

RIO GRANDE SILVERY MINNOW AUGMENTATION IN THE MIDDLE RIO GRANDE,
NEW MEXICO

Annual Report 2010



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Middle Rio Grande Endangered Species Act Collaborative Program

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Cover Photo: VIE marking of Rio Grande silvery minnow

Credit: Jason Remshardt, USFWS

TABLE OF CONTENTS

EXECUTIVE SUMMARY	6
INTRODUCTION	7
METHODS	8
Study Area	8
Augmentation.....	10
Post-Augmentation Monitoring	10
Length-Frequency	11
Recapture Data from Other Researchers.....	12
Fish Community.....	12
RESULTS	12
Augmentation.....	12
Post-Augmentation Monitoring	13
Length-Frequency	14
Recapture Data from Other Researchers.....	18
Fish Community.....	18
DISCUSSION	18
ACKNOWLEDGEMENTS	21
LITERATURE CITED	22
Appendix A.....	24
Appendix B.	26
Appendix C.	59

LIST OF TABLES

Table 1. Rio Grande silvery minnow augmentation monitoring site descriptions, 2010.	11
Table 2. Status, numbers, percent of total, percent occurrence, and density for all species collected during NMFWCO augmentation monitoring at all sites combined in 2010	14

LIST OF FIGURES

Figure 1. Map of study area for Rio Grande silvery minnow augmentation and monitoring 2010.	9
Figure 2. Catch rates for September 2010 Population Monitoring.....	13
Figure 3. Growth rate for unmarked Rio Grande silvery minnow from slope (B) of the regression for mean standard lengths (with 95% confidence interval) between age at month estimates in 2010.....	15
Figure 4. Length-frequency histograms of unmarked Rio Grande silvery minnow captured between January and June 2010.....	16
Figure 5. Length-frequency histograms of unmarked Rio Grande silvery minnow captured between July and December 2010.	17

EXECUTIVE SUMMARY

- In 2010, we continued to implement the revised augmentation plan. This revised augmentation plan provides a detailed stocking strategy only for the Middle Rio Grande, New Mexico between 2008 and 2012 for Isleta and San Acacia Reaches.
- Based on population monitoring catch rates, 8 sites required stocking in 2010, compared with 1 in 2009 and no stocking in 2008.
- In 2010, we continued monitoring on tribal lands in Angostura and Isleta reaches to supplement data collection from other researchers.
- In 2010, while no recaptures of hatchery released Rio Grande silvery minnow were documented from this project, a total of 472 recaptures were documented from other researchers.

INTRODUCTION

In 2001, the “Rio Grande silvery minnow augmentation plan” was created. Since that time, over 1,200,000 hatchery-raised Rio Grande silvery minnow have been released into the Middle Rio Grande, New Mexico. Initially the goal was to produce 500,000 annually for release based primarily on the expected capacities of propagation facilities, along with knowledge about current population status and suggestions from geneticists. Our stocking and monitoring efforts were initially focused in the Angostura Reach (Albuquerque) where catch rates of wild Rio Grande silvery minnow were extremely low and the expected benefit of augmentation could be maximized (Remshardt and Davenport 2003). Between 2002 and 2004, 100,000 to 200,000 Rio Grande silvery minnow were released annually in the Angostura Reach.

Starting in 2005, augmentation was expanded to include the Isleta and San Acacia Reaches. In addition to augmentation and other conservation measures such as habitat improvement, improved spring runoff and habitat conditions for juvenile survival in 2005 created an opportunity for Rio Grande silvery minnow to increase in abundance. Between 2005 and 2007, 100,000 to 400,000 Rio Grande silvery minnow were released annually throughout all reaches (Remshardt 2008). In 2008, we began implementing the revised 5-year Rio Grande silvery minnow Augmentation Plan (Remshardt 2008). Favorable conditions and recruitment beginning in 2008 meant that no augmentation was needed that year.

This annual report summarizes findings between January and December 2010. This effort reflects management needs identified in the Middle Rio Grande Endangered Species Program (Program), Item A.2.2 for Rio Grande silvery minnow as well as the Rio Grande Silvery Minnow Recovery Plan (RGSMRP; U.S. Fish and Wildlife Service 2010). These include development and refinement of augmentation protocols for use in the middle Rio Grande (Task 8b) and annual monitoring of augmented populations as identified as a needed task (Task 8d) by the Program and RGSMRP, respectively.

The ultimate goal of augmentation is to re-establish self-sustaining populations of Rio Grande silvery minnow in the MRGNM. Long-term benefits of this study are to: 1) augment populations within the MRGNM; and 2) evaluate stocking efforts and methods.

Specific objectives of augmentation and monitoring activities in 2010 were to:

- 1) Continue using revised stocking protocol; calculate number of Rio Grande silvery minnow necessary to meet target densities.
- 2) Continue using revised stocking protocol; closely monitor Angostura Reach Rio Grande silvery minnow densities for effects of augmentation.
- 3) Determine temporal and spatial upstream and downstream movement of previously stocked Rio Grande silvery minnow within and among reaches.
- 4) Provide guidance for augmentation activities to maximize survival of Rio Grande silvery minnow.

METHODS

Study Area

This investigation concentrates on areas relative to the known current range within Angostura, Isleta, and San Acacia reaches (Figure 1, Table 1). Angostura Reach (61 km) extends from Angostura Diversion Dam (River Mile (RM) 209.7) to Isleta Diversion Dam (RM 169.3) and includes the cities of Bernalillo, Corrales, and Albuquerque. Isleta Reach (90 km) extends from Isleta Diversion Dam to San Acacia Diversion Dam. This reach includes the southern portion of Isleta Pueblo, cities of Bosque Farms, Valencia, Los Lunas, Belen, and smaller villages such as La Joya, and Bernardo, along with Sevilleta National Wildlife Refuge, all within Bernalillo, Valencia, and Socorro counties. The San Acacia Reach (roughly 76 km) extends from San Acacia Diversion Dam to the headwaters of Elephant Butte Reservoir (the exact location of the lower boundary varies depending upon reservoir water-surface elevation). This reach is relatively remote, including only the city of Socorro and villages of San Acacia, Lemitar, Escondida, and San Antonio along with Bosque del Apache National Wildlife Refuge, within Socorro and Sierra counties.

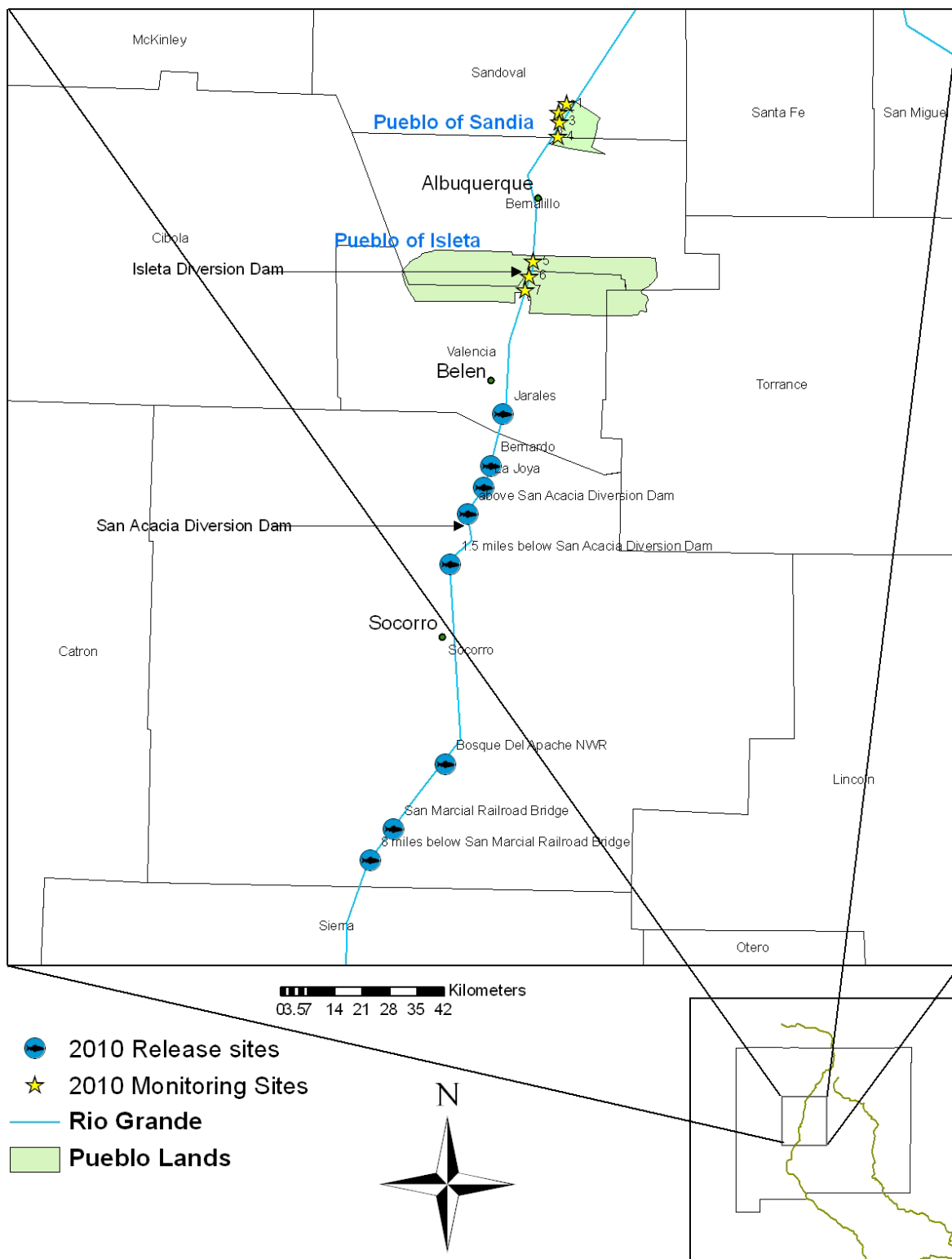


Figure 1. Map of study area for Rio Grande silvery minnow augmentation and monitoring 2010.

Augmentation

As detailed in the revised RGSM augmentation plan 2008-2012 (Remshardt 2008), augmentation efforts were focused only within the Isleta and San Acacia reaches in 2010 and will continue through 2012. This will allow us to accurately assess the long-term benefits of recent (2002-2007) augmentation in the Angostura Reach. The release number (A) for each site (S_i) is calculated using the following formula:

$$AS_i = (C_t - C_o) \times (\text{total estimated area } m^2 \text{ between } S_i \text{ and } S_{i+1})$$

where; C_t = Target catch rate at each site, or 1 fish / 100 m^2 ,
 C_o = Observed catch rate at each site in September
 S_i = Site of release
 S_{i+1} = Next downstream site.

Post-Augmentation Monitoring

Monitoring of stocked fish involved specific post-stocking surveys at 1-month intervals to determine survival, growth and movement by NMFWCO. Monitoring sites are currently maintained within Pueblo boundaries to collect additional recapture data not available from standard population monitoring. These efforts were also used to collect secondary information on fish community structure. Fish were collected with a 3 m x 1.8 m, 3 mm mesh seine. Length of individual seine hauls were measured to the nearest 0.1 meter to estimate sampling effort, which was calculated by multiplying the distance of each seine haul by the effective width of the seine (2.5 m). Catch rates for all fish were calculated as number of fish per 100 m^2 sampled. All mesohabitat types were sampled within each site with a minimum of 30 seine hauls at each sampling location, except at high flows when safe wading was difficult or during intermittent conditions when seizable habitat was limited. Water quality parameters were measured (pH, conductivity, water temperature, air temperature, total dissolved solids, and salinity) at each monitoring site. Standard and total lengths were measured from a minimum of 10 Rio Grande silvery minnow per site, age class (young-of-year and age 1+), including marked and unmarked individuals. All other fish captured were identified and enumerated for each individual seine haul in the field and subsequently released. Scientific and common names are arranged in phylogenetic order and follow Nelson et al. (2004), except where subspecies are noted. The use of subspecific epithets reflects the importance of geographical subdivisions in evolution.

Table 1. Rio Grande silvery minnow augmentation monitoring site descriptions, 2010.

Site #	Site Name	Description
Angostura Reach		
1	Sandia Bosque Line 14	New Mexico, Sandoval County, Rio Grande, Pueblo of Sandia, 1.5 miles downstream of U.S. 550 Bridge crossing, RM 202.0.
2	Lomitas Negras	New Mexico, Sandoval County, Rio Grande, below Rio Ranch #3 Wastewater Treatment Plant Outfall, RM 198.3
3	Dixon Road	New Mexico, Sandoval County, Rio Grande, at Sandia Wasteway Outfall, RM 196.0
4	North Amafca	New Mexico, Sandoval County, Rio Grande, Pueblo of Sandia, 1.0 miles upstream of Alameda Bridge crossing, RM 193.2.
5	Atrisco Outfall	New Mexico, Bernalillo County, Rio Grande, Pueblo of Isleta, 1.9 miles upstream of Isleta Diversion Dam, RM 171.2.
Isleta Reach		
6	IDD (Below Isleta Diversion Dam)	New Mexico, Bernalillo County, Rio Grande, Pueblo of Isleta, 0.1 miles downstream of Isleta Diversion Dam, RM 169.3
7	Alejandro Gate	New Mexico, Valencia County, Rio Grande, Pueblo of Isleta, 2.7 miles downstream of Isleta Diversion Dam, RM 166.6

Length-Frequency

Standard lengths of captured Rio Grande silvery minnow were compared by sampling trip to evaluate potential differences in growth rates. The Petersen method of length-frequency analysis was used to estimate age groups (Isaac 1990, Devries and Frie 1996). In this method, the frequency of individuals was plotted as a function of 2 mm standard length increments for each monthly monitoring sample. Age was then assigned to each individually measured fish. Similarly, the known age of recaptured marked and measured Rio Grande silvery minnow was assigned to each individual. Linear regression was used to compare the potential differences between and among marked and unmarked fish by plotting standard length against estimated (or known) ages. The regression coefficient β , or slope was also used as an estimate of instantaneous growth, or in this case monthly growth rate since each sample was spaced approximately one month apart. Student's t was used to test the hypothesis about equality of two

population regression coefficients, or in this case, the equality of growth rates between and among marked and unmarked Rio Grande silvery minnow ($\alpha = 0.05$).

Recapture Data from Other Researchers

Recapture data collected from other researchers continues to provide valuable data on movement and retention of VIE marked fish. Included in this year's summary are collections from U.S. Bureau of Reclamation's electrofishing surveys and data from standard population monitoring and population estimate work for RGSM conducted by ASIR (American Southwest Ichthyological Researchers). These and other researchers are asked to volunteer recapture information on VIE-marked Rio Grande silvery minnow. These projects have varying objectives and methods, but a summary of recaptures can provide an overall view of project effectiveness. In 2010, fish releases happened to coincide with population monitoring events in November and December 2010. These surveys occurred within days of fish releases and resulted in large numbers of recaptures.

Fish Community

A summary table of fish collections for the current study period (January 2010 to December 2010) was constructed with observations made for each species, including status of the species (native or introduced), total number of individuals, relative percentage of each species, percent occurrence in individual seine hauls, and density (fish/100 m²). Observations were also made on total number of species, total effort, and uncommon species. Most fish names in this report are those in the American Fisheries Society's "A List of Common and Scientific Names of Fishes from the United States and Canada" (Nelson et al. 2004). Use of subspecific names includes additional citations.

RESULTS

Augmentation

Based on the September 2010 catch rates from the standard RGSM population monitoring conducted by ASIR (Dudley and Platania 2010), a request for release in the Middle Rio Grande in 2010 was made through the RGSM augmentation program for 138,000 fish.

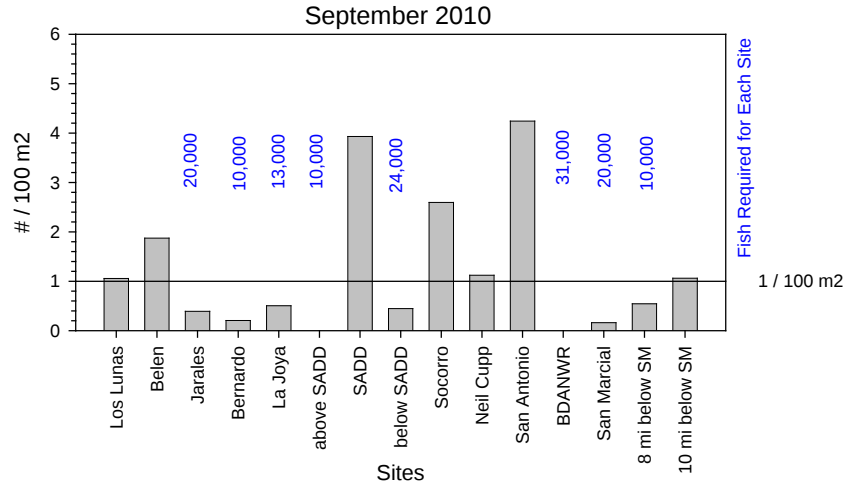


Figure 2. Catch rates for September 2010 Population Monitoring (from Dudley and Platania 2010)

The catch rates from the September monitoring were compared with the target catch rate of 1 RGSM / 100 m² for each site (Figure 2). Seven of the 15 sites in the Isleta and San Acacia reaches had catch rates over this target, ranging from 0 to 4.24 RGSM / 100 m², including 2 sites that were either dry or recorded no RGSM. Therefore, there are a total of 8 release sites for Rio Grande silvery minnow for the Middle Rio Grande during 2010, including 4 in both the Isleta and San Acacia reaches (Figure 2).

On 4-16 November 2010, 135,990 Rio Grande silvery minnow were released by NMFWCO, with assistance from Dexter National Fish Hatchery, City of Albuquerque-Biopark, and State of New Mexico-Los Lunas Refugium personnel. All of these fish had an orange, right, predorsal VIE tag. Block nets and/or cages were placed at each site. All fish were released inside the blocked area to prevent immediate dispersal related to the stress of handling and transport and increase short-term survival. The fish were released and the block nets and cages were removed after 4 hours.

Post-Augmentation Monitoring

Augmentation monitoring within pueblo boundaries continued in 2010. These monitoring efforts are conducted by NMFWCO in conjunction with the associated environment departments of each Pueblo. For these monitoring sites, there were a total of 1,108 Rio Grande silvery minnow collected between January and December 2010 (Table 2). Rio Grande silvery minnow represented 6.8% of all fish captured, were collected in 15.8% of all seine hauls with an overall catch rate of 2.45 individuals/100 m² (Table 2). Over the sampling period, catch rates varied for Rio Grande silvery minnow, with the largest collection of 139 individuals occurring on 3 May 2010 at the Isleta Diversion Dam site. During monitoring conducted by NMFWCO in 2010, there were no recaptures of VIE marked Rio Grande silvery minnow.

Table 2. Status, numbers, percent of total, percent occurrence, and density for all species collected during NMFWCO augmentation monitoring at all sites combined in 2010. For status, N=native and I=introduced. Subspecific names include citations below.

Species	Status	n	% of Total	Percent Occurrence	Density (fish/100m ²)
gizzard shad <i>Dorosoma cepedianum</i>	I	9	0.1	0.2	0.02
red shiner <i>Cyprinella lutrensis</i>	N	8,497	52.1	36.3	18.79
common carp <i>Cyprinus carpio</i>	I	47	0.3	1.4	0.10
Rio Grande silvery minnow <i>Hybognathus amarus</i>	N	1,108	6.8	15.8	2.45
fathead minnow <i>Pimephales promelas</i>	N	188	1.2	3.5	0.42
flathead chub <i>Platygobio gracilis gulonella</i> ^a	N	1560	9.6	19.4	3.45
longnose dace <i>Rhinichthys cataractae cataractae</i> ^b	N	285	1.7	4.2	0.63
river carpsucker <i>Carpiodes carpio elongatus</i> ^c	N	509	3.1	3.3	1.13
white sucker <i>Catostomus commersoni</i>	I	1,488	9.1	6.5	3.29
black bullhead <i>Ameiurus melas</i>	I	2	<0.1	< 0.1	<0.01
yellow bullhead <i>Ameiurus natalis</i>	I	14	0.1	0.6	0.03
channel catfish <i>Ictalurus punctatus</i>	I	767	4.7	8.6	1.70
western mosquitofish <i>Gambusia affinis</i>	I	1,657	10.2	6.6	3.66
white bass <i>Morone chrysops</i>	I	4	<0.1	0.1	0.01
green sunfish <i>Lepomis cyanellus</i>	I	13	0.1	0.5	0.03
bluegill <i>Lepomis macrochirus speciosus</i> ^d	N	39	0.2	0.7	0.09
largemouth bass <i>Micropterus salmoides</i>	I	39	0.2	1.0	0.09
white crappie <i>Pomoxis annularis</i>	I	63	0.4	1.5	0.14
walleye <i>Sander vitreus</i>	I	6	<0.1	0.3	0.01
TOTAL		16,295	100	57.9	36.04

^a Olund and Cross (1961) ^b Jenkins and Burkhead (1993)

^c Trautman (1981) ^d Hubbs and Lagler (1958), Avise and Smith (1974)

Length-Frequency

Age at month estimates were created by visually determining breaks in the length-frequency distribution of measured Rio Grande silvery minnow by month (Figures 4-5). While not exact, it is an adequate qualitative method for examining general patterns in age-class strength and growth rates. There were 538 unmarked in the length-frequency dataset captured in 2010. There were no marked recaptures in 2010; therefore no analysis of length-frequency was completed for hatchery released fish. Linear regression was used to estimate monthly (instantaneous) growth rate. The slope of the regression line (*B*) for unmarked Rio Grande silvery minnow was estimated at 2.14 mm/month (Figure 3), with even higher growth rates of 9-14 mm/month observed during the initial 4 months for juvenile fish.

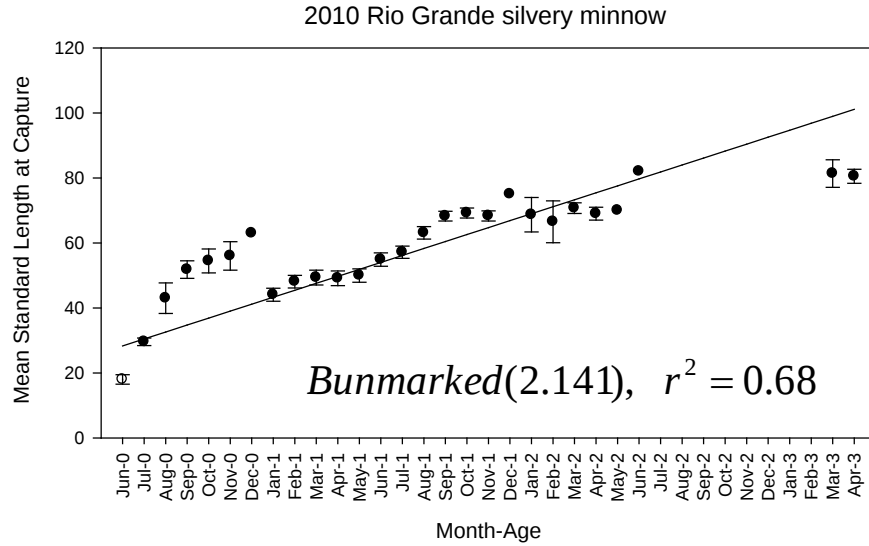


Figure 3. Growth rate for unmarked Rio Grande silvery minnow from slope (B) of the regression for mean standard lengths (with 95% confidence interval) between age at month estimates in 2010.

Upon examination of length-frequency data by month, there appeared to be two or three age classes present in most month's sample depending on the season. This is generally represented by ages 1-3 between January and May (prior to and during the spawn) and ages 0 and 1 between June and December (after the spawn). Based on length-frequency observations, maximum age of Rio Grande silvery minnow was estimated to be approximately 40 months (81 mm SL). This individual likely represented the 2007 year class (Figures 4-5). Between January and July, the 2009 year class was well represented, between July and December the 2010 year class appeared but was not as strong as in years past, indicating relatively weak recruitment.

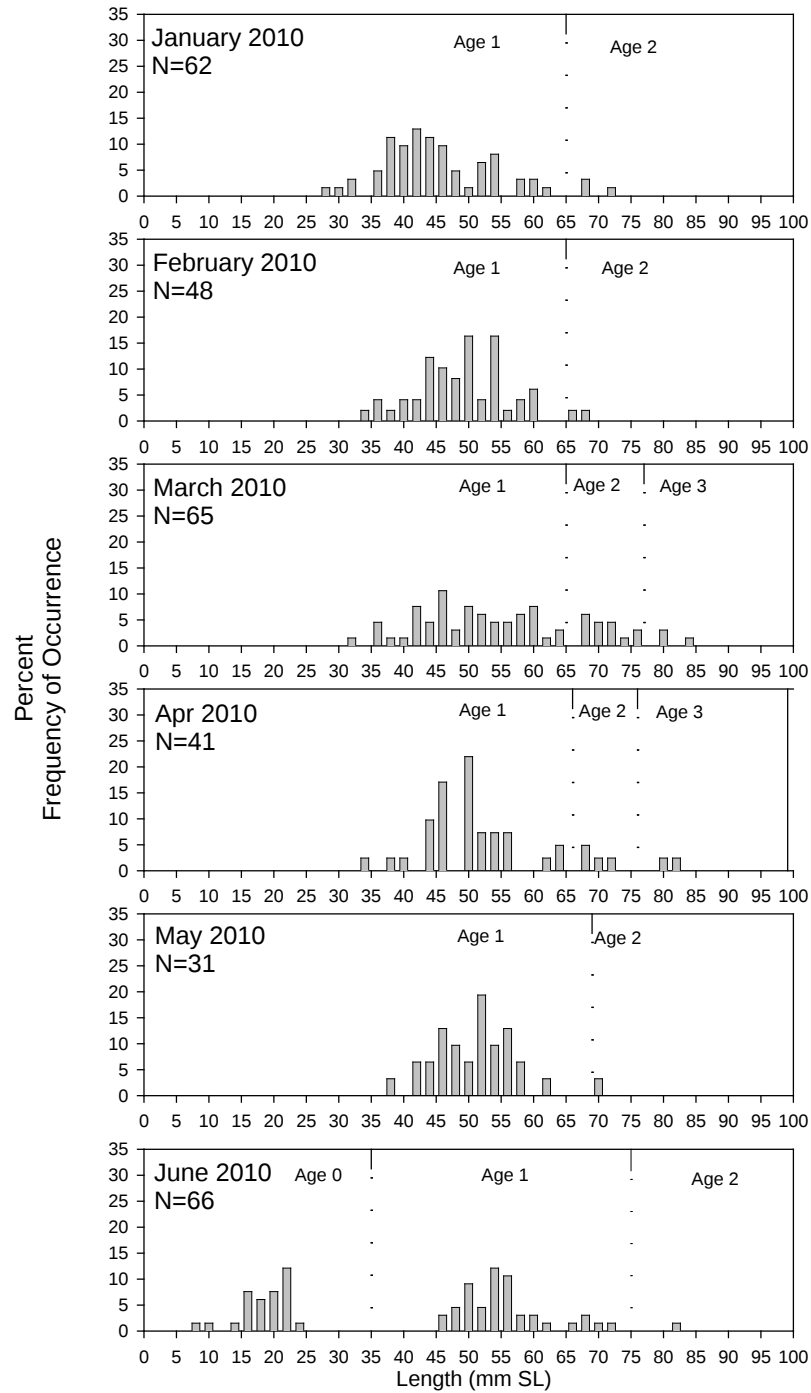


Figure 4. Length-frequency histograms of unmarked Rio Grande silvery minnow captured between January and June 2010. Dashed lines represent estimated breaks between year classes.

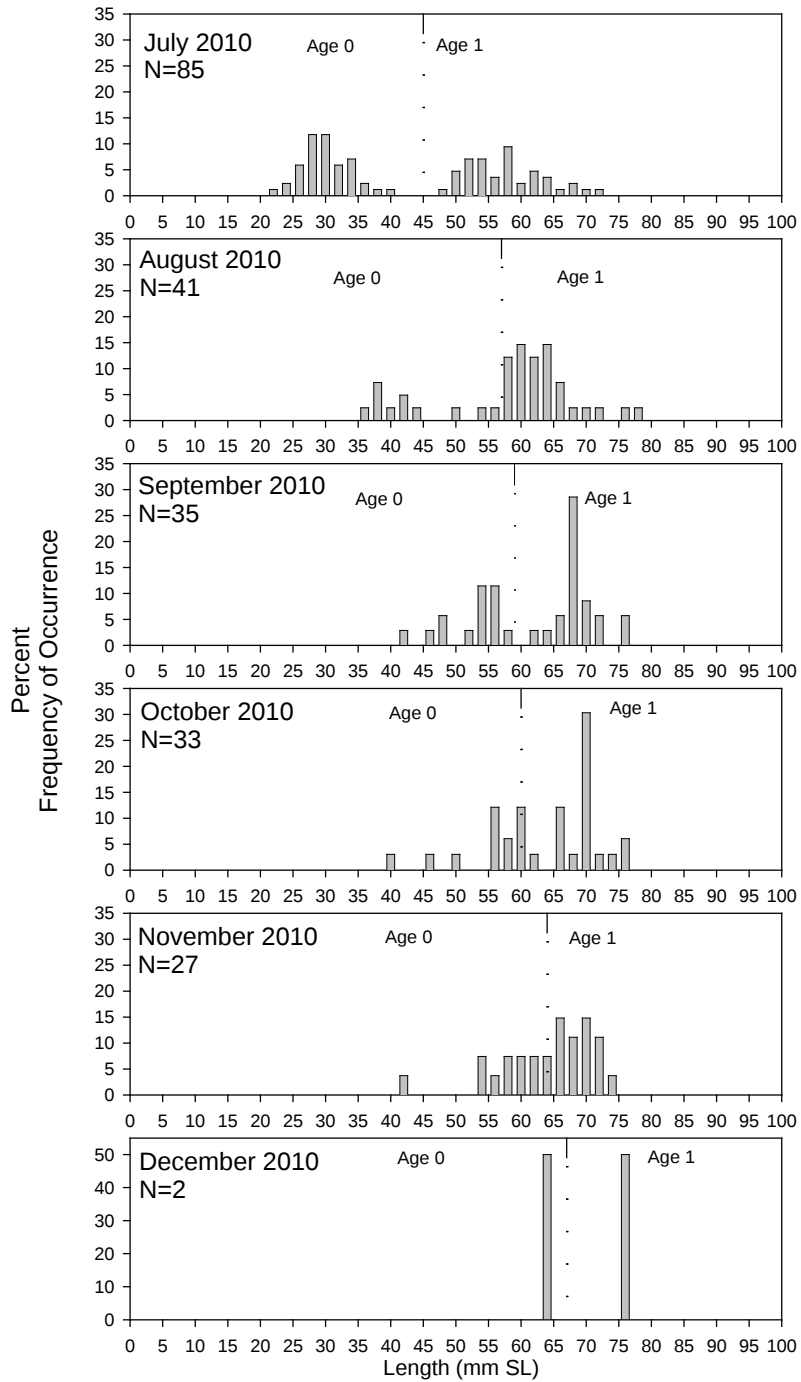


Figure 5. Length-frequency histograms of unmarked Rio Grande silvery minnow captured between July and December 2010. Dashed lines represent estimated breaks between year classes.

Recapture Data from Other Researchers

Although there were no recaptures of VIE marked Rio Grande silvery minnow from our project in 2010, there were numerous recaptures from other projects (USBOR 2010, Dudley et al. 2012). A total of 472 VIE marked Rio Grande silvery minnow were observed in 2010, including 468 during the last two months of the year from the November 2010 release. There were 4 recaptures in February 2010 collected by USBOR during electrofishing surveys. This collection was the only collection that included VIE marked Rio Grande silvery minnow from the 2009 release. This was a relatively small release (~ 20k) at only one location. In this collection, a total of 224 unmarked Rio Grande silvery minnow were also caught, resulting in 1.8% that were VIE marked. For the 2010 release, a total of 173 unmarked Rio Grande silvery minnow were also caught, resulting in 73.0% that were VIE marked. Initial indications are that these released fish (~ 135K at multiple release sites) had successful short-term survival. Previous results have indicated that recaptures occur primarily within the first 6 months after a release, with catch rates decreasing out to 24 months after a release. It is anticipated that data from 2011 will show similar results.

Fish Community

From January to December 2010, 2,280 seine hauls totaling 45,216.1 m² were conducted. In these samples, 16,295 individuals representing 19 species were collected (Table 2). Native cyprinids including red shiner (*Cyprinella lutrensis*), Rio Grande silvery minnow, fathead minnow (*Pimephales promelas*), flathead chub (*Platygobio gracilis gulonella*), and longnose dace (*Rhinichthys cataractae cataractae*) represented 71% of all individuals collected. Red shiner was the numerically dominant species of the fish community and accounted for 52% of all fish collected.

DISCUSSION

Augmentation efforts in 2010 concluded the eighth year in the Middle Rio Grande, New Mexico. Since 2002, 1,282,954 Rio Grande silvery minnow have been released. 2010 represented the third year of implementation for a revised 5-year augmentation plan (2008-2012) for the Middle Rio Grande. As a result of this revised augmentation strategy and intermittent river conditions for Rio Grande silvery minnow in the wild, eight sites required stocking in 2010, as compared with 1 site in 2009 and no fish being required for augmentation in 2008.

Under the revised stocking protocol, we determined that augmentation in the Isleta and San Acacia Reaches was necessary at eight sites in 2010. This is a significant increase when compared to the one site that was stocked in 2009. A total of 138,000 VIE tagged RGSM were requested for augmentation at sites between Jarales in the Isleta Reach and 8 miles downstream of the San Marcial Railroad Bridge in the San Acacia Reach. A total of 135,990 were tagged for release, which represented 99% of the requested amount. Additional fish that were unable to be tagged and were scheduled for the Middle Rio Grande were made available and released as part of the continued reintroduction in Big Bend, Texas in October 2010.

Included in the revised augmentation plan is a strategy to reduce downstream movement immediately after release due to the stress of handling and transport. We now “soft-release” all augmentation-related Rio Grande silvery minnow. This has likely led to decreased initial movement and associated mortality. With batch-marking such as VIE, it is difficult to monitor movement from month to month without knowing the specific actions of each fish. Still, past evidence has shown that the majority of recaptured VIE tagged fish are found within 15 miles of the release location. Specific information on individual movement (including juveniles) is still an important information gap in Rio Grande silvery minnow biology.

In addition to the sites that required stocking, all other sites recorded lower catch rates for 2010 compared to both 2008 and 2009. Low flows between July and September appear to be reducing the recruitment success of Rio Grande silvery minnow in 2010, in all of the sampling reaches. A combination of habitat loss and crowding within existing habitats could be factors leading to the apparent decline of Rio Grande silvery minnow in 2010. Similar to reduced catch rates in the Isleta and San Acacia reaches, Angostura Reach also exhibited lower catch rates compared with previous years in 2010. Overall catch rate for Angostura Reach was 0.35 RGSM / 100 m², which was only slightly above the 0.01 RGSM / 100 m² level that would require us to implement stocking before 2012. We will continue to monitor the change within this reach in relation to our current augmentation strategy.

With the temporary removal of augmentation from Angostura Reach, it is anticipated that catch rates in this reach will decrease in relation to catch rates in the lower reaches. This observation may be clouded by benefits gained from other restoration activities and detracted by continued threats such as habitat fragmentation.

Augmentation through 2012 will continue to focus in the Isleta and San Acacia Reaches while evaluating past efforts in the Angostura Reach. The primary way to determine the effects of augmentation in the Angostura Reach is to remove augmentation and monitor the changes in catch rates (and population estimates). Initial observations throughout the Middle Rio Grande indicate that the majority of the population is located in the Isleta and San Acacia Reaches. If this trend continues and catch rates in the Angostura Reach drop to levels observed prior to augmentation (2002), then it can be expected that augmentation (along with favorable habitat and flow conditions) was a driving force in the temporary increase in catch rates observed between 2003 and 2006. It is possible that the Angostura Reach, by being the shortest and most disconnected reach (both lower reaches obtain fish from upstream sources), struggles to support Rio Grande silvery minnow without management. Continued work on issues like habitat restoration, habitat connectivity, and fish passage along with a precise augmentation strategy in all reaches could improve the long-term persistence of Rio Grande silvery minnow throughout the Middle Rio Grande, New Mexico.

As stated previously, the ultimate goal of augmentation is to re-establish self-sustaining populations of Rio Grande silvery minnow in the MRGNM. While hatchery-released fish cannot contribute directly to recovery, their presence in the system and subsequent reproduction is thought to contribute. It has been suggested that augmentation has had effects on genetics and distribution, especially early on and in the Angostura Reach discussed above (Osborne, et al.

2012), but their subsequent effects to population estimates recently has been less clear(Dudley, et al. 2011).

Continued monitoring of an augmented population is critical for evaluating the success of any project (George et al. 2009). Within the last three years, we have implemented new protocols that have been adapted from information learned in previous years. Evaluation of these populations has not just focused on documenting the presence or absence of released fish, but has included information on growth, movement, survival. Cooperative research includes genetic monitoring and providing information and fish for reintroduction. Augmentation such as this is not intended to be a perpetual effort, and by definition must not continue for the population to be by definition of a “self-sustaining population” (USFWS 2010). Although various conservation efforts have been undertaken in the past and others are currently being carried out in the middle Rio Grande, and abundance in recent years is increasing, the threat of extinction of the Rio Grande silvery minnow continues because of the high probability of continued drought, the fragmented and isolated nature of currently occupied habitat, and the absence of silvery minnows in other parts of the historic range. Additional work needs to be done to conserve this species and the ecosystems upon which it depends.

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Appendix A.
Recapture information of Rio Grande silvery minnow in 2010 from all researchers.

<u>Field #</u>	<u>N</u>	<u>Wild</u>	<u>Recapture Date</u>	<u>Release Date</u>	<u>Number of Days Post- Release</u>	<u>rm release</u>	<u>rm recapture</u>	<u>Distance Traveled (RM)*</u>
Yellow Left Dorsal, 12 November 2009 @ Mid Bosque del Apache National Wildlife Refuge (21,218)								
2010BOR	4	224	2/26/2010	11/12/2009	106	78.9	77-84	0
	4	224						

Orange Right Dorsal, 4-16 November 2010 Between Jarales and 8 miles downstream of San Marcial Railroad Bridge (135,990)

RKD10-228	50	2	11/15/2010	11/4/2010	11	143.2-60.5	127.0	0
RKD10-238	31	13	11/16/2010	11/4/2010	12	143.2-60.5	127.0	0
RKD10-239	1	0	11/16/2010	11/4/2010	12	143.2-60.5	130.6	0
RKD10-248	23	1	11/17/2010	11/4/2010	13	143.2-60.5	127.0	0
RKD10-258	21	0	11/18/2010	11/4/2010	14	143.2-60.5	127.0	0
RKD10-268	13	25	12/1/2010	11/4/2010	27	143.2-60.6	58.8	-1.7
RKD10-269	171	40	12/1/2010	11/4/2010	27	143.2-60.5	60.5	0
RKD10-270	67	1	12/1/2010	11/4/2010	27	143.2-60.5	68.6	0
RKD10-271	6	0	12/1/2010	11/4/2010	27	143.2-60.5	79.1	0
RKD10-275	64	6	12/1/2010	11/4/2010	27	143.2-60.5	114.6	0
RKD10-276	5	19	12/1/2010	11/4/2010	27	143.2-60.5	116.2	0
RKD10-277	5	58	12/1/2010	11/4/2010	27	143.2-60.5	116.8	0
RKD10-278	10	5	12/2/2010	11/4/2010	28	143.2-60.5	127.0	0
RKD10-279	1	3	12/2/2010	11/5/2010	27	143.2-60.5	127.0	0
	468	173						

USBOR Electrofishing (USBOR 2010, Y. Paroz, pers. comm..)

ASIRF Pop Monitoring/Estimation (Dudley et al. 2011, Dudley and Platania 2012, R. Dudley, pers. comm.)

Appendix B.
Ichthyofaunal composition of 2010 Rio Grande silvery minnow augmentation monitoring surveys

2010 Augmentation Report

DIXON ROAD

20-Jan-2010 WJR10-869 30 seine hauls Effort 612.5 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	42
<i>Hybognathus amarus</i>	18
<i>Platygobio gracilis</i>	9
<i>Gambusia affinis</i>	1

NORTH AMAFCA

20-Jan-2010 WJR10-870 30 seine hauls Effort 576.6 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	29
<i>Hybognathus amarus</i>	12
<i>Platygobio gracilis</i>	44

LOMITAS NEGRAS

20-Jan-2010 WJR10-871 30 seine hauls Effort 607.5 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	221
<i>Hybognathus amarus</i>	11
<i>Pimephales promelas</i>	10
<i>Platygobio gracilis</i>	4
<i>Ictalurus punctatus</i>	1
<i>Gambusia affinis</i>	14
<i>Lepomis cyanellus</i>	2
<i>Micropterus salmoides</i>	2

SANDIA LINE 14

20-Jan-2010

WJR10-872

30 seine hauls

Effort

584.5 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	47
<i>Hybognathus amarus</i>	35
<i>Platygobio gracilis</i>	85
<i>Catostomus commersoni</i>	1

ATRISCO OUTFALL

20-Jan-2010

WJR10-873

30 seine hauls

Effort

535.25 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	61
<i>Pimephales promelas</i>	1
<i>Platygobio gracilis</i>	2

ALEJANDRO GATE

20-Jan-2010

WJR10-874

30 seine hauls

Effort

486.5 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	337
<i>Hybognathus amarus</i>	12
<i>Pimephales promelas</i>	12
<i>Carpoides carpio</i>	2
<i>Catostomus commersoni</i>	2
<i>Gambusia affinis</i>	13
<i>Micropterus salmoides</i>	1
<i>Pomoxis annularis</i>	1

IDD

20-Jan-2010 WJR10-875 30 seine hauls Effort 393.5 m²

W. Jason Remshardt, Tristan J. Astring, Evan B. Anderson

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	317
<i>Cyprinus carpio</i>	2
<i>Hybognathus amarus</i>	5
<i>Pimephales promelas</i>	1
<i>Platygobio gracilis</i>	1
<i>Carpiodes carpio</i>	1
<i>Catostomus commersoni</i>	5
<i>Ameiurus natalis</i>	1
<i>Ictalurus punctatus</i>	3
<i>Lepomis macrochirus</i>	4
<i>Micropterus salmoides</i>	1
<i>Pomoxis annularis</i>	6

DIXON ROAD

23-Feb-2010 WJR10-876 30 seine hauls Effort 553 m²

W. Jason Remshardt, Thomas P. Archdeacon, Camelio Torres, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	26
<i>Hybognathus amarus</i>	5
<i>Pimephales promelas</i>	4
<i>Platygobio gracilis</i>	19
<i>Ictalurus punctatus</i>	1
<i>Gambusia affinis</i>	1

NORTH AMAFCA

23-Feb-2010

WJR10-877

30 seine hauls

Effort

593.25 m²

W. Jason Remshardt, Thomas P. Archdeacon, Camelio Torres, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	16
<i>Hybognathus amarus</i>	25
<i>Platygobio gracilis</i>	7
<i>Ictalurus punctatus</i>	1

LOMITAS NEGRAS

23-Feb-2010

WJR10-878

30 seine hauls

Effort

587 m²

W. Jason Remshardt, Thomas P. Archdeacon, Clint Sandoval, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	84
<i>Hybognathus amarus</i>	3
<i>Pimephales promelas</i>	6
<i>Platygobio gracilis</i>	4
<i>Catostomus commersoni</i>	1
<i>Ictalurus punctatus</i>	1
<i>Gambusia affinis</i>	59
<i>Lepomis cyanellus</i>	1
<i>Micropterus salmoides</i>	8

SANDIA LINE 14

23-Feb-2010

WJR10-879

30 seine hauls

Effort

421 m²

W. Jason Remshardt, Thomas P. Archdeacon, Clint Sandoval, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	57
<i>Hybognathus amarus</i>	20
<i>Platygobio gracilis</i>	35
<i>Ameiurus natalis</i>	1
<i>Ictalurus punctatus</i>	1

ATRISCO OUTFALL

26-Feb-2010 WJR10-880 30 seine hauls Effort 729 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	119
<i>Cyprinus carpio</i>	1
<i>Hybognathus amarus</i>	5
<i>Pimephales promelas</i>	2
<i>Platygobio gracilis</i>	8

IDD

26-Feb-2010 WJR10-881 30 seine hauls Effort 434.75 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	21
<i>Hybognathus amarus</i>	1
<i>Platygobio gracilis</i>	7
<i>Catostomus commersoni</i>	1

ALEJANDRO GATE

26-Feb-2010 WJR10-882 30 seine hauls Effort 506.5 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	46
<i>Hybognathus amarus</i>	32
<i>Platygobio gracilis</i>	7
<i>Lepomis macrochirus</i>	1
<i>Micropterus salmoides</i>	3

ATRISCO OUTFALL

24-Mar-2010 WJR10-883 30 seine hauls Effort 741.75 m²

W. Jason Remshardt, Thomas P. Archdeacon, Tristan J. Austring, Evan B. Anderson

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	13
<i>Hybognathus amarus</i>	3
<i>Platygobio gracilis</i>	4
<i>Ictalurus punctatus</i>	1

IDD

24-Mar-2010 WJR10-884 30 seine hauls Effort 475.5 m²

W. Jason Remshardt, Thomas P. Archdeacon, Tristan J. Austring, Evan B. Anderson

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	33
<i>Hybognathus amarus</i>	5
<i>Catostomus commersoni</i>	1

ALEJANDRO GATE

24-Mar-2010 WJR10-885 30 seine hauls Effort 616 m²

W. Jason Remshardt, Thomas P. Archdeacon, Tristan J. Austring, Evan B. Anderson

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	82
<i>Hybognathus amarus</i>	26
<i>Carpionodes carpio</i>	1
<i>Micropterus salmoides</i>	2
<i>Pomoxis annularis</i>	1

DIXON ROAD

29-Mar-2010 WJR10-886 30 seine hauls Effort 578.5 m²

W. Jason Remshardt, Thomas P. Archdeacon, Tristan J. Astring, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	19
<i>Hybognathus amarus</i>	53
<i>Pimephales promelas</i>	3
<i>Platygobio gracilis</i>	4
<i>Catostomus commersoni</i>	2

NORTH AMAFCA

29-Mar-2010 WJR10-887 30 seine hauls Effort 623.25 m²

W. Jason Remshardt, Thomas P. Archdeacon, Tristan J. Astring, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	9
<i>Hybognathus amarus</i>	14
<i>Pimephales promelas</i>	1
<i>Platygobio gracilis</i>	3
<i>Catostomus commersoni</i>	3

LOMITAS NEGRAS

29-Mar-2010 WJR10-888 25 seine hauls Effort 510.75 m²

W. Jason Remshardt, Thomas P. Archdeacon, Tristan J. Astring, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	141
<i>Cyprinus carpio</i>	1
<i>Hybognathus amarus</i>	11
<i>Pimephales promelas</i>	6
<i>Platygobio gracilis</i>	4
<i>Catostomus commersoni</i>	1
<i>Gambusia affinis</i>	134
<i>Lepomis macrochirus</i>	2
<i>Micropterus salmoides</i>	1

DIXON ROAD

28-Apr-2010

TJA10-001

30 seine hauls

Effort

709.5 m²

Tristan J. Austring, Evan B. Anderson, James P. Sandoval, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	1
<i>Hybognathus amarus</i>	5
<i>Platygobio gracilis</i>	46
<i>Rhinichthys cataractae</i>	16
<i>Catostomus commersoni</i>	8

NORTH AMAFCA

28-Apr-2010

TJA10-002

20 seine hauls

Effort

308 m²

Tristan J. Austring, Evan B. Anderson, James P. Sandoval, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	2
<i>Hybognathus amarus</i>	4
<i>Pimephales promelas</i>	2
<i>Catostomus commersoni</i>	4

SANDIA LINE 14

28-Apr-2010

TJA10-003

30 seine hauls

Effort

657 m²

Tristan J. Austring, Evan B. Anderson, James P. Sandoval, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	27
<i>Hybognathus amarus</i>	11
<i>Platygobio gracilis</i>	65
<i>Rhinichthys cataractae</i>	11
<i>Catostomus commersoni</i>	1
<i>Pomoxis annularis</i>	1

LOMITAS NEGRAS

28-Apr-2010

TJA10-004

30 seine hauls

Effort

543.25 m²

Tristan J. Austring, Evan B. Anderson, James P. Sandoval, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	29
<i>Hybognathus amarus</i>	122
<i>Pimephales promelas</i>	28
<i>Platygobio gracilis</i>	1
<i>Carpodes carpio</i>	2
<i>Catostomus commersoni</i>	12
<i>Gambusia affinis</i>	3
<i>Lepomis cyanellus</i>	2
<i>Pomoxis annularis</i>	5

ALEJANDRO GATE

3-May-2010

WJR10-909

30 seine hauls

Effort

429 m²

W. Jason Remshardt, Thomas P. Archdeacon, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	387
<i>Hybognathus amarus</i>	2
<i>Pimephales promelas</i>	1
<i>Catostomus commersoni</i>	2
<i>Lepomis macrochirus</i>	1

IDD

3-May-2010 WJR10-910 30 seine hauls Effort 626.75 m²

W. Jason Remshardt, Thomas P. Archdeacon, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	19
<i>Cyprinus carpio</i>	1
<i>Hybognathus amarus</i>	139
<i>Pimephales promelas</i>	5
<i>Platygobio gracilis</i>	2
<i>Carpionodes carpio</i>	1
<i>Ictalurus punctatus</i>	2
<i>Micropterus salmoides</i>	1
<i>Pomoxis annularis</i>	1

ATRISCO OUTFALL

3-May-2010 WJR10-911 30 seine hauls Effort 631 m²

W. Jason Remshardt, Thomas P. Archdeacon, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	27
<i>Pimephales promelas</i>	1
<i>Platygobio gracilis</i>	17

IDD

25-May-2010 WJR10-914 30 seine hauls Effort 658.25 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	19
<i>Hybognathus amarus</i>	6
<i>Platygobio gracilis</i>	5

ALEJANDRO GATE

25-May-2010 WJR10-915 30 seine hauls Effort 473.25 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	47
<i>Hybognathus amarus</i>	2

DIXON ROAD

26-May-2010 WJR10-916 30 seine hauls Effort 622.5 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	32
<i>Hybognathus amarus</i>	1
<i>Platygobio gracilis</i>	19
<i>Rhinichthys cataractae</i>	26

NORTH AMAFCA

26-May-2010 WJR10-917 30 seine hauls Effort 477.25 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	34
<i>Cyprinus carpio</i>	2
<i>Hybognathus amarus</i>	4
<i>Pimephales promelas</i>	1
<i>Catostomus commersoni</i>	109
<i>Ictalurus punctatus</i>	1
<i>Lepomis macrochirus</i>	1
<i>Pomoxis annularis</i>	1

LOMITAS NEGRAS

26-May-2010 WJR10-918 30 seine hauls Effort 558 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	20
<i>Hybognathus amarus</i>	9
<i>Pimephales promelas</i>	5
<i>Platygobio gracilis</i>	5
<i>Rhinichthys cataractae</i>	1
<i>Catostomus commersoni</i>	5
<i>Gambusia affinis</i>	14
<i>Morone chrysops</i>	1
<i>Lepomis macrochirus</i>	2
<i>Pomoxis annularis</i>	3

SANDIA LINE 14

26-May-2010 WJR10-919 30 seine hauls Effort 629.5 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	76
<i>Hybognathus amarus</i>	9
<i>Pimephales promelas</i>	1
<i>Platygobio gracilis</i>	29
<i>Rhinichthys cataractae</i>	5
<i>Catostomus commersoni</i>	29
<i>Ameiurus natalis</i>	1
<i>Ictalurus punctatus</i>	1
<i>Lepomis macrochirus</i>	1
<i>Pomoxis annularis</i>	1

IDD

29-Jun-2010 TJA10-050 30 seine hauls Effort 574.5 m²

Tristan J. Austring, Evan B. Anderson, Irene M. Roselli, Sara D. Blocker, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	1039
<i>Cyprinus carpio</i>	2
<i>Hybognathus amarus</i>	35
<i>Pimephales promelas</i>	2
<i>Platygobio gracilis</i>	12
<i>Rhinichthys cataractae</i>	1
<i>Carpiodes carpio</i>	1
<i>Catostomus commersoni</i>	20
<i>Ictalurus punctatus</i>	2
<i>Lepomis cyanellus</i>	2
<i>Pomoxis annularis</i>	1

ALEJANDRO GATE

29-Jun-2010 TJA10-051 30 seine hauls Effort 581.5 m²

Tristan J. Austring, Evan B. Anderson, Irene M. Roselli, Sara D. Blocker, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	163
<i>Cyprinus carpio</i>	10
<i>Hybognathus amarus</i>	44
<i>Platygobio gracilis</i>	3
<i>Carpiodes carpio</i>	30
<i>Catostomus commersoni</i>	35
<i>Ameiurus natalis</i>	1
<i>Ictalurus punctatus</i>	1
<i>Gambusia affinis</i>	1
<i>Micropterus salmoides</i>	1

ATRISCO OUTFALL

29-Jun-2010 TJA10-052 30 seine hauls Effort 593.75 m²

Tristan J. Austring, Evan B. Anderson, Irene M. Roselli, Sara D. Blocker, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	21
<i>Cyprinus carpio</i>	1
<i>Hybognathus amarus</i>	9
<i>Pimephales promelas</i>	1
<i>Platygobio gracilis</i>	3
<i>Rhinichthys cataractae</i>	1
<i>Carpodes carpio</i>	124
<i>Catostomus commersoni</i>	65
<i>Ictalurus punctatus</i>	1
<i>Lepomis cyanellus</i>	2
<i>Sander vitreus</i>	2

SANDIA LINE 14

29-Jun-2010 TJA10-053 30 seine hauls Effort 665 m²

Tristan J. Austring, Evan B. Anderson, Irene M. Roselli, Sara D. Blocker, David Lente

<u>Species</u>	<u>N</u>
<i>Dorosoma cepedianum</i>	3
<i>Cyprinella lutrensis</i>	82
<i>Hybognathus amarus</i>	19
<i>Platygobio gracilis</i>	10
<i>Rhinichthys cataractae</i>	16
<i>Catostomus commersoni</i>	40

LOMITAS NEGRAS

30-Jun-2010 TJA10-054 30 seine hauls Effort 475.5 m²

Tristan J. Austring, Evan B. Anderson, Irene M. Roselli, Tim Smith, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	31
<i>Cyprinus carpio</i>	4
<i>Platygobio gracilis</i>	1
<i>Rhinichthys cataractae</i>	1
<i>Catostomus commersoni</i>	920
<i>Gambusia affinis</i>	151
<i>Micropterus salmoides</i>	5

NORTH AMAFCA

30-Jun-2010 TJA10-055 30 seine hauls Effort 622.25 m²

Tristan J. Austring, Evan B. Anderson, Irene M. Roselli, Tim Smith, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	56
<i>Cyprinus carpio</i>	3
<i>Hybognathus amarus</i>	24
<i>Platygobio gracilis</i>	10
<i>Rhinichthys cataractae</i>	3
<i>Catostomus commersoni</i>	113

DIXON ROAD

30-Jun-2010 TJA10-056 30 seine hauls Effort 671.75 m²

Tristan J. Austring, Evan B. Anderson, Irene M. Roselli, Tim Smith, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	86
<i>Cyprinus carpio</i>	2
<i>Hybognathus amarus</i>	5
<i>Platygobio gracilis</i>	11
<i>Rhinichthys cataractae</i>	4
<i>Catostomus commersoni</i>	35
<i>Sander vitreus</i>	1

IDD

27-Jul-2010 WJR10-927 30 seine hauls Effort 753.25 m²

W. Jason Remshardt, Tristan J. Austring, Andy T. Dean, Irene M. Roselli

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	413
<i>Cyprinus carpio</i>	1
<i>Hybognathus amarus</i>	44
<i>Pimephales promelas</i>	8
<i>Platygobio gracilis</i>	24
<i>Carpiodes carpio</i>	13
<i>Catostomus commersoni</i>	1
<i>Ictalurus punctatus</i>	153
<i>Gambusia affinis</i>	5

ATRISCO OUTFALL

27-Jul-2010 WJR10-928 30 seine hauls Effort 680.25 m²

W. Jason Remshardt, Tristan J. Austring, Andy T. Dean, Irene M. Roselli

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	81
<i>Cyprinus carpio</i>	2
<i>Hybognathus amarus</i>	5
<i>Pimephales promelas</i>	24
<i>Platygobio gracilis</i>	16
<i>Rhinichthys cataractae</i>	3
<i>Carpiodes carpio</i>	202
<i>Ameiurus natalis</i>	4
<i>Ictalurus punctatus</i>	94
<i>Gambusia affinis</i>	13

ALEJANDRO GATE

27-Jul-2010

WJR10-929

30 seine hauls

Effort

601.5 m²

W. Jason Remshardt, Tristan J. Astring, Andy T. Dean, Irene M. Roselli

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	276
<i>Cyprinus carpio</i>	1
<i>Hybognathus amarus</i>	66
<i>Pimephales promelas</i>	5
<i>Platygobio gracilis</i>	9
<i>Carpiodes carpio</i>	9
<i>Catostomus commersoni</i>	2
<i>Ameiurus natalis</i>	2
<i>Ictalurus punctatus</i>	67
<i>Gambusia affinis</i>	5
<i>Pomoxis annularis</i>	21
<i>Sander vitreus</i>	1

DIXON ROAD

28-Jul-2010

WJR10-930

30 seine hauls

Effort

525 m²

W. Jason Remshardt, Erica L. Johnson, Irene M. Roselli, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	72
<i>Cyprinus carpio</i>	2
<i>Hybognathus amarus</i>	5
<i>Pimephales promelas</i>	1
<i>Platygobio gracilis</i>	55
<i>Rhinichthys cataractae</i>	20
<i>Carpiodes carpio</i>	13
<i>Catostomus commersoni</i>	32
<i>Gambusia affinis</i>	2
<i>Lepomis macrochirus</i>	2
<i>Micropterus salmoides</i>	1

NORTH AMAFCA

28-Jul-2010

WJR10-931

30 seine hauls

Effort

593.25 m²

W. Jason Remshardt, Erica L. Johnson, Irene M. Roselli, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	25
<i>Cyprinus carpio</i>	2
<i>Hybognathus amarus</i>	27
<i>Pimephales promelas</i>	2
<i>Platygobio gracilis</i>	56
<i>Rhinichthys cataractae</i>	1
<i>Carpodes carpio</i>	12
<i>Catostomus commersoni</i>	5
<i>Gambusia affinis</i>	1
<i>Morone chrysops</i>	1
<i>Micropterus salmoides</i>	1

LOMITAS NEGRAS

28-Jul-2010

WJR10-932

30 seine hauls

Effort

623.25 m²

W. Jason Remshardt, Erica L. Johnson, Irene M. Roselli, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	54
<i>Hybognathus amarus</i>	10
<i>Pimephales promelas</i>	17
<i>Platygobio gracilis</i>	20
<i>Rhinichthys cataractae</i>	19
<i>Carpodes carpio</i>	11
<i>Catostomus commersoni</i>	14
<i>Gambusia affinis</i>	132
<i>Micropterus salmoides</i>	1
<i>Pomoxis annularis</i>	1

ATRISCO OUTFALL

24-Aug-2010 WJR10-940 30 seine hauls Effort 959.5 m²

W. Jason Remshardt, Andy T. Dean, Erica L. Johnson, Irene M. Roselli, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	62
<i>Pimephales promelas</i>	1
<i>Platygobio gracilis</i>	9
<i>Carpiodes carpio</i>	6
<i>Ameiurus melas</i>	2
<i>Ictalurus punctatus</i>	33

IDD

24-Aug-2010 WJR10-941 30 seine hauls Effort 715.25 m²

W. Jason Remshardt, Andy T. Dean, Erica L. Johnson, Irene M. Roselli, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	194
<i>Hybognathus amarus</i>	2
<i>Pimephales promelas</i>	5
<i>Platygobio gracilis</i>	13
<i>Rhinichthys cataractae</i>	1
<i>Ictalurus punctatus</i>	32
<i>Gambusia affinis</i>	21

ALEJANDRO GATE

24-Aug-2010 WJR10-942 30 seine hauls Effort 766.5 m²

W. Jason Remshardt, Andy T. Dean, Erica L. Johnson, Irene M. Roselli, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	103
<i>Hybognathus amarus</i>	5
<i>Platygobio gracilis</i>	13
<i>Carpodes carpio</i>	9
<i>Ameiurus natalis</i>	1
<i>Ictalurus punctatus</i>	14
<i>Gambusia affinis</i>	8
<i>Micropterus salmoides</i>	2
<i>Pomoxis annularis</i>	3

DIXON ROAD

25-Aug-2010 WJR10-943 30 seine hauls Effort 878.25 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson, Erica L. Johnson, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	114
<i>Hybognathus amarus</i>	22
<i>Platygobio gracilis</i>	137
<i>Rhinichthys cataractae</i>	50
<i>Catostomus commersoni</i>	3
<i>Ameiurus natalis</i>	1
<i>Ictalurus punctatus</i>	26
<i>Gambusia affinis</i>	15
<i>Pomoxis annularis</i>	1

NORTH AMAFCA

25-Aug-2010

WJR10-944

30 seine hauls

Effort

742 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson, Erica L. Johnson, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	51
<i>Hybognathus amarus</i>	5
<i>Platygobio gracilis</i>	51
<i>Rhinichthys cataractae</i>	4
<i>Carpiodes carpio</i>	9
<i>Catostomus commersoni</i>	6
<i>Ictalurus punctatus</i>	24
<i>Gambusia affinis</i>	4

LOMITAS NEGRAS

25-Aug-2010

WJR10-945

30 seine hauls

Effort

570 m²

W. Jason Remshardt, Tristan J. Austring, Evan B. Anderson, Erica L. Johnson, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	45
<i>Hybognathus amarus</i>	14
<i>Platygobio gracilis</i>	5
<i>Rhinichthys cataractae</i>	5
<i>Carpiodes carpio</i>	1
<i>Catostomus commersoni</i>	1
<i>Ictalurus punctatus</i>	2
<i>Gambusia affinis</i>	9
<i>Lepomis macrochirus</i>	2
<i>Micropterus salmoides</i>	1

SANDIA LINE 14

25-Aug-2010

WJR10-946

30 seine hauls

Effort

717 m²

W. Jason Remshardt, Tristan J. Astring, Evan B. Anderson, Erica L. Johnson, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	38
<i>Hybognathus amarus</i>	5
<i>Platygobio gracilis</i>	52
<i>Rhinichthys cataractae</i>	5
<i>Carpodes carpio</i>	2
<i>Ictalurus punctatus</i>	1
<i>Gambusia affinis</i>	50

ATRISCO OUTFALL

23-Sep-2010

TPA10-045

30 seine hauls

Effort

442.75 m²

Thomas P. Archdeacon, Andy T. Dean, Erica L. Johnson, Irene M. Roselli, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	34
<i>Hybognathus amarus</i>	2
<i>Pimephales promelas</i>	6
<i>Platygobio gracilis</i>	11
<i>Carpodes carpio</i>	3
<i>Ictalurus punctatus</i>	143

IDD

23-Sep-2010

TPA10-046

30 seine hauls

Effort

420.75 m²

Thomas P. Archdeacon, Andy T. Dean, Erica L. Johnson, Irene M. Roselli, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	402
<i>Hybognathus amarus</i>	6
<i>Platygobio gracilis</i>	15
<i>Ictalurus punctatus</i>	82
<i>Gambusia affinis</i>	10
<i>Pomoxis annularis</i>	4

ALEJANDRO GATE

23-Sep-2010 TPA10-047 30 seine hauls Effort 328.75 m²

Thomas P. Archdeacon, Andy T. Dean, Erica L. Johnson, Irene M. Roselli, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	156
<i>Cyprinus carpio</i>	1
<i>Hybognathus amarus</i>	19
<i>Carpoides carpio</i>	3
<i>Ictalurus punctatus</i>	1
<i>Gambusia affinis</i>	19
<i>Micropterus salmoides</i>	1
<i>Sander vitreus</i>	1

SANDIA LINE 14

29-Sep-2010 TPA10-048 30 seine hauls Effort 620.5 m²

Thomas P. Archdeacon, Andy T. Dean, Irene M. Roselli, Tim Smith, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	24
<i>Platygobio gracilis</i>	25
<i>Rhinichthys cataractae</i>	13
<i>Catostomus commersoni</i>	1
<i>Ameiurus natalis</i>	1
<i>Ictalurus punctatus</i>	7
<i>Gambusia affinis</i>	97

DIXON ROAD

29-Sep-2010

TPA10-049

30 seine hauls

Effort

580.75 m²

Thomas P. Archdeacon, Andy T. Dean, Irene M. Roselli, Tim Smith, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	60
<i>Hybognathus amarus</i>	1
<i>Pimephales promelas</i>	1
<i>Platygobio gracilis</i>	14
<i>Rhinichthys cataractae</i>	10
<i>Gambusia affinis</i>	10

NORTH AMAFCA

29-Sep-2010

TPA10-050

30 seine hauls

Effort

659.75 m²

Thomas P. Archdeacon, Andy T. Dean, Irene M. Roselli, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	29
<i>Hybognathus amarus</i>	6
<i>Platygobio gracilis</i>	26
<i>Rhinichthys cataractae</i>	23
<i>Carpoides carpio</i>	1
<i>Ictalurus punctatus</i>	3
<i>Gambusia affinis</i>	42

LOMITAS NEGRAS

29-Sep-2010

TPA10-051

30 seine hauls

Effort

588.25 m²

Thomas P. Archdeacon, Andy T. Dean, Irene M. Roselli

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	55
<i>Hybognathus amarus</i>	1
<i>Pimephales promelas</i>	2
<i>Platygobio gracilis</i>	39
<i>Rhinichthys cataractae</i>	18
<i>Gambusia affinis</i>	22
<i>Lepomis cyanellus</i>	2
<i>Lepomis macrochirus</i>	1
<i>Micropterus salmoides</i>	2

IDD

1-Nov-2010

TJA10-057

30 seine hauls

Effort

613.75 m²

Tristan J. Austring, Andy T. Dean, Irene M. Roselli, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	440
<i>Cyprinus carpio</i>	2
<i>Hybognathus amarus</i>	4
<i>Pimephales promelas</i>	10
<i>Platygobio gracilis</i>	19
<i>Carpoides carpio</i>	2
<i>Catostomus commersoni</i>	1
<i>Ictalurus punctatus</i>	27
<i>Gambusia affinis</i>	19

ATRISCO OUTFALL

1-Nov-2010

TJA10-058

30 seine hauls

Effort

781 m²

Tristan J. Austring, Andy T. Dean, Irene M. Roselli, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	20
<i>Cyprinus carpio</i>	1
<i>Pimephales promelas</i>	3
<i>Platygobio gracilis</i>	9
<i>Rhinichthys cataractae</i>	2
<i>Carpionodes carpio</i>	2
<i>Ameiurus natalis</i>	1
<i>Ictalurus punctatus</i>	5
<i>Gambusia affinis</i>	1
<i>Micropterus salmoides</i>	1

ALEJANDRO GATE

1-Nov-2010

TJA10-059

30 seine hauls

Effort

609.25 m²

Tristan J. Austring, Andy T. Dean, Irene M. Roselli

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	161
<i>Cyprinus carpio</i>	1
<i>Hybognathus amarus</i>	1
<i>Platygobio gracilis</i>	2
<i>Ictalurus punctatus</i>	3
<i>Gambusia affinis</i>	2
<i>Pomoxis annularis</i>	6

LOMITAS NEGRAS

3-Nov-2010

TPA10-058

30 seine hauls

Effort

595.75 m²

Thomas P. Archdeacon, Irene M. Roselli, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	232
<i>Hybognathus amarus</i>	3
<i>Platygobio gracilis</i>	68
<i>Rhinichthys cataractae</i>	4
<i>Ictalurus punctatus</i>	4
<i>Gambusia affinis</i>	635
<i>Lepomis macrochirus</i>	2

SANDIA LINE 14

3-Nov-2010

TPA10-059

30 seine hauls

Effort

630 m²

Thomas P. Archdeacon, Erica L. Johnson, Irene M. Roselli, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	35
<i>Cyprinus carpio</i>	1
<i>Hybognathus amarus</i>	6
<i>Platygobio gracilis</i>	70
<i>Rhinichthys cataractae</i>	17
<i>Catostomus commersoni</i>	1
<i>Ictalurus punctatus</i>	2
<i>Gambusia affinis</i>	6
<i>Sander vitreus</i>	1

DIXON ROAD

3-Nov-2010

TPA10-060

30 seine hauls

Effort

625.25 m²

Thomas P. Archdeacon, Erica L. Johnson, Irene M. Roselli, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	22
<i>Hybognathus amarus</i>	4
<i>Pimephales promelas</i>	3
<i>Platygobio gracilis</i>	14
<i>Rhinichthys cataractae</i>	2
<i>Catostomus commersoni</i>	3
<i>Ictalurus punctatus</i>	1
<i>Gambusia affinis</i>	13

NORTH AMAFCA

3-Nov-2010

TPA10-061

30 seine hauls

Effort

607.25 m²

Thomas P. Archdeacon, Erica L. Johnson, Irene M. Roselli, Mark Morales

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	64
<i>Hybognathus amarus</i>	15
<i>Pimephales promelas</i>	2
<i>Platygobio gracilis</i>	66
<i>Rhinichthys cataractae</i>	3
<i>Carpionodes carpio</i>	2
<i>Catostomus commersoni</i>	3
<i>Gambusia affinis</i>	21

ATRISCO OUTFALL

29-Nov-2010

EBA10-100

30 seine hauls

Effort

620 m²

Evan B. Anderson, Erica L. Johnson, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	17
<i>Pimephales promelas</i>	1
<i>Platygobio gracilis</i>	9
<i>Micropterus salmoides</i>	1

IDD

29-Nov-2010 EBA10-101 30 seine hauls Effort 546 m²

Tristan J. Austring, Evan B. Anderson, Andy T. Dean, Erica L. Johnson, Irene M. Roselli, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	774
<i>Hybognathus amarus</i>	10
<i>Pimephales promelas</i>	3
<i>Platygobio gracilis</i>	1
<i>Ictalurus punctatus</i>	8
<i>Gambusia affinis</i>	16

ALEJANDRO GATE

29-Nov-2010 TJA10-060 30 seine hauls Effort 702.75 m²

Tristan J. Austring, Andy T. Dean, Irene M. Roselli

<u>Species</u>	<u>N</u>
<i>Dorosoma cepedianum</i>	6
<i>Cyprinella lutrensis</i>	309
<i>Cyprinus carpio</i>	2
<i>Hybognathus amarus</i>	67
<i>Platygobio gracilis</i>	87
<i>Carpionodes carpio</i>	2
<i>Gambusia affinis</i>	1
<i>Micropterus salmoides</i>	2
<i>Pomoxis annularis</i>	2

LOMITAS NEGRAS

1-Dec-2010 TJA10-061 30 seine hauls Effort 509.5 m²

Tristan J. Austring, Evan B. Anderson, Andy T. Dean, Erica L. Johnson, Irene M. Roselli

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	8
<i>Hybognathus amarus</i>	1
<i>Platygobio gracilis</i>	4
<i>Carpoides carpio</i>	43
<i>Ictalurus punctatus</i>	1
<i>Gambusia affinis</i>	80
<i>Morone chrysops</i>	2
<i>Lepomis cyanellus</i>	1
<i>Micropterus salmoides</i>	1
<i>Pomoxis annularis</i>	1

SANDIA LINE 14

1-Dec-2010 TJA10-062 30 seine hauls Effort 545 m²

Tristan J. Austring, Evan B. Anderson, Andy T. Dean, Erica L. Johnson, Irene M. Roselli

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	41
<i>Hybognathus amarus</i>	3
<i>Platygobio gracilis</i>	57

DIXON ROAD

1-Dec-2010 TJA10-063 30 seine hauls Effort 519.5 m²

Tristan J. Austring, Evan B. Anderson, Andy T. Dean, Erica L. Johnson, Irene M. Roselli

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	7
<i>Cyprinus carpio</i>	2
<i>Hybognathus amarus</i>	1
<i>Platygobio gracilis</i>	23
<i>Ictalurus punctatus</i>	1
<i>Gambusia affinis</i>	2

NORTH AMAFCA

1-Dec-2010 TJA10-064 30 seine hauls Effort 554.75 m²

Tristan J. Austring, Evan B. Anderson, Andy T. Dean, Erica L. Johnson, Irene M. Roselli

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	15
<i>Pimephales promelas</i>	1
<i>Platygobio gracilis</i>	11
<i>Gambusia affinis</i>	3
<i>Lepomis cyanellus</i>	1

ALEJANDRO GATE

20-Dec-2010 TJA10-065 25 seine hauls Effort 319.5 m²

Tristan J. Austring, Erica L. Johnson, Irene M. Roselli, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	79
<i>Hybognathus amarus</i>	1
<i>Platygobio gracilis</i>	8
<i>Ictalurus punctatus</i>	8
<i>Pomoxis annularis</i>	3

ATRISCO OUTFALL

20-Dec-2010 TJA10-066 30 seine hauls Effort 658.5 m²

Tristan J. Austring, Erica L. Johnson, Irene M. Roselli, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	3
<i>Platygobio gracilis</i>	36
<i>Carpoides carpio</i>	2
<i>Ictalurus punctatus</i>	1

IDD

20-Dec-2010

TJA10-067

20 seine hauls

Effort

337.75 m²

Tristan J. Austring, Erica L. Johnson, Irene M. Roselli, David Lente

<u>Species</u>	<u>N</u>
<i>Cyprinella lutrensis</i>	64
<i>Hybognathus amarus</i>	1
<i>Ictalurus punctatus</i>	7
<i>Gambusia affinis</i>	2

Appendix C.

Water quality measurements by collection number. For detailed site information, cross-reference with Appendix B.

Collno = collection number; DO = dissolved oxygen (mg/l); Temp = water temperature (C); TDS = total dissolved solids (mg/l); Sal = salinity (ppt); SpC = specific conductance (ms/cm).

Collno	DO	Temp	Tds	Sal	pH	Time	SpC
EBA10-100	6.85	4.29	0.26	0.12	6.33	852	0.40
EBA10-101	7.79	5.98	0.27	0.20	6.22	1059	0.42
TJA10-001	9.60	11.35	0.15	0.11	8.15	942	0.24
TJA10-002	9.81	11.34	0.15	0.11	8.19	955	0.24
TJA10-003	9.88	11.41	0.15	0.11	8.24	1055	0.24
TJA10-004	9.71	12.23	0.17	0.13	8.21	1309	0.26
TJA10-050	6.66	20.16	0.26	0.17	8.18	842	0.35
TJA10-051	6.49	20.64	0.26	0.19	8.09	1057	0.41
TJA10-052	5.52	25.35	0.19	0.14	8.05	1520	0.30
TJA10-053	7.57	20.89	0.20	0.14	8.45	910	0.30
TJA10-054	7.11	22.80	0.25	0.19	8.34	1113	0.38
TJA10-055	6.88	24.49	0.20	0.15	8.43	1322	0.31
TJA10-056	6.65	24.84	0.20	0.15	8.27	1441	0.31
TJA10-057	9.72	11.56	0.31	0.24	8.01	900	0.48
TJA10-058	9.85	12.39	0.33	0.25	8.18	1032	0.50
TJA10-059	7.95	15.00	0.32	0.24	8.11	1313	0.50
TJA10-060	10.72	5.29	0.29	0.22	8.93	919	0.45
TJA10-061	8.03	5.18	0.25	0.19	6.14	854	0.38
TJA10-062	7.01	4.91	0.21	0.15	6.04	1023	0.32
TJA10-063	8.82	8.61	0.26	0.20	6.43	1145	0.41
TJA10-064	9.34	7.25	0.23	0.17	6.31	1304	0.35
TJA10-065	8.39	7.22	0.27	0.21	7.92	909	0.42
TJA10-066	10.20	6.77	0.24	0.18	7.88	1054	0.37
TJA10-067	10.09	8.27	0.25	0.19	7.92	1306	0.39
TPA10-045	69.90	20.02	0.12	0.09	8.08	920	0.17
TPA10-046	59.55	20.96	0.14	0.11	8.07	1109	0.22
TPA10-047	60.65	21.38	0.23	0.17	7.95	1307	0.35
TPA10-048	8.60	18.37	0.20	0.15	8.39	900	0.31
TPA10-049	8.03	19.37	0.21	0.16	8.21	1040	0.33
TPA10-050	7.99	21.82	0.21	0.16	8.48	1208	0.33
TPA10-050	8.30	23.13	0.25	0.19	8.52	1404	0.38
TPA10-058	8.80	11.61	0.28	0.19	8.45	910	0.40
TPA10-059	7.43	11.99	0.22	0.16	8.59	1100	0.25
TPA10-060	6.40	13.56	0.22	0.16	8.53	1250	0.33
TPA10-061	6.56	14.65	0.22	0.17	4.71	1355	0.34
WJR10-869	10.88	4.46	0.29	0.22	8.46	830	0.44
WJR10-870	12.19	5.43	0.26	0.19	9.19	1020	0.39

*Missing Data

Appendix B Cont.

WJR10-871	12.56	5.29	0.28	0.22	9.45	1213	0.43
WJR10-872	13.48	4.58	0.27	0.20	9.63	1354	0.41
WJR10-873	10.93	5.43	0.25	0.19	6.03	933	0.39
WJR10-874	8.80	6.44	0.27	0.20	7.19	1135	0.41
WJR10-875	12.09	7.22	0.26	0.20	7.42	1332	0.41
WJR10-876	*	6.05	*	*	*	900	*
WJR10-877	*	*	*	*	*	1127	*
WJR10-878	*	*	*	*	*	1330	*
WJR10-879	*	*	*	*	*	1500	*
WJR10-880	10.63	5.63	0.26	0.20	7.92	900	0.44
WJR10-881	9.66	9.71	0.26	0.19	8.06	1250	0.40
WJR10-882	10.24	7.46	0.28	0.21	8.10	1100	0.43
WJR10-883	8.79	7.78	0.23	0.18	7.53	1040	0.36
WJR10-884	10.38	8.51	0.25	0.18	7.62	1150	0.38
WJR10-886	8.18	8.51	0.20	0.15	8.09	933	0.31
WJR10-887	7.59	8.90	0.19	0.14	8.24	1040	0.30
WJR10-888	7.77	9.06	0.22	0.16	8.19	1232	0.33
WJR10-909	11.42	14.57	0.26	0.20	8.43	1326	0.41
WJR10-910	9.31	10.89	0.18	0.13	8.20	926	0.27
WJR10-911	10.33	12.39	0.17	0.12	8.45	1134	0.25
WJR10-914	7.76	15.58	0.18	0.13	8.30	915	0.28
WJR10-915	4.87	14.45	0.33	0.25	7.88	1054	0.52
WJR10-916	6.79	14.38	0.16	0.07	8.25	900	0.25
WJR10-917	5.36	17.46	0.17	0.13	8.67	1034	0.26
WJR10-918	7.45	18.96	0.17	0.12	8.60	1252	0.26
WJR10-919	6.90	18.42	0.17	0.12	8.31	1436	0.25
WJR10-927	6.36	22.92	0.18	0.14	8.54	921	0.28
WJR10-928	6.11	24.41	0.17	0.13	8.29	1119	0.27
WJR10-929	5.84	25.45	0.19	0.15	8.10	1310	0.30
WJR10-930	6.68	24.31	0.20	0.15	8.64	856	0.30
WJR10-931	6.56	25.34	0.20	0.15	8.49	1035	0.31
WJR10-932	6.78	25.36	0.25	0.19	8.42	1247	0.39
WJR10-940	6.68	23.34	0.20	0.15	8.28	848	0.30
WJR10-941	6.74	22.84	0.24	0.18	7.85	1025	0.36
WJR10-942	6.76	24.56	0.23	0.18	8.19	1234	0.36
WJR10-943	7.35	20.52	0.21	0.15	8.49	840	0.30
WJR10-944	7.72	22.04	0.20	0.15	8.53	1028	0.31
WJR10-945	7.51	23.22	0.22	0.16	8.45	1234	0.34
WJR10-946	7.73	23.48	0.20	0.15	8.42	1404	0.31

*Missing Data