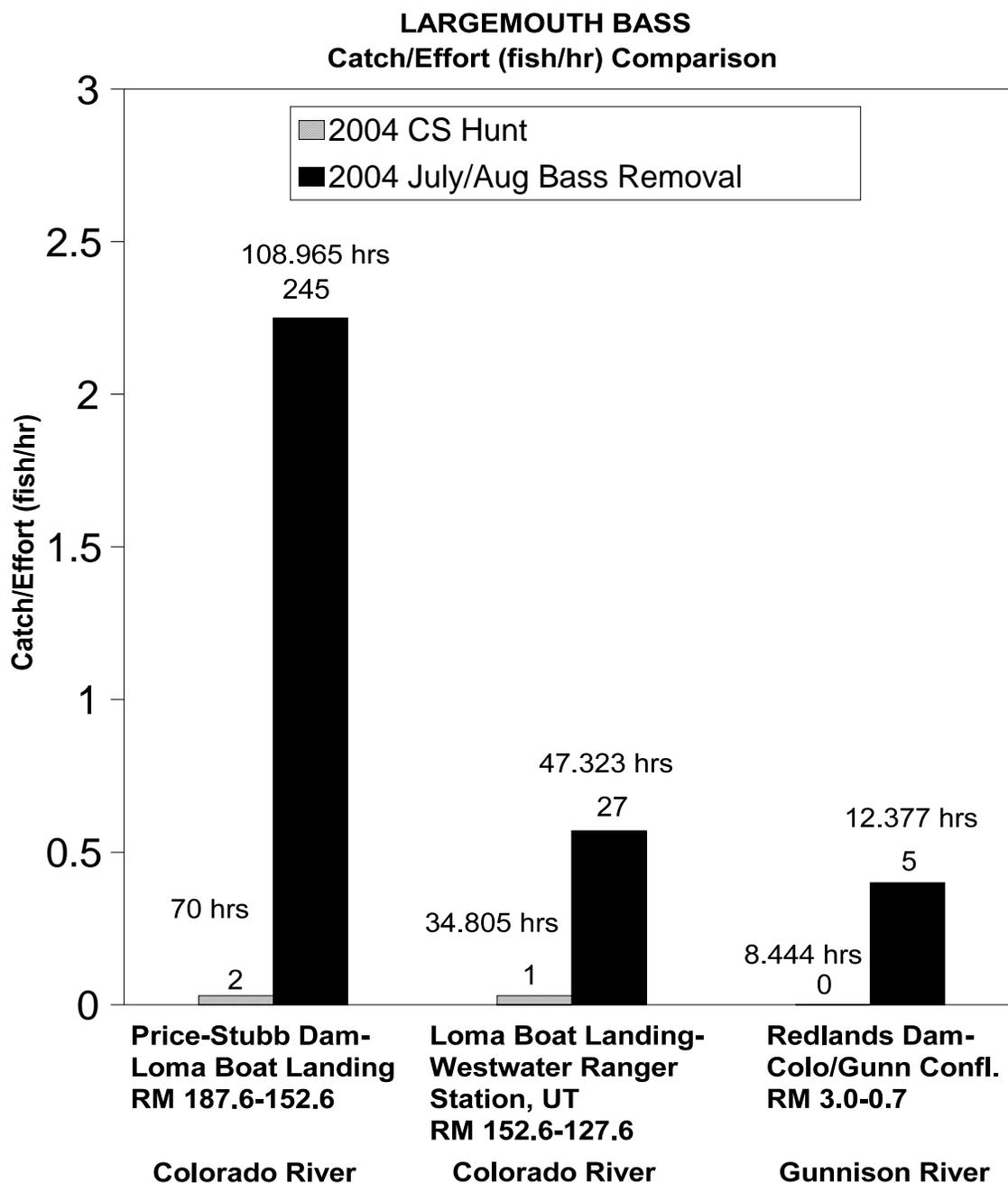


Figure 12. Overall catch effort comparison (fish/hr) for largemouth bass collected with boat-based electrofishing in main channel habitats in two different river segments in the Colorado River (Price-Stubb Dam to the Loma Boat Landing and Loma Boat Landing to the Westwater Ranger Station, UT) and one river segment in the Lower Gunnison River (Redlands Dam to the Colorado/Gunnison River confluence) during the 2004 spring Colorado pikeminnow population monitoring and the 2004 summer smallmouth bass removal project. Note: passes within a project were combined. The number immediately above the bar is the total number of fish collected; effort is given in hours electrofished.

APPENDIX B

Appendix B includes figures, tables, and text slides presented on December 8, 2004, in Grand

Junction, Colorado, at the Nonnative Fish Management Workshop that were not included in the aforementioned 2004 Annual Report for Recovery Program Number 126

**ACTUAL NUMBERS OF FISH BY PASS
Price-Stubb-Westwater, UT, and the Lower
Gunnison River**

Smallmouth Bass

<u>Pass 1</u>	<u>Pass 2</u>	<u>Pass 3</u>	<u>Pass 4</u>	<u>Totals</u>
219	256	504	186	1,165

Largemouth Bass

<u>Pass 1</u>	<u>Pass 2</u>	<u>Pass 3</u>	<u>Pass 4</u>	<u>Totals</u>
28	23	146	80	277

Black Crappie/Green Sunfish/Bluegill

<u>Pass 1</u>	<u>Pass 2</u>	<u>Pass 3</u>	<u>Pass 4</u>	<u>Totals</u>
141	105	384	131	761

**Reconnaissance Sampling
Upper Colorado River**

	<u>Smallmouth Bass</u>	<u>Largemouth Bass</u>	<u>Green Sunfish</u>	<u>Walleye</u>
Rifle Bridge- Rulison Bridge	20	42	8	1
Rulison Bridge- Parachute Bridge	0	4	3	0
Parachute Bridge- Debeque I-70 Bridge	1	8	19	0
Debeque I-70 Bridge- Beavertail Mountain	0	11	6	0

