

CENTRAL ARIZONA PROJECT FISH MONITORING

FINAL ANNUAL REPORT

SUMMARY OF SAMPLE YEAR 2008 FISH SURVEYS IN BEHALF OF A
LONG-TERM MONITORING PLAN FOR FISH POPULATIONS IN
SELECTED WATERS OF THE GILA RIVER BASIN, ARIZONA

by

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Submitted to

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This report summarizes fish sampling in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year (SY) 2008 (period October 14, 2008 to January 12, 2009). Reclamation's monitoring program is a result of several biological opinions on impacts of transportation and delivery of Central Arizona Project (CAP) water from the Colorado River at Lake Havasu to the Gila River basin. Its primary intention is to establish baseline data on the presence and distribution of non-native fishes and to detect changes in species composition or distribution in the CAP aqueduct and selected river, stream, and canal reaches in Arizona.

Protocols implemented during this monitoring are detailed by Clarkson (1996 a-c), and will not be reiterated in detail here. In general, streams were stratified according to geomorphology or flow characteristics, and replicate 200-m "quantitative" sampling stations were established as the source for distribution and assemblage structure data. The plan calls for electrofishing as the primary gear for this purpose, but use of other methods is encouraged if electrofishing is deemed inadequate. Following collection of quantitative data from fixed stream stations, qualitative sampling is often performed up- and/or downstream of each station to search for rare species.

In canals, sampling is more opportunistic, and is usually conducted during low flow or "dry-up" conditions. Sampling reaches are fixed, but only in the CAP canal are fixed stations sampled. For logistical reasons, pumping plant forebays are the primary source of CAP canal fishery data, and sampling there requires the use of a large array of sampling gears to be effective. Sampling in the Salt River Project (SRP) and Florence-Casa Grande (FCG) canals typically requires searches for available water and fish concentrations during flow outages, and primarily relies upon seines, dip nets, and entanglement gears for collection of fishes. SRP canals above the electrical fish barriers are sampled repeatedly with large seines and capture nearly all fishes in these short, confined reaches. See Clarkson (1998) for more detailed descriptions of monitored streams and canals and the methods used to sample them.

Waters sampled during this monitoring were (1) San Pedro River (hereafter abbreviated SanP) downstream from the U.S. and Mexico international boundary, (2) Gila River between Coolidge Dam and Ashurst-Hayden Diversion, (3) Salt River between Stewart Mountain Dam and Granite Reef Diversion, (4) CAP Canal at selected pumping plants, (5) SRP South Canal (SRPs), (6) SRP Arizona (North) Canal (SRPn), (7) FCG Canal, and (9) Cienega Creek (Table 1).

Comparisons are not made with data acquired during prior years of this monitoring program as reported by Clarkson (1998, 1999, 2001), Marsh (1999, 2004a-c), and Marsh and Kesner (2004, 2005, 2006a-b, 2007a-b (available online at <http://www.usbr.gov/lc/phoenix/biology/azfish/aznativefish.html>), or to data reported under other studies of these waters (e.g., Marsh and Minckley 1982, Mueller 1996). The reader is referred to those documents for comparisons with prior years.

MONITORING OVERVIEW

A total of 23 taxa (excluding undetermined cichlids) was captured during SY 2008 monitoring. No new taxa were detected. Two species were taken in Cienega Creek, four in Salt River, five in FCG, 7 in Gila River, eight in CAP, nine in San Pedro, 15 in SRPs, and 16 were taken in SRPn (Table 2). Five native species (22% of total taxa) were collected: longfin dace, roundtail chub, Gila topminnow, Sonora sucker, and desert sucker. Three were in SRPs and SRPn, two in San Pedro River and Cienega Creek, one in Salt River, and none was in CAP or FCG canals or the Gila River. Natives comprised 19 to 100% of all species among streams, excepting sample streams where there were none. The remaining 18 taxa were non-native, which among streams numbered between 0 (Cienega) and 13 (SRPn) species.

Total number of fish varied widely among waters, reaches, and stations (Table 3), a reflection of differences in sampling effort and gear type as well as fish abundance. Canal samples were not strictly comparable because those from SRPn, SRPs, and FCG were opportunistic and qualitative (except for samples above the electrical fish barriers on the SRP canals, which represented near-complete censuses). Monitoring in streams and rivers, and in the CAP Canal, is mostly quantitative, supplemented by some non-quantitative sampling. Numbers presented in all tables include only quantitative sampling data except for samples from SRPs, SRPn, and FCG which include both quantitative and non-quantitative samples. Native fishes overall accounted for 21.6% of 5,843 individuals captured at all Gila River basin stations during the sample year (Table 3). Proportion that native fishes comprised of total catch ranged from 0% (Gila River, CAP and FCG canals) to 100% (Cienega Creek). San Pedro was 89.6% native and the Salt River was 9.4% native. SRPs and SRPn samples were 26.4 and 7.8% natives above the electric fish barriers, respectively, and 0.1 and 13.2% natives below those structures (Table 3).

Community structure differed substantially among waters, reaches, and stations (Table 3). Native longfin dace was the most abundant species in combined samples from the San Pedro River (followed by black bullhead). Mosquitofish followed by channel catfish were the most abundant species from samples in the Gila River. Largemouth bass was most abundant in the Salt River catch (followed by rainbow trout). Redear sunfish followed by common carp were the most abundant fishes in the CAP Canal. Channel catfish predominated in samples above the electrical fish barrier in SRPs and SRPn (followed by flathead catfish). Grass carp (visual) predominated the catch below the barrier on SRPs (followed by red shiner), while mosquitofish followed by channel catfish predominated the catch below the barrier on the SRPn. Channel catfish predominated the catch above and below the barrier in the FCG (followed by flathead catfish and mosquitofish, respectively). Native longfin dace was the most abundant species in Cienega Creek, followed by Gila topminnow, the only other fish encountered there.

SAN PEDRO RIVER

Sampling Notes and Deviations from Protocol – Sampling was performed by Marsh & Associates between October 14 and 16, 2008 (Table 1). Seven of eight currently available stations were sampled (station 1-2-2 was eliminated from the protocol in 2005). The site at Hughes Ranch (station 1-2-1) was dry. Backpack electrofishing was conducted at all sites.

Species Richness and Distribution – Nine species were captured in the San Pedro River (Tables 4 and 5A). No new species were detected. Seven species were taken in the upper reach, three in the middle, and four in the lower. Two natives were encountered (longfin dace and desert sucker). Longfin dace was found at six stations, while desert sucker was collected only at Charleston (station 1-1-3).

Five non-natives were in the upper reach, two in the middle, and three in the lower. Common carp, green sunfish, and mosquitofish were only found in the upper reach, yellow bullhead and red shiner were only captured in the lower reach, fathead minnow was captured in the upper and middle reach, and black bullhead was captured in all three reaches.

Assemblage Structure – Native species dominated the catch overall (89.6% of a total catch of 482 individuals), and at all three reaches (Tables 3 and 5A). Native longfin dace was the most abundant fish species overall (86% of total numbers) and predominated the catch in all three reaches (Table 5A). Desert sucker was represented by 17 specimens collected in the upstream reach.

Black bullhead was the most abundant non-native and the second most abundant species overall, making up 6.0% of the catch. Fathead minnow contributed about 2% to the total catch followed by mosquitofish (about 1%). Other species each contributed 1% or less to the total numbers.

GILA RIVER

Sampling Notes and Deviations from Protocol – Reaches were sampled between November 17 and 20, 2008 (Table 1). Collections were made by Marsh & Associates. Nine of eleven currently available stations were sampled. No stations were sampled in the upper reach because authorization to access these sites was unavailable from the land owner (San Carlos Apache Tribe). The lower-most station (Box-O Wash, number 2-4-3) was relocated downstream approximately 1 km because of access issues. Backpack electrofishing was used at all sites and was supplemented with trammel netting at Dripping Springs Wash (2-2-1).

Species Richness and Distribution – Seven fish species were captured in the Gila River (Tables 4 and 5B). No new species were detected. Seven were taken in the upper-middle reach, five in the lower-middle, and two in the lower. No native species were encountered. A single specimen of desert sucker captured in 2007 comprises the entirety of native fish catch for the Gila River in the past six years (Marsh and Kesner 2007).

Channel catfish and flathead catfish were found at all reaches. Common carp, red shiner, and mosquitofish were captured in the upper-middle and lower-middle reaches, and green sunfish and largemouth bass were captured only in the upper-middle reach.

Assemblage Structure – Non-native mosquitofish was the most abundant species overall (40% of total catch) and predominated the catch at the upper-middle reach. Channel catfish was second in overall abundance (29% of total numbers) and predominated the catch in lower reach. Red shiner was third (19%), followed by common carp (7%), which predominated in the lower-middle reach. Flathead catfish and green sunfish each contributed about 2% of total catch, followed by largemouth bass (about 1%).

SALT RIVER

Sampling Notes and Deviations from Protocol – Sampling was performed by Marsh & Associates with assistance from Reclamation on December 15, 2008 (Table 1). The two upstream stations, Stewart Mountain Dam (3-1-1) and Goldfield Administrative Site (3-1-2, formerly Blue Point RS), could not be sampled because of atypically high flows. Presence of an occupied bald eagle *Haliaeetus leucocephalus* nest near the latter site could result in future access limitations. A boat-mounted electrofisher and trammel nets were used to sample the lower station.

Species Richness and Distribution – Four fish species were taken from the Salt River (Table 4 and 5C). No new species were detected. Sonora sucker was the only native species encountered. Nonnative largemouth bass, yellow bullhead, and rainbow trout also were captured.

Assemblage Structure – Total catch from the Salt River was 32 individuals. Native fishes comprised 9% of the total catch (Tables 3 and 5C). In the two previous years native longfin dace and desert sucker were also collected, but both were from stations that were not sampled in 2008 (Marsh & Kesner 2007). Nonnative largemouth bass was the most abundant species captured overall (69% of total catch), followed by rainbow trout (19%), and native Sonora sucker (9%). One yellow bullhead was also captured.

CENTRAL ARIZONA PROJECT CANAL

Sampling Notes and Deviations from Protocol – Four of the seven stations currently available were sampled by Reclamation with assistance from Marsh & Associates between November 2 and 5, 2008 (Table 1). The three stations upstream from (west of) Phoenix were not sampled in 2008 due to a lack of pump outages or delivery rate reductions that for logistical and safety reasons must be in effect when sampling is performed. Boat-mounted electrofishing, minnow trapping, trammel netting, and trot lining were conducted at all stations sampled.

Species Richness and Distribution – Eight taxa, all non-native, were captured from the CAP Canal. No new species were detected. Four species were taken from the Salt-Gila station (middle reach), and six in the downstream reach (Tables 4 and 5D). Grass carp and channel catfish were taken from both sampled reaches. Red shiner and striped bass were only collected

in the middle reach, and redear sunfish, common carp, largemouth bass, and bluegill were only found in the lower reach.

Assemblage Structure – Redear sunfish was the most abundant species overall (37% of total catch), followed by common carp (19%) and grass carp (15%) in the sample of 478 individuals from the CAP Canal (Table 5D). Fourth most abundant were striped bass, largemouth bass, and red shiner (each about 8%), followed by channel catfish (5%) and bluegill (about 1%). In the single station middle reach grass carp (12 of 35 total captures, 34%), red shiner and striped bass (each 10 fish) were common. Three channel catfish also were captured.

Redear sunfish dominated the catch in the lower reach (51%), followed by common carp (26%) and largemouth bass (10%). Grass carp was fourth most abundant species (8%), channel catfish fifth (3%), and bluegill sixth (1%).

SRP SOUTH CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed by Marsh & Associates with assistance from Reclamation on November 24, 2008 (Table 1). Five stations were sampled during routine monitoring; one above the electrical fish barrier and four downstream at River Road Siphon (2.5 miles), RWCD turnout (4.0 miles), demossing station (6.1 miles) and Triple Junction (9.0 miles) where the South Canal ends. The above barrier site was sampled with a bag seine, the RWCD turnout was sampled with a straight seine, River Road Siphon and demossing station were sampled visually, and Triple Junction was sampled with dip nets. A key provided by SRP to pass locked gates across canal roadways did not open one lock, resulting in a short delay and minor inconvenience but no compromise of fish monitoring.

Species Richness and Distribution – Fifteen species, including three natives and excluding undetermined cichlids, were captured from the SRPs Canal (Tables 2 and 4). No new species were detected; however, the second occurrence of goldfish above the electrical fish barrier was documented (its first occurrence was in 2007). The canal was subdivided into two reaches: “above barrier” (one station), and a downstream, below barrier reach with four stations (Tables 4 and 5E), although these latter stations were not designated in the monitoring protocol (Clarkson 1996a). Twelve species were taken above the electric fish barrier and ten were from collective downstream canal stations. Native Sonora sucker, plus non-native goldfish, common carp, red shiner, channel catfish, largemouth bass, and flathead catfish were encountered above and below the electrical fish barrier. Native roundtail chub and desert sucker, plus non-native yellow bullhead, rainbow trout, and blue tilapia were encountered above but not below, while grass carp, mosquitofish and an undetermined cichlid were encountered below but not above the barrier.

Below the fish barrier, six species were at the upper, three at the upper-middle, zero species were seen at the lower-middle, and four at the lower station. Non-native red shiner, channel catfish and largemouth bass were contacted at two stations below the fish barrier. All other fish species were found at one station each.

Assemblage Structure – Native fishes comprised 26% of the total catch (329 fish) above the fish barrier, but only 0.1% below the barrier (3,085 fish, Table 3). However, at single station 3,000

grass carp were visually recorded comprising the vast majority of the below barrier sample (97% of catch). Grass carp also comprised the majority of overall catch (89%, Table 5E). Native Sonora sucker contributed about 2% to the overall catch and was fourth most abundant while native desert sucker and roundtail chub comprised less than 1% each. Relative abundance of native suckers below the barrier is almost certainly underestimated, as collectors tend to capture sub-samples of up to a few hundred individuals rather than all of the obviously large aggregations that are encountered throughout the canal.

Non-native channel catfish was the second most abundant fish overall, accounting for 3% of total catch, and followed among non-natives by flathead catfish (2%), largemouth bass, red shiner, and common carp (each about 1%). Other non-native fishes each contributed less than 1% to the total catch.

Predominant fishes above the electrical fish barrier were nonnative channel catfish (29%), flathead catfish (22%), and native Sonora sucker (20%). Fourth most abundant was largemouth bass (9%), followed by common carp (6%), blue tilapia, native desert sucker and roundtail chub (each about 3%), and red shiner and yellow bullhead (each about 1%, Table 5E). Other species each contributed less than 1% to the total catch above the barrier.

Below the fish barrier, besides the 3,000 grass carp observed, red shiner was the second most abundant species captured (34 individuals about 1%). Other species each contributed less than 1% to the total catch below the barrier (Table 5E).

SRP NORTH (ARIZONA) CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed by Marsh & Associates with assistance from Reclamation on January 12, 2009 (Table 1). Two stations were sampled during routine monitoring: one above the electrical fish barrier and one below the fish barrier. The above barrier site was sampled with a bag seine. A boat-mounted electrofisher and trammel nets were used to collect fishes below the barrier in the reach between the 101 (Pima) freeway and Indian Bend Wash, 14.5 miles downstream from Granite Reef Diversion Dam. Other stations were not sampled because there was no reach-wide outage that would have provided an opportunity to safely and effectively make collections.

Species Richness and Distribution – Sixteen species, including three natives were captured from the SRPn Canal (Tables 2 and 4). No new species were detected; however, the first occurrence of goldfish above the electrical fish barrier was documented. The canal was subdivided into two reaches: “above” (one station) and “below” (one station) the electrical fish barrier (Table 5F), although these reaches were not designated in the monitoring protocol (Clarkson 1996a). Twelve species were taken above the electric fish barrier and seven were collected from below. Native Sonora sucker, channel catfish, and largemouth bass were collected above and below the barrier. Yellow bullhead, goldfish, common carp, roundtail chub, rainbow trout, blue tilapia, desert sucker, black crappie, and flathead catfish were encountered above but not below the barrier, while grass carp, mosquitofish, green sunfish, and bluegill were taken below but not above.

Assemblage Structure – Native fishes collectively comprised 9% of the total number of 593 individuals taken from the SRPn Canal (Table 3). Sonora sucker was the third most abundant fish species overall (8% of total catch), while only two desert suckers were encountered (0.3% of total numbers).

Non-native channel catfish dominated the overall catch (42% of total numbers), followed among non-natives by flathead catfish (24%), largemouth bass (7%), mosquitofish (6%), bluegill and common carp (about 3% each), and rainbow trout, yellow bullhead, and blue tilapia (about 2% each). Other species each contributed 1% or less to the total numbers.

Above the fish barrier channel catfish was the most abundant species captured (45% of catch), followed by flathead catfish (29%), largemouth bass and native Sonora sucker (7% each), common carp and rainbow trout (about 3% each), and yellow bullhead and blue tilapia (about 2% each). Other species each contributed less than 1% to the total catch above the barrier (Table 5F).

Below the fish barrier, nonnative mosquitofish was the dominant species (31%), followed by channel catfish (29%), bluegill (15%), native Sonora sucker (13%), grass carp (7%), and largemouth bass (4%, Table 4F).

FLORENCE-CASA GRANDE CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed by Marsh & Associates with Reclamation assistance on October 27, 2008 (Table 1). Four stations were sampled during routine monitoring: one immediately below the canal headworks at Ashurst-Hayden Diversion Dam (above the electrical fish barrier located at China Wash), and three below China Wash barrier located 2.6 miles downstream from the diversion dam. Stations immediately below the barrier were at China Wash, at the Kenilworth Road bridge 14.6 miles downstream from Ashurst-Hayden, and at the Pima Lateral Canal (15.2 miles downstream). The station at the dam was sampled using a backpack electrofisher and a straight seine. Seepage through the turnout gates was approximately 1.5 cfs, the wetted channel was variably 1 to 5 m wide, mostly shallow with deepest pools ca. 1 m, and substrate was sandy-gravel with some fines. China Wash was sampled using a straight seine, Kenilworth Road bridge with a backpack electrofisher, and the station at Pima Lateral was sampled with a backpack electrofisher, straight seine, and dip nets.

Species Richness and Distribution – Five species were taken from the Florence-Casa Grande Canal (Tables 2 and 4); none was native. All five species were collected above and below the electric fish barrier at China Wash. Channel catfish was the most abundant species overall (80% or total catch) and was the most abundant species at each station sampled.

Assemblage Structure – No native species were represented in the total sample of 194 individuals from the FCG Canal (Table 3). Above the electrical fish barrier, the catch was predominated by channel catfish (89%) followed by flathead catfish (5%) and red shiner (4%). One yellow bullhead and one mosquitofish also were captured. Below the electrical fish barrier, channel catfish predominated (72%), followed by mosquitofish (14%), red shiner (11%), and yellow

bullhead (2%). A single flathead catfish constitutes the remainder of the catch below the barrier (Table 5G).

CIENEGA CREEK

Sampling Notes and Deviations from Protocol – Sampling was performed by Marsh & Associates with Reclamation assistance on October 29, 2008 (Table 1). This was the second year of monitoring for this stream reach, which was added to the monitoring program with the addition of the Santa Cruz River subbasin to the geographic area considered under the 2008 CAP Section 7 Endangered Species Act consultation. Two stations were sampled during routine monitoring: one at Head Cut and one at Three Bridges. Head-cut (station 1) is located in the SW¼ Sec29, T16S, R17E, Pima Co. Its UTM coordinates are Zone 12S 535690E 3541630N (NAD 27) and it lies at approximately 3367' MSL. Three Bridges (station 2) is located in the NE¼ Sec19, T16S, R17E, Pima Co. The station is approximately 0.2 km up- and downstream of the Pantano Road bridge crossing at Zone 12S 533490E 3542470N and it is at approximately 3323' MSL. Both stations were sampled using a backpack electrofisher and a straight seine; there were no deviations from standard protocol.

Species Richness and Distribution – Two species, native longfin dace and Gila topminnow, were taken from Cienega Creek (Tables 2 and 4). Longfin dace were collected at both stations while Gila topminnow was only collected from the upper station.

Assemblage Structure – Native longfin dace dominated the catch overall (591 individuals, 86% of total catch), as well as at the upstream and downstream stations (73% and 100% respectively). Gila topminnow made up the remainder of the catch (Table 5H).

RECOMMENDATIONS

The process of acquiring required authorization to access established stations will be initiated early in the sample year in attempt to ensure that all permissions are in hand when the field season begins. A suitable long-term alternate to Gila River station 2-4-3 (Box-O Wash) should be identified and evaluated to eliminate access issues. Presence of an occupied bald eagle nest near Salt River station 3-1-2 (Goldfield Administrative Site) could potentially limit future access at that location. A suitable alternate site should be identified as a contingency.

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TABLE 1. Station, date, gear type, and lead entity for sampling activities conducted in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, for sample year 2008 (period October 14, 2008 to January 12, 2009). Stations are identified by 3-digit numeric codes that respectively indicate stream or canal name, reach name, (1-up to 4-down-stream), and station name (1-3 for upper, middle, and lower) (see Clarkson 1996 a-c). Where station location and name have changed from Clarkson 1996 a-c, the corrected (new) name is given. Dates are given as month (01-12) day (01-31) and year (07 or 08). Abbreviations as follow: Stations: SRP = Salt River Project, FCG = Florence-Casa Grande Canal, and CAP = Central Arizona Project Canal. Gear codes, names, and acronyms by category are Entrapment/Entanglement: gill net (G), trammel net (T), hoop net (H), fyke net (F), trap net (TR), minnow trap (M), shock/gill net (SGN), shock/trammel net (STN), experimental gill net (EXPG); Seining: straight seine (SS), bag seine (BS), kick seine (KS), dip net (D); Angling: spin-cast (SC), fly rod (FR), drop line (DL), trotline (TL); Electrofishing: backpack shocker (Bp), boat shocker (Ef), bank shocker (BKS); tote barge shocker (TB); and Miscellaneous: trammel net/drifted (TND), gill net/drifted (GND), electric seine (ES), and visual observation (VO). CAP stations all are associated with pumping plants, which are named for each station, while FCG and SRP stations are given as approximate miles downstream from canal origin and/or a verbal location description.

Station	Date	Gear	Lead
San Pedro River			
1-1-1 Hereford	10 14 08	Bp	Marsh & Associates (M & A)
1-1-2 Lewis Springs	10 14 08	Bp	M & A
1-1-3 Charleston	10 14 08	Bp	M & A
1-2-1 Hughes Ranch	10 15 08	Dry site	M & A
1-2-3 Three Links Farm	10 15 08	Bp	M & A
1-3-1 Aravaipa Creek	10 15 08	Bp	M & A
1-3-2 Dudleyville	10 16 08	Bp	M & A
1-3-3 Mouth	10 16 08	Bp	M & A
Gila River			
2-1-1 Coolidge Dam	No sample		---
2-1-3 Hook & Line Ranch	No sample		---
2-2-1 Dripping Springs Wash	11 17 08	Bp, T	M & A
2-2-2 Christmas	11 17 08	Bp	M & A
2-2-3 O'Carroll Canyon	11 17 08	Bp	M & A
2-3-1 San Pedro River	11 17 08	Bp	M & A
2-3-2 Kearny	11 18 08	Bp	M & A
2-3-3 Kelvin	11 18 08	Bp	M & A
2-4-1 A-Diamond Ranch	11 18 08	Bp	M & A
2-4-2 Cochran	11 20 08	Bp	M & A
2-4-3 Box-O Wash	11 20 08	Bp	M & A

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Station	Date	Gear	Lead
Salt River			
3-1-1 Stewart Mountain Dam	No sample		---
3-1-2 Blue Point RS	No sample		---
3-1-3 Granite Reef Dam	12 15 08	Ef, T	M & A
CAP Pumping Plants			
4-1-1 Bouse	No sample		---
4-1-2 Little Harquahala	No sample		---
4-1-3 Hassayampa	No sample		---
4-2-1 Salt-Gila	11 02 08	Ef, M, T, TL	Reclamation
4-3-1 Brady	11 03 08	Ef, M, T, TL	Reclamation
4-3-2 Red Rock	11 04 08	Ef, M, T, TL	Reclamation
4-3-3 San Xavier	11 05 08	Ef, M, T, TL	Reclamation
SRP South Canal			
5 0.0 Above fish barrier	11 24 08	BS	M & A
0.1 Below fish barrier	No sample		---
2.5 River Road siphon	11 24 08	VO	M & A
4.0 RWCD turnout	11 24 08	SS	M & A
6.1 Demossing station	11 24 08	VO	M & A
9.0 Triple Junction	11 24 08	D	M & A
SRP North (Arizona) Canal			
6 0.0 Above fish barrier	01 12 09	BS	M & A
0.2 Below fish barrier	No sample		---
8.0 Evergreen Drain	No sample		---
14.5 Indian Bend Wash	01 12 09	Ef, T	M & A
FCG			
7 0.0 Below diversion dam	10 27 08	Bp, SS	M & A
2.6 Below China Wash	10 27 08	SS	M & A
11.4 First turnout	No sample		---
14.6 Kenilworth Road bridge	10 27 08	Bp	M & A
15.2 Pima Lateral	10 27 08	Bp, SS, D	M & A
Cienega Creek			
9-1-1 Head Cut	10 29 08	Bp	M & A
9-1-2 Three Bridges	10 29 08	Bp	M & A

TABLE 2. Common and scientific names and four letter codes for fish species captured during sampling activities conducted in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2008 (period October 14, 2008 to January 12, 2009). Native fishes indicated by asterisks. Abbreviations as in Clarkson 1996a, but also see notes below.

Species		SanP	Gila	Salt	CAP	SRPs	SRPn	FCG	Cien	All sites
*Desert sucker <i>Pantosteus clarki</i>	PACL	X	O	O	O	X	X	O	O	X
*Gila topminnow <i>Poeciliopsis occidentalis</i>	POOC	O	O	O	O	O	O	O	X	X
*Longfin dace <i>Agosia chrysogaster</i>	AGCH	X	O	O	O	O	O	O	X	X
*Roundtail chub <i>Gila robusta</i>	GIRO	O	O	O	O	X	X	O	O	X
*Sonora sucker <i>Catostomus insignis</i>	CAIN	O	O	X	O	X	X	O	O	X
Black bullhead <i>Ameiurus melas</i>	AMME	X	O	O	O	O	O	O	O	X
Black crappie <i>Pomoxis nigromaculatus</i>	PONI	O	O	O	O	O	X	O	O	X
Blue tilapia <i>Oreochromis aureus</i>	ORAU	O	O	O	O	X	X	O	O	X
Bluegill <i>Lepomis macrochirus</i>	LEMA	O	O	O	X	X	X	O	O	X
Channel catfish <i>Ictalurus punctatus</i>	ICPU	O	X	O	X	X	X	X	O	X
Common carp <i>Cyprinus carpio</i>	CYCA	X	X	O	X	X	X	O	O	X
Fathead minnow <i>Pimephales promelas</i>	PIPR	X	O	O	O	O	O	O	O	X
Flathead catfish <i>Pylodictis olivaris</i>	PYOL	O	X	O	O	X	X	X	O	X
Goldfish <i>Carassius auratus</i>	CAAU	O	O	O	O	X	X	O	O	X
Grass carp <i>Ctenopharyngodon idellus</i>	CTID	O	O	O	X	X	X	O	O	X
Green sunfish <i>Lepomis cyanellus</i>	LECY	X	X	O	O	O	X	O	O	X
Largemouth bass <i>Micropterus salmoides</i>	MISA	O	X	X	X	X	X	O	O	X
Mosquitofish <i>Gambusia affinis</i>	GAAF	X	X	O	O	X	X	X	O	X
Rainbow trout <i>Oncorhynchus mykiss</i>	ONMY	O	O	X	O	X	X	O	O	X
Red shiner <i>Cyprinella lutrensis</i>	CYLU	X	X	O	X	X	O	X	O	X
Redear sunfish <i>Lepomis microlophus</i>	LEMI	O	O	O	X	O	O	O	O	X
Striped bass <i>Morone saxatilis</i>	MOSA	O	O	O	X	O	O	O	O	X

TABLE 2 concluded.

Undetermined cichlid ¹ <i>Tilapia ?</i>	TILA	O	O	O	O	X	O	O	O	X
Yellow bullhead <i>Ameiurus natalis</i>	AMNA	X	O	X	O	X	X	X	O	X
Total species (taxa) ²		9	7	4	8	15	16	5	2	23
Native		2	0	1	0	3	3	0	2	5
Non-native		7	7	3	8	12	13	5	0	18
Percent native		22	0	25	0	20	19	0	100	22

¹ Undetermined cichlid may include juveniles of all species of cichlids plus juvenile and adult individuals that represent crosses among the species.

² Total species (taxa) excludes undetermined cichlids, which are assumed to be subsumed into the individual species.

TABLE 3. Total numbers of fishes captured during sampling in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2008 (period October 14, 2008 to January 12, 2009). Native fishes indicated by asterisks. Abbreviations as in Clarkson (1996a). Ab and Bb respectively indicate Above and Below electrical fish barriers on SRPn, SRPs, and FCG canals.

Species	SanP	Gila	Salt	CAP	SRPs		SRPn		FCG		Cienega	Total
					Ab	Bb	Ab	Bb	Ab	Bb		
*Desert sucker	17				10		2					29
*Gila topminnow											96	96
*Longfin dace	415										591	1,006
*Roundtail chub					10		1					11
*Sonora sucker			3		67	2	35	14				121
Black bullhead	29											29
Black crappie							3					3
Blue tilapia					11		11					22
Bluegill				1		12		16				29
Channel catfish		89		6	97	9	217	31	76	79		604
Common carp	1	23		25	19	10	15					93
Fathead minnow	12											12
Flathead catfish		6			74	5	141		4	1		231
Goldfish					1	2	1					4
Grass carp				20		3,000		7				3,027
Green sunfish	1	5						1				7
Largemouth bass		4	22	10	31	7	36	4				114
Mosquitofish	4	122				5		33	1	15		180
Rainbow trout			6		1		13					20
Red shiner	2	59		10	4	34			3	12		124
Redear sunfish				49								49
Striped bass				10								10
Undetermined cichlid						1						1
Yellow bullhead	1		1		4		12		1	2		21
Total	482	308	32	131	329	3,087	487	106	85	109	687	5,843
Total native	432	0	3	0	87	2	38	14	0	0	687	1,263
Total nonnative	50	308	29	131	242	3085	449	92	85	109	0	4,580
Percent native	89.6	0.0	9.4	0.0	26.4	0.1	7.8	13.2	0.0	0.0	100.0	21.6

TABLE 4. Fish species richness determined by sampling in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year (SY) 2008 (period October 14, 2008 to January 12, 2009). Species counts exclude undetermined cichlids (see notes accompanying Table 1). See table 1 for reach and station names (see also Clarkson 1996 a-c). Distances between stations and reaches are variable(?). Totals for each reach (and for all reaches) followed by number of native and non-native (n/nn) species; NS indicates no sample during SY 2008; dash (--) indicates designated reach or station does not exist on that stream/canal. Reaches along SRPn, SRPs, and FCG canals are artificial; canal reaches 1 are above respective electrical fish barriers and reaches 2, 3, and 4 are below; see also Clarkson (1996 a-c).

Reach/Station	SanP	Gila	Salt	CAP	SRPs	SRPn	FCG	Cienega
1-1	3	NS	NS	NS	12	12	5	2
1-2	1	--	NS	NS	--	--	--	1
1-3	5	NS	4	NS	--	--	--	--
total	7		4		12	12	5	2
n/nn	2/5		1/3		3/9	3/9	0/5	2/0
2-1	NS	5	--	4	6	NS	5	--
2-2	--	7	--	--	3	NS	2	--
2-3	3	4	--	--	0	7	2	--
2-4	--	--	--	--	4	--	--	--
total	3	7		4	10	7	5	
n/nn	1/2	0/7		0/4	1/9	1/6	0/5	
3-1	2	2	--	4	--	--	--	--
3-2	2	4	--	4	--	--	--	--
3-3	2	3	--	6	--	--	--	--
total	4	5		6				--
n/nn	1/3	0/5		0/6				
4-1	--	2	--	--	--	--	--	--
4-2	--	1	--	--	--	--	--	--
4-3	--	1	--	--	--	--	--	--
total		2						
n/nn		0/2						
Total all reaches	9	7	4	8	15	16	5	2
n/nn	2/7	0/7	1/3	0/8	3/12	3/13	0/5	2/0
percent native	22	0	25	0	20	19	0	100

TABLE 5A. Fish catch at San Pedro River stations (see TABLE 1) during sampling in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2008 (period October 14, 2008 to January 12, 2009). Fish species listed alphabetically using standard abbreviations in Table 2, data are total fish or number of young-of-year (age-0) followed by number of older age classes (age >1), if specified; subtotals and total number are for each age class.

Station Code	AGCH	AMME		AMNA	CYCA	CYLU	GAAF	LECY	PACL	PIPR	Sum	No Spp
		0	1	1	1			1	1			
1-1-1	0	0	14	0	1	0	0	1	0	0	16	3
1-1-2	1	0	0	0	0	0	0	0	0	0	1	1
1-1-3	56	0	2	0	0	0	4	0	17	9	88	5
Subtotal	57	0	16	0	1	0	4	1	17	9	105	7
1-2-3	232	2	10	0	0	0	0	0	0	3	247	3
Subtotal	232	2	10	0	0	0	0	0	0	3	247	3
1-3-1	66	0	1	0	0	0	0	0	0	0	67	2
1-3-2	18	0	0	1	0	0	0	0	0	0	19	2
1-3-3	42	0	0	0	0	2	0	0	0	0	44	2
Subtotal	126	0	1	1	0	2	0	0	0	0	130	4
Total	415	2	27	1	1	2	4	1	17	12	482	9

TABLE 5B. Fish catch at Gila River stations (see TABLE 1) during sampling in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2008 (period October 14, 2008 to January 12, 2009). Fish species listed alphabetically using standard abbreviations in Table 2; data are total fish or number of young-of-year (age-0) followed by number of older age classes (age >1), if specified; subtotals and total number are for each age class.

Station code	CYCA	CYLU	GAAF	ICPU		LECY		MISA		PYOL		Sum	No Spp
	1			0	1	0	1	0	1	0	1		
2-2-1	0	43	26	1	1	2	2	2	0	0	0	77	5
2-2-2	10	3	87	1	54	1	0	0	2	0	1	159	7
2-2-3	1	12	4	2	0	0	0	0	0	0	0	19	4
Subtotal	11	58	117	4	55	3	2	2	2	0	1	255	7
2-3-1	0	1	1	0	0	0	0	0	0	0	0	2	2
2-3-2	11	0	2	4	2	0	0	0	0	0	3	22	4
2-3-3	1	0	2	0	2	0	0	0	0	0	0	5	3
Subtotal	12	1	5	4	4	0	0	0	0	0	3	29	5
2-4-1	0	0	0	11	2	0	0	0	0	2	0	15	2
2-4-2	0	0	0	2	0	0	0	0	0	0	0	2	1
2-4-3	0	0	0	7	0	0	0	0	0	0	0	7	1
Subtotal	0	0	0	20	2	0	0	0	0	2	0	24	2
Total	23	59	122	28	61	3	2	2	2	2	4	308	7

TABLE 5C. Fish catch at Salt River stations (see TABLE 1) during sampling in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2008 (period October 14, 2008 to January 12, 2009). Fish species listed alphabetically using standard abbreviations in Table 2, data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; total number is for each age class.

Station Code	AMNA	CAIN	MISA	ONMY	Sum	No Spp	
3-1-3	1	3	7	15	6	32	4
Total	1	3	7	15	6	32	4

TABLE 5D. Fish catch at Central Arizona Project (CAP) canal stations (see TABLE 1) during sampling in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2008 (period October 14, 2008 to January 12, 2009). Fish species listed alphabetically using standard abbreviations in Table 2; data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; subtotals and total number are for each age class.

	CTID	CYCA	CYLU	ICPU	LEMA	LEMI	MISA	MOSA	Sum	No Spp	
Station Code	1	1		1	1	1	0	1	0		
4-2-1	12	0	10	3	0	0	0	0	10	35	4
Subtotal	12	0	10	3	0	0	0	0	10	35	4
4-3-1	6	11	0	1	0	0	1	2	0	21	4
4-3-2	1	1	0	0	0	3	1	1	0	7	4
4-3-3	1	13	0	2	1	46	2	3	0	68	6
Subtotal	8	25	0	3	1	49	4	6	0	96	6
Total	20	25	10	6	1	49	4	6	10	131	8

TABLE 5E. Fish catch at Salt River Project (SRP) South Canal stations (see TABLE 1) during sampling in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2008 (period October 14, 2008 to January 12, 2009). Fish species listed alphabetically using standard abbreviations in Table 2, data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; total number is for each age class. See Table 1 for sampling dates.

	AMNA	CAAU	CAIN	CTID	CYCA	CYLU	GAAF	GIRO	ICPU	LEMA	MISA	ONMY	ORAU	PACL	PYOL	TILA	Sum	No Spp
Station Code	1	1	0 1	1	1			1	0 1	0 1	0 1	1	1	1	0 1	1		
above barrier	4	1	2 65	0	19	4	0	10	0 97	0 0	0 0	31	1	11	10	0 74	0	329 12
Subtotal	4	1	2 65	0	19	4	0	10	0 97	0 0	0 0	31	1	11	10	0 74	0	329 12
2.5 below dam	0	2	0 2	3000	10	0	0	0	0 1	0 0	0 0	2	0	0	0 0	1	3018	6
4.0 below dam	0	0	0 0	0	0	22	0	0	0 0	9 3	4 1	0	0	0	0 0	0	39	3
6.1 below dam	0	0	0 0	0	0	0	0	0	0 0	0 0	0 0	0	0	0	0 0	0	0	0
9.0 below dam	0	0	0 0	0	0	12	5	0	7 1	0 0	0 0	0	0	0	5 0	0	30	4
Subtotal	0	2	0 2	3000	10	34	5	0	7 2	9 3	4 3	0	0	0	5 0	1	3087	10
Total	4	3	2 67	3000	29	38	5	10	7 99	9 3	4 34	1	11	10	5 74	1	3416	15

TABLE 5F. Fish catch at Salt River Project (SRP) North (Arizona) Canal stations (see TABLE 1) during sampling in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2008 (period October 14, 2008 to January 12, 2009). Fish species listed alphabetically using standard abbreviations in Table 2, data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; total number is for each age class. See Table 1 for sampling dates.

	AMNA	CAAU	CAIN	CTID	CYCA	GAAF	GIRO	ICPU	LECY	LEMA	MISA	ONMY	ORAU	PACL	PONI	PYOL	Sum	No Spp					
Station Code	1	1	0	1	1	1	1	0	1	0	0	1	1	1	0	1							
above barrier	12	1	9	26	0	15	0	1	12	205	0	0	2	34	13	11	1	1	3	1	140	487	12
Subtotal	12	1	9	26	0	15	0	1	12	205	0	0	2	34	13	11	1	1	3	1	140	487	12
14.5 below dam	0	0	1	13	7	0	33	0	2	29	1	16	3	1	0	0	0	0	0	0	0	106	7
Subtotal	0	0	1	13	7	0	33	0	2	29	1	16	3	1	0	0	0	0	0	0	0	106	7
Total	12	1	10	39	7	15	33	1	14	234	1	16	5	35	13	11	1	1	3	1	140	593	16

TABLE 5G. Fish catch at Florence Casa Grande (FCG) Canal stations (see TABLE 1) during sampling in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2008 (period October 14, 2008 to January 12, 2009). Fish species listed alphabetically using standard abbreviations in Table 2, data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; total number is for each age class. See Table 1 for sampling dates.

Station Code	AMNA		CYLU	GAAF	ICPU		PYOL	Sum	No Spp
	0	1			0	1			
above barrier	1	0	3	1	75	1	4	85	5
Subtotal	1	0	3	1	75	1	4	85	5
2.6 below dam	1	0	7	15	17	2	1	43	5
14.6 below dam	0	1	0	0	10	0	0	11	2
15.2 below dam	0	0	5	0	49	1	0	55	2
Subtotal	1	1	12	15	76	3	1	109	5
Total	2	1	15	16	151	4	5	194	5

TABLE 5H. Fish catch at Cienega Creek stations (see TABLE 1) during sampling in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2008 (period October 14, 2008 to January 12, 2009). Fish species listed alphabetically using standard abbreviations in Table 2, data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; total number is for each age class. See Table 1 for sampling dates.

Station Code	AGCH	POOC	Sum	No Spp
9-1-1	260	96	356	2
9-1-2	331	0	331	2
Total	591	96	687	2