

- I. Project Title: Evaluating effects of non-native predator removal on native fishes in the Yampa River, Colorado
  
- II. Principal Investigator(s): Larval Fish Laboratory  
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- III. Project Summary: Control actions for several non-native fish predators have been implemented in several rivers of the upper Colorado River Basin but effects of those removals on restoration of native fishes is unknown. Understanding the response of the native fish community to predator removal is needed to understand if removal programs are having the desired effect. Therefore, the objective of this project is to document fish community changes in response to predaceous fish removals in a reach of the Yampa River, Colorado. A general hypothesis for this work might be whether non-native fishes negatively affect native ones or not.
  
- IV. Study Schedule: *2004 to 2007*
  
- V. Relationship to RIPRAP:  
REDUCE NEGATIVE IMPACTS OF NONNATIVE FISHES AND SPORTFISH MANAGEMENT ACTIVITIES (NONNATIVE AND SPORTFISH MANAGEMENT)  
Green River Action Plan: Yampa and Little Snake Rivers: Formal program guidance is yet being developed.
  
- VI. Accomplishment of FY 2007 Tasks and Deliverables, Discussion of Initial Findings and Shortcomings:

In 2007 we sampled 72 habitat areas in the Yampa River, 36 in the control reach and 36 in the treatment reach (Table 1). Twenty-one habitat areas were isolated pools, with fewer numbers of backwaters, embayments, shoelines, and other habitat types (Table 2). In all reaches and habitat types, 14,951 fish were sampled (Table 3). Native fishes (n = 235) constituted 1.6% of that total, with most (n = 163) occurring in the treatment reach where adult and large juvenile smallmouth bass were removed, along with age-0 smallmouth bass. Most of those native fishes (n = 205, 87%) were taken in isolated pools where few or no smallmouth bass occurred regardless of whether the habitat area was in the control and treatment reach; only 30 native fish were captured in the mainstem (Table 4). Importantly, a native species, mottled sculpin *Cottus bairdi*, were captured for the first time during this study (n = 8), with all fish coming from the control reach. Most

Table 1. Isolated pool and main channel sampling sites in the Juniper reach of the Yampa River, river miles 100-124, in 2007.

	Control	Treatment	Grand Total
Isolated Pool	13	8	21
Main Channel	23	28	51
Grand Total	36	36	72

Table 2. Number of sampling sites in each habitat type in the control and treatment sections of the Juniper reach of the Yampa River, river miles 100-124, in 2007. BA = backwater, ED = eddy, EM = embayment, IP = isolated pool, PO = pool, RI = riffle, RU = run, SH = shoreline.

Habitat code	Control	Treatment	Grand Total
BA	7	11	18
ED	3	2	5
EM	8	4	12
IP	13	8	21
PO			0
RI	1	3	4
RU		1	1
SH	4	7	11
Grand Total	36	36	72

Table 3. Number of fish captured in control and treatment sections of the Juniper reach of the Yampa River, river miles 100-124, in 2007. BH = bluehead sucker, FM = flannelmouth sucker, MS = mottled sculpin, RT = roundtail chub, SD = speckled dace, BB = black bullhead, BC = black crappie, BG = bluegill, BS = brook stickleback, CP = common carp, CR = creek chub, FH = fathead minnow, GS = green sunfish, ID = Iowa darter, NP = northern pike, PK = plains killifish, RD = reside shiner, RS = red shiner, SMB = smallmouth bass, SS = sand shiner, WS = white sucker.

	Species	Control	Treatment	Grand Total
Native Species	BH	12	14	26
	FM	13	6	19
	MS	8		8
	RT	1	142	143
	SD	38	1	39
Non Native Species	BB	1779	620	2399
	BC	8	2	10
	BG	1		1
	BGxGS	1		1
	BS	131	49	180
	CP	136	1108	1244
	CR	195	156	351
	FH	2174	342	2516
	GS	2	3	5
	ID	91	19	110
	NP	1		1
	PK		11	11
	RD	7		7
	RS	1		1
	SMB	2096	1447	3543
	SS	429	1747	2176
	WS	1475	664	2139
WSxBH		3	3	
WSxFM	7	11	18	
Grand Total		8606	6345	14951

Table 4. Number of fish captured in isolated pool and main channel areas, control and treatment sections combined, of the Juniper reach of the Yampa River, river miles 100-124, in 2007. BH = bluehead sucker, FM = flannelmouth sucker, MS = mottled sculpin, RT = roundtail chub, SD = speckled dace, BB = black bullhead, BC = black crappie, BG = bluegill, BS = brook stickleback, CP = common carp, CR = creek chub, FH = fathead minnow, GS = green sunfish, ID = Iowa darter, NP = northern pike, PK = plains killifish, RD = reside shiner, RS = red shiner, SMB = smallmouth bass, SS = sand shiner, WS = white sucker.

	Species	Isolated Pool	Main Channel	Grand Total
Native Species	BH	26		26
	FM	18	1	19
	MS		8	8
	RT	128	15	143
	SD	33	6	39
Non Native Species	BB	323	2076	2399
	BC	5	5	10
	BG		1	1
	BGXGS		1	1
	BS	134	46	180
	CP	674	570	1244
	CR	160	191	351
	FH	2207	309	2516
	GS	1	4	5
	ID	16	94	110
	NP		1	1
	PK		11	11
	RD	7		7
	RS	1		1
	SMB	761	2782	3543
	SS	414	1762	2176
	WS	1453	686	2139
WSXBH	3		3	
WSxFM	16	2	18	
Grand Total		6380	8571	14951

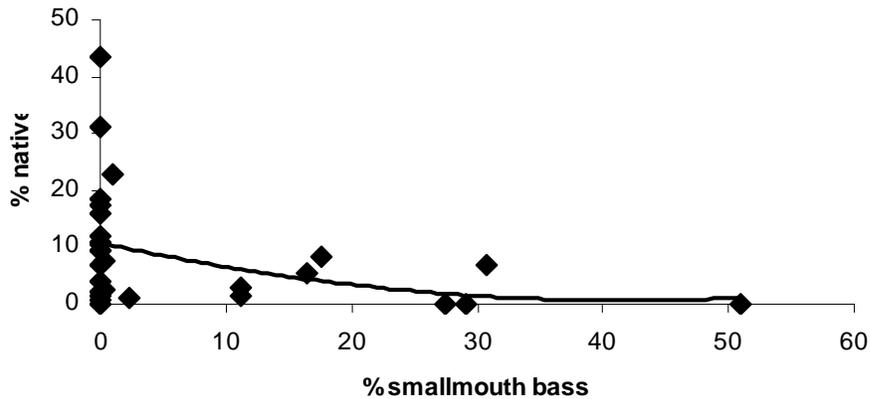


Figure 1. Relationship of % native fish in samples from isolated pools in control and treatment reaches in the Juniper reach of the Yampa River, river miles 100-124, as a function of % of smallmouth bass in samples. Samples were from isolated pools sampled in 2003-2007. One sample with 89.5% bass and no native fish was excluded to better show the relationship.

native fishes captured in this study in years 2003-2006 were also captured in isolated pools, regardless of whether they were located in the control or treatment reach. This data is provisional because we only recently finished field work in the Yampa River and analysis and sample work is not yet complete. We plan to report result of 2007 sampling at the December 2007 predator fish workshop in Grand Junction. Because results of 2006 sampling were not available due to field commitments on this project through October, the FY 2006 results are discussed below. Relevant data from previous presentations are also placed at the end of this report so that comparisons can be made. Additionally, we completed a report approved by the Biology Committee in October 2007 that summarized sampling from 2003-2006.

We will also begin analysis of smallmouth bass otoliths collected from the Yampa River. This is being done to better understand effects of streamflow and water temperature on timing and duration of smallmouth bass spawning and hatching dates and growth rates. This will be conducted with FY 08 funds since we only received a portion of the annual budget in FY 07. This analysis is complementary to a similar effort in the Green River under project 115.

In 2006, we sampled 83 habitat areas in the Yampa River, 36 in the control reach and 47 in the treatment reach. Seven habitat areas were isolated pools. In all reaches and habitat types, 14,140 fish were sampled. Native fishes (n = 221) constituted 1.6% of that total, with most occurring in the control reach where adult and large juvenile smallmouth bass were removed but age-0 smallmouth was not conducted. However, most of those native fishes (n = 189, 86%) were taken in isolated pools where few or no smallmouth bass occurred irregardless of whether the habitat area was in the control and treatment reach; only 32 native fish were captured in the mainstem. Most native fishes captured in this study in years 2003-2005 were also captured in isolated pools, irregardless of whether they were located in the control or treatment reach.

Project data collected in FY 05 were reported at the non-native predator workshop conducted in Grand Junction, Colorado, in December 2005. We sampled a total of 88 habitat areas in autumn 2005, in both control (N = 45) and treatment (N = 43) reaches. Habitat types included backwaters, riffles, pools, shorelines, and isolated pools. These locations were sampled mostly with an electric seine, with emphasis on obtaining representative samples of small-bodied fishes.

A total of 13,190 fish were captured in samples in both control and treatment reaches in autumn. Samples were dominated by non-native fishes in both treatment and control reaches. Treatment reaches supported about < 0.3 % native fishes including roundtail chub and speckled dace. Control reaches supported 1.8 % native fishes of those same taxa, but only 0.3% of those were captured in the main channel. The rest were captured in an isolated pool that was free of smallmouth bass. Smallmouth bass relative abundance in 2005 was high initially but was reduced via removal sampling such that relative abundance of about half that in the treatment reach compared to the control. Sand shiner and white sucker abundance was higher in the treatment reach compared to the control (38.1 vs 6.9 sand shiner, 19.1 vs. 13.6 white sucker, in treatment vs control areas respectively). Increased abundance of those small-bodied fishes, and reduced abundance of smallmouth bass, may be indicative of a treatment effect.

Similar to 2003 and 2004, isolated pool and main channel (all habitat types) fish communities differed in fish composition. In main channel habitat, 12,896 fish were captured and 1.0% were native fish. In comparison, 294 fish were captured in the single isolated pool and 44.9% were native. Smallmouth bass were 45% of the main channel fish community but none were found in the isolated pool. More native fish were captured in the single isolated pool sample than in all 87 other main channel samples in control or treatment areas.

A comparison of data collected in 1981 from the same Yampa River reach to that collected in 2003 to 2007 suggested a large influx in large-bodied predaceous fishes since then. Samples also showed a large decline in abundance of small-bodied native fishes. In 1981, small-bodied native fishes from 2 reaches within the study area were 20 and 33% of samples collected, compared to <<10% in most years.

VII. Recommendations: We will present a more complete summary of data in autumn 2007 in FY 2008 at the Non-native fish workshop. We also completed a report in March 2007, which was subsequently approved by the Biology Committee in October 2007, on work completed from 2003-2006.

Bestgen, K. R., C. D. Walford, and A. A. Hill. 2007. Native fish response to removal of non-native predator fish in the Yampa River, Colorado. Final report to the Recovery Implementation Program for Endangered Fishes in the Upper Colorado River Basin. U. S. Fish and Wildlife Service, Denver, CO. Larval Fish Laboratory Contribution 150.

VIII. Project Status: On track and ongoing.

IX. FY 2007 Budget Status

- A. Funds Provided: \$45,120
- B. Funds Expended: \$45,120

