

BLUE RIVER BARRIER MONITORING, 2018



Chase A Ehlo
Arizona Fish and Wildlife Conservation Office
U.S. Fish and Wildlife Service
60911 HWY 95 Parker, AZ 85344



Submitted to:
Bill Stewart
Bureau of Reclamation
Phoenix Area Office
6150 W. Thunderbird Road, Glendale, AZ 85306

Table of Contents

List of Tables ii

List of Figures ii

Background 1

Methodology..... 1

 Barrier Monitoring 1

 Blue River Monitoring 1

Results 2

 Barrier Monitoring 2

 Randomly Selected Transects 2

 Population Structure 3

Discussion..... 3

Acknowledgements..... 3

Literature Cited 4

Appendix. List of PIT Tags inserted into nonnative fish below the Blue River Barrier..... 12

List of Tables

Table 1. Locations of randomly selected transects and pools for backpack electrofishing and deployment of hoop nets, respectively..... 5

Table 2. Summary of backpack electrofishing effort and mesohabitat at three randomly selected transects Reach 1 of the Blue River, AZ. 6

Table 3. Summary of fish collected with backpack electrofishing at three randomly selected transects on Reach 1 of the Blue River, AZ. 7

Table 4. Summary of native fish captured across all sampling conducted in Reach 1 of the Blue River, AZ. 8

Table 5. CPUE data collected upstream and downstream of the the Blue River barrier over five years. ... 9

List of Figures

Figure 1. Map of the sampling area with sampling sites in the Blue River, AZ..... 10

Figure 2. Length-frequency histogram of the three large bodied species, Roundtail Chub, Sonora Sucker, and Desert Sucker, captured in the Blue River, AZ..... 11

Background

Native fishes are declining throughout Arizona, primarily due to deleterious interactions with nonnative aquatic species. One tool used to curtail the decline is the construction of stream barriers to impede upstream migration of nonnative fish species. The Bureau of Reclamation (Reclamation) has constructed several barriers on stream sites to protect and conserve endangered and candidate/proposed species including: Loach Minnow *Tiaroga cobitis*, Spikedace *Meda fulgida*, Roundtail Chub *Gila Robusta*, Gila Topminnow *Poeciliopsis occidentalis*, and Gila Chub *Gila Intermedia* (undergoing taxonomic review/revision), and other aquatic wildlife including amphibians and reptiles. Reclamation is committed to monitoring stream barriers constructed in accordance with requirements related to the Central Arizona Project for a minimum of five years post-construction. The primary purpose of the monitoring is to evaluate the effectiveness of the barriers. Secondly, monitoring will also provide information on the fish/aquatic community of each stream. Funding was provided to the Arizona Fish and Wildlife Conservation Office to monitor barrier effectiveness over a five year period.

This report details the fifth year of monitoring on the Blue River, including barrier monitoring and sampling and data collection consistent with Arizona Game and Fish Department's annual monitoring efforts on Blue River as a whole. The Blue River is a tributary to the San Francisco River and the much larger Gila River Basin. Native fish historically present in the stream were Longfin Dace *Agosia chrysogaster*, Speckled Dace *Rhinichthys osculus*, Loach Minnow, Sonora Sucker *Catostomus insignis*, and Desert Sucker *Pantosteus clarki* (Minckley & Marsh 2009). Spikedace and Roundtail Chub were introduced in 2012 to expand their current population. Constructed in 2012, the barrier on the Blue River is located 0.8 kilometers above its confluence with the San Francisco River. The purpose of the barrier is to provide nonnative free habitat for endangered Loach Minnow and Spikedace, Roundtail Chub, and other native species (Reclamation 2013).

Methodology

Barrier Monitoring

Sampling was conducted with a Smith-Root Model 12 backpack electrofisher to monitor upstream and downstream of the barrier. Methods roughly followed Marsh (2014), in which 200 meters (m) of stream was sampled below the barrier. Mesohabitat (number of pools, riffles, and runs) were quantified for the sampling reach. In the previous year 200 m of stream was sampled directly above the barrier, but the regular monitoring of the 3 random transects following Arizona Game and Fish Department methodology was deemed sufficient for detecting upstream migration of nonnative fish above the barrier. All fish were measured (in millimeters [mm]) and nonnative fish found above barriers were enumerated and euthanized. Presence of other native aquatic wildlife such as Lowland Leopard Frog *Lithobates yavapaiensis* or Narrow-headed Garter Snake *Thamnophis rufipunctatus* were also noted. Target nonnative species (those species large enough to insert a PIT tag) below barriers were tagged with 134 kHz PIT tags, and 0.91 m x 0.61 m remote PIT scanners will be deployed above barriers in subsequent years to detect upstream movement of fish past the barrier.

Blue River Monitoring

In addition to barrier monitoring, AZFWCO conducted annual monitoring of Reach 1 in the Blue River which stretches from the barrier upstream to the Pat Mesa Tributary. Annual monitoring in Blue River followed protocols detailed in the Blue River Monitoring Plan (AZGFD et. al. 2012). Arizona Game and Fish Department divided Reach 1 of the Blue River into 24-200 m backpack electrofishing transects and labeled 22 pools deemed too deep to effectively backpack electrofish (AZGFD et. al. 2012). AZFWCO randomly selected 3-200 meter transects for backpack electrofishing (Table 1; Figure 1). In the previous year 7 pools were randomly selected for deploying hoop nets; however, due to inclement weather and lack of personnel, hoop nets were not deployed this year.

Transects were delineated by mesohabitat types (run, riffle, pool, and cascade) and electrofishing occurred upstream with one electrofisher and two netters. At the end of each mesohabitat within the transect, fish were identified to species, total length (TL) was measured (millimeters [mm]) and electrofishing seconds (sec) and distance (meters [m]) were recorded before sampling the next mesohabitat. Electrofishing ceased at the end of the 200 m transect.

Results

We visited the Blue River on October 31 and November 1, 2018. The weather was characterized by warm sunny days with intermittent thunderstorms. The USGS stream gauge at the Juan Miller Crossing USGS recorded a discharge of 11.2 cubic feet per second (cfs) and water was clear with great visibility for backpack electrofishing.

Barrier Monitoring

Macro-habitat for the 200 m downstream transect was predominately comprised of riffle habitat with the exception of a 10 m pool at the beginning of the transect and a pool that comprised the final five meters up to the base of the barrier. A total of 34 individuals, two native and one nonnative species, were captured in 1,240 sec of electrofishing including: native Longfin Dace and Desert Sucker and nonnative Channel Catfish *Ictalurus punctatus* (Table 3). The majority of the fish captured was the native Longfin Dace (Table 3). All four Channel Catfish were captured (and PIT tagged [Appendix]) in the pool directly below the barrier which may be concerning in high flow events in which laminar flows over the barrier may make upstream movement possible.

Randomly Selected Transects

No nonnative species were encountered upstream of the barrier. The furthest downstream transect was comprised of two mesohabitats: approximately 130 m of riffle habitat and 70 m of run habitat (Table 2). A total of 8 fish, including three native species (Longfin Dace, Sonora Sucker, and Desert Sucker), were captured in 1,004 sec of electrofishing (Table 3).

The middle transect was comprised of three mesohabitats: approximately 8 m of pool habitat, 150 m of run habitat, and 42 m of riffle habitat (Table 2). A total of 77 fish, including five native species, were captured in 1,716 sec of electrofishing. The majority of fish captured were Longfin Dace, Sonora Sucker, and Desert Sucker, with low numbers of Roundtail Chub and Spikedace (Table 3).

The furthest upstream transect was comprised of two habitats: approximately 130 m of riffle habitat and 70 m of run habitat (Table 2). A total of 45 fish, including six native species, were captured in 1,316 sec of electrofishing. The majority of fish captured were Longfin Dace, Sonoran Sucker, and Desert Sucker. Two Spikedace, one Speckled Dace, and one Loach Minnow were also captured (Table 3).

Population Structure

When combining all sampling, Longfin Dace encompassed the majority of the catch (Table 4). Sonoran Sucker and Desert Sucker had identical catch numbers as did Roundtail Chub and Spikedace. The large-bodied fish (i.e. Sonora Sucker, Desert Sucker and Roundtail Chub) were mostly comprised of small young-of-year and sub-adult fish with few fish over 100 mm (Table 4; Figure 1). The majority of Roundtail Chub were around 100 mm in size (Table 4; Figure 1). This suggests that Roundtail Chub have successfully reproduced and recruited in the past, yet there was no evidence of young-of-year fish in the lower reach. The other stocked fish, Spikedace, has also shown signs of recruitment with one individual as small as 36 mm.

Discussion

Although direct comparisons with previous sampling events lack statistical power, inferences can be made. In 2012, the first year of monitoring, the only native fish encountered was Longfin Dace. In subsequent years, diversity increased, particularly after stocking of Roundtail Chub, Spikedace, and Loach Minnow. All three of these species were still present in 2018. However, overall catch rates were lower in 2018 compared to the previous two sampling events (Table 5), and Roundtail Chub catch rates were drastically reduced in 2018 (Table 5). There was also a lack of large adult Roundtail Chub, Sonoran Sucker, and Desert Sucker but is likely due to the absence of hoop netting which is more efficient at sampling the large deep pools than backpack electrofishing. Overall, the native fish community is intact and nonnatives continue to be absent above the barrier indicating their numbers may be decreasing or absent and suggests that the barrier is functioning as intended.

Acknowledgements

We thank B. Stewart (USBR) and K. Mosher (USBR) for assistance with background information, logistics, and sampling protocol. We thank M. Thorson and M. Dazen for assistance with field work and data collection.

Literature Cited

- AZGFD (Arizona Game and Fish Department), Bureau of Reclamation, US Forest Service, and US Fish and Wildlife Service. 2012. Blue River native fish restoration project: stocking, non-native removal, and monitoring plan. Arizona Game and Fish Department, Phoenix.
- Ehlo, C.E. Blue River fish barrier monitoring. Report submitted to Bureau of Reclamation, U.S. Fish and Wildlife Service, Parker, AZ. 13 pages.
- Marsh, P.C., B.R. Kesner and J.C.G. Marsh. 2012. Blue River fish barrier monitoring. Report, Reclamation Order No. R12PB32035 under BPA No. R10PA32064, Marsh & Associates, Tempe, Arizona. 12 pages.
- Marsh, P.C., B.R. Kesner and J.C.G. Marsh. 2013. Blue River fish barrier monitoring. Report, Reclamation Order No. R12PB32035 under BPA No. R10PA32064, Marsh & Associates, Tempe, Arizona. 13 pages.
- Marsh, P.C., B.R. Kesner and J.B. Wisenall. 2014. Blue River fish barrier monitoring. Report, Reclamation Order No. R12PB32035 under BPA No. R10PA32064, Marsh & Associates, Tempe, Arizona. 14 pages.
- Minckley, W.L. and P.C. Marsh. 2009. Inland fishes of the greater southwest: chronicle of a vanishing biota. University of Arizona Press, Tucson. 426 pages.
- Reclamation (Bureau of Reclamation). 2013. Blue River Fish Barrier Final Construction Report. Bureau of Reclamation, Phoenix Area Office, September 2010. 108 pages.

Table 1. Locations of randomly selected transects and pools for backpack electrofishing and deployment of hoop nets, respectively.

	Sampling Site	Easting	Northing
Transect	2	668170	3676690
	15	668161	3678349
	20	668571	3678458

Table 2. Summary of backpack electrofishing effort and mesohabitat at three randomly selected transects Reach 1 of the Blue River, AZ.

Transect	Habitat	Seconds	Distance Sampled (m)
2	Riffle	440	110
	Run	320	60
	Riffle	138	20
	Run	106	10
	<i>TOTAL</i>	<i>1004</i>	
15	Run	474	60
	Pool	100	8
	Riffle	210	22
	Run	224	30
	Riffle	106	5
	Run	329	60
	Riffle	273	15
<i>TOTAL</i>	<i>1716</i>		
20	Run	273	40
	Riffle	875	130
	Run	168	30
	<i>TOTAL</i>	<i>1316</i>	

Table 3. Summary of fish collected with backpack electrofishing at three randomly selected transects on Reach 1 of the Blue River, AZ. CPUE refers to Catch Per Second of Electrofishing in 1,004, 1,716, 1,316, and 1,240 seconds for transects 2, 15, 20, and downstream respectively. Numbers in parentheses on mean TL refer to minimum and maximum total lengths.

Transect	Species	Number Collected	CPUE	Mean TL (mm)
2	Longfin Dace	1	0.001	63.00 (63-63)
	Sonora Sucker	3	0.003	176.67 (172-180)
	Desert Sucker	2	0.002	80.50 (76-85)
	<i>TOTAL</i>	8	<i>0.008</i>	
15	Longfin Dace	31	0.018	45.71 (26-65)
	Sonora Sucker	16	0.009	70.13 (46-86)
	Roundtail Chub	9	0.005	94.67 (72-120)
	Spikedace	7	0.004	47.43 (36-72)
	Desert Sucker	12	0.007	67.83 (44-176)
	<i>TOTAL</i>	77	<i>0.045</i>	
20	Longfin Dace	20	0.015	47.10 (37-65)
	Sonora Sucker	11	0.008	64.91 (42-74)
	Spikedace	2	0.002	56.00 (50-62)
	Desert Sucker	10	0.008	76.20 (55-127)
	Speckled Dace	1	0.001	72.00 (72-72)
	Loach Minnow	1	0.001	64.00 (64-64)
	<i>TOTAL</i>	45	<i>0.034</i>	
Downstream	Longfin Dace	27	0.022	56.33 (33-68)
	Channel Catfish	4	0.003	296.25 (90-390)
	Desert Sucker	3	0.002	85.67 (84-88)
	<i>TOTAL</i>	34	<i>0.027</i>	

Table 4. Summary of native fish captured across all sampling conducted in Reach 1 of the Blue River, AZ.

Species	Number Collected	Relative Abundance	Mean TL (mm)	Minimum TL (mm)	Maximum TL (mm)
Longfin Dace	79	0.48	49.91	26	68
Sonora Sucker	30	0.18	78.87	42	180
Roundtail Chub	9	0.05	94.67	72	120
Spikedace	9	0.05	49.33	36	72
Desert Sucker	27	0.16	73.85	44	176
Speckled Dace	1	0.01	72.00	72	72
Loach Minnow	1	0.01	64.00	64	64
TOTAL	164				

Table 5. CPUE data collected on the Blue River barrier over five years. Data for 2012, 2013, and 2014 were derived from Marsh et. al. (2012), Marsh et. al. (2013), Marsh et. al. (2014), and Ehlo et al. (2017) respectively. CPUE refers to Catch Per Second of Electrofishing. *Denotes a native species.

	Species	2012	2013	2014	2017	2018
Upstream	Fathead Minnow	0.238	0.013	0.022		
	Green Sunfish	0.019	0.001			
	Red Shiner			0.002		
	Longfin Dace*	0.032	0.193	0.261	0.069	0.013
	Speckled Dace*				0.085	0.0002
	Spikedace*				0.024	0.002
	Loach Minnow*				0.001	0.0002
	Sonora Sucker*		0.003	0.009	0.06	0.007
	Desert Sucker*			0.035	0.083	0.006
	Roundtail Chub*			0.005	0.051	0.002
Downstream	Red Shiner			0.002	0.028	
	Channel Catfish			0.004	0.005	0.003
	Yellow Bullhead	0.031		0.006		
	Fathead Minnow	0.133			0.001	
	Green Sunfish	0.036			0.001	
	Western Mosquitofish	0.077				
	Longfin Dace*	0.02	0.014	0.048	0.029	0.022
	Speckled Dace*		0.008		0.002	
	Desert Sucker*			0.002	0.007	0.002
	Sonora Sucker*				0.003	
TOTAL		0.050	0.060	0.110	0.100	0.031



Figure 1. Map of the sampling area with sampling sites in the Blue River, AZ.

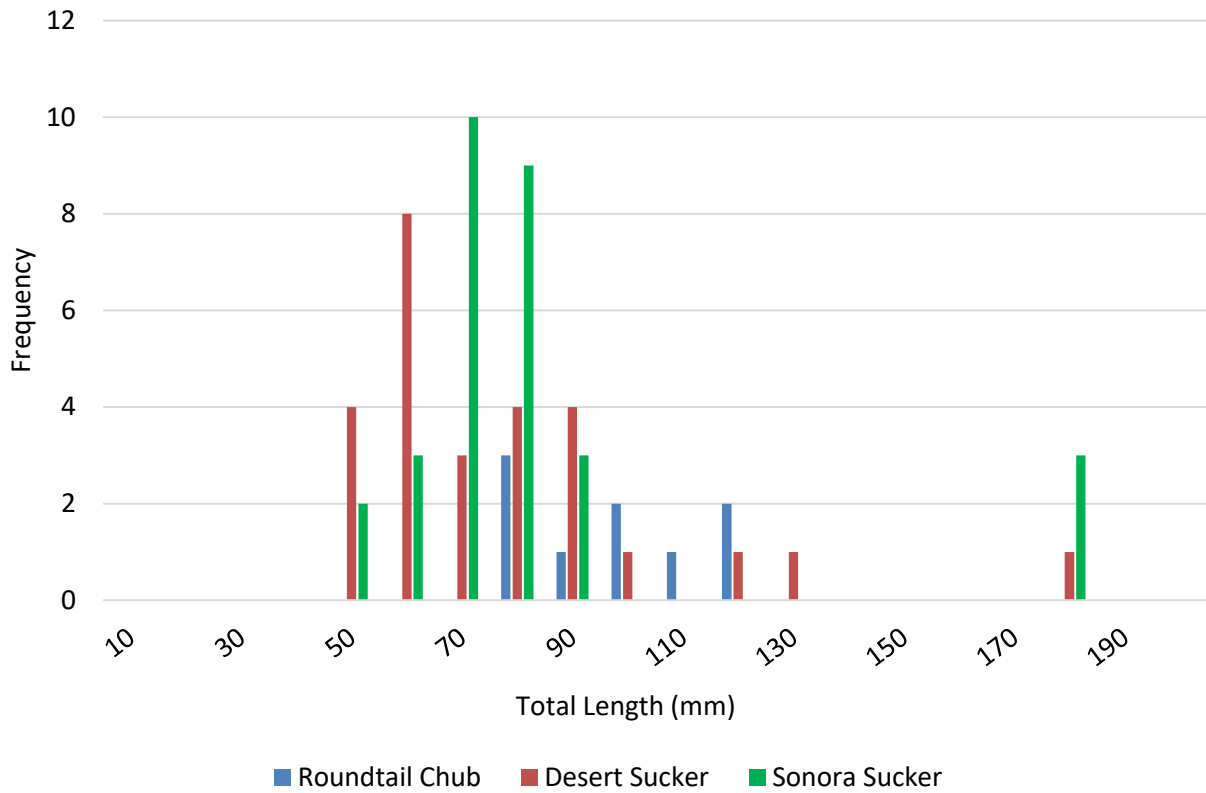


Figure 2. Length-frequency histogram of the three large bodied species, Roundtail Chub, Sonora Sucker, and Desert Sucker, captured in the Blue River, AZ.

Appendix. List of PIT Tags inserted into nonnative fish below the Blue River Barrier.

Species	TL	PIT tags
Channel Catfish	390	003C0228C5
Channel Catfish	340	003C0228AD
Channel Catfish	365	003C0228D8
Channel Catfish	90	003C0228D7