

CENTRAL ARIZONA PROJECT FISH MONITORING

FINAL ANNUAL REPORT

SUMMARY OF SAMPLE YEAR 2007 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 in partial fulfillment of
U.S. Bureau of Reclamation
Agreement Number 04-CS-32-0170

Submitted to

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July 24, 2008

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) 2007 (period July 31, 2007 to January 11, 2008). 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 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)(all 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 26 taxa (excluding undetermined and hybrid *Lepomis*) was captured during SY 2007 monitoring. Two species were taken in Cienega Creek, 7 in San Pedro and Gila rivers and in FCG, 10 in CAP, 11 in Salt River, 16 in SRPn, and 17 were taken in SRPs (Table 2). Five native species (24% of total taxa) were collected: longfin dace, roundtail chub, Gila topminnow, Sonora sucker, and desert sucker. Three were in SRPs, SRPn and Salt River, two in San Pedro River and Cienega Creek, and none was in CAP or FCG canals or the Gila River. Natives comprised 18 to 100% of all species among streams, excepting sample streams where there were none. The remaining 21 taxa were non-native, which among streams numbered between 5 (San Pedro) and 14 (SRPs) 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 since 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 both quantitative and non-quantitative sampling data, and Appendix A provides non-quantitative fish data for samples from waters where such sampling was undertaken. Native fishes overall accounted for 40.1% of 5,338 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 91.8% native and the Salt River was 80.1% native. SRPs and SRPn samples were 30.5 and 18.6% natives above the electric fish barriers, respectively, and 7.4 and 39.5% 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). Red shiner followed by mosquitofish was the most abundant species from samples in the Gila River. Native desert sucker was most abundant in the Salt River catch (followed by largemouth bass). Redear sunfish followed by largemouth bass were the most abundant fishes in the CAP Canal. Native Sonora sucker and common carp predominated in samples above the electrical fish barrier in SRPs and SRPn respectively (followed by common carp and Sonora sucker respectively). Red shiner predominated the catch below the barrier on SRPs (followed by Sonora sucker), while Sonora sucker followed by bluegill predominated the catch below the barrier on the SRPn. Red shiner predominated the catch above the barrier in the FCG (followed by mosquitofish), while mosquitofish was the most abundant species below the barrier (followed by yellow bullhead catfish, Table 3). Longfin dace was the most abundant followed by Gila topminnow, the only other species encountered on Cienega Creek.

SAN PEDRO RIVER

Sampling Notes and Deviations from Protocol – Sampling was performed by Marsh & Associates from October 31 through November 2, 2007 (Table 1). All eight currently available stations were sampled (station 1-2-2 was eliminated from the protocol in 2005). Backpack electrofishing was conducted at all sites. No fish were captured at the mouth (station 1-3-3), although the site was sampled.

Species Richness and Distribution – Seven species were captured in the San Pedro River (Tables 4 and 5A). Seven species were taken in the upper reach, five in the middle, and two in the lower. Two natives were encountered (longfin dace and desert sucker), comprising two-sevenths of total species. Longfin dace was found at five stations, while desert sucker was collected at a single station.

Five non-natives were in the upper reach, four in the middle, and one in the lower. Common carp was only found in the upper reach, green sunfish, largemouth bass, and mosquitofish were captured in the upper and middle reaches and black bullhead was captured in all three reaches.

Assemblage Structure – Native species dominated the catch overall (91.8% of a total catch of 757 individuals), and at all three reaches (Tables 3 and 5A). Native longfin dace was the most abundant fish species overall (90% of total numbers) and predominated the catch in all three reaches (Table 5A). Desert sucker was represented by 13 specimens collected in the upstream reach.

Black bullhead was the most abundant non-native and the second most abundant species overall, making up 4.2% of the catch. Green sunfish contributed about 2% to the total catch followed by largemouth bass and mosquitofish (about 1% each). Two (0.3% of total catch) common carp were collected in the upstream reach.

GILA RIVER

Sampling Notes and Deviations from Protocol – Reaches were sampled between November 8 and 10, 2007 (Table 1). Collections were made by Marsh & Associates with assistance from Reclamation. Nine of eleven currently available stations were sampled. No stations were sampled in the upper reach because timely authorization to access these sites was unavailable from the land owner (San Carlos Apache Tribe). Backpack electrofishing was used at eight sites. The San Pedro River station (2-3-1) consisted of small isolated pools and was sampled with dip nets.

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

Common carp, red shiner, mosquitofish, channel catfish and flathead catfish were found at all reaches. Red shiner was captured at all 9 stations sampled making it the most widely distributed species sampled. Green sunfish were captured only in the upper-middle reach and yellow bullhead in the lower reach.

Assemblage Structure – Non-native red shiner was the most abundant species overall (50% of total catch) and predominated the catch in two of three reaches sampled (upper middle and lower). Mosquitofish was second in overall abundance (30% of total numbers) and predominated the catch in lower middle reach. Channel catfish was third (13%), followed by common carp, flathead catfish and green sunfish (each about 2% of total catch), and yellow bullhead (about 1%).

SALT RIVER

Sampling Notes and Deviations from Protocol – Sampling was performed by Marsh & Associates with assistance from Reclamation on December 20 and 21, 2007 (Table 1). The upper and middle stations were sampled using a backpack electrofisher and trammel nets (the upper station sample was also supplemented with a straight seine), while a boat-mounted electrofisher and trammel nets were used to sample the lower station.

Species Richness and Distribution – Eleven fish species were taken from the Salt River; three from the upper, eight from the middle and seven from the lower station (Table 4 and 5C). Three native species (longfin dace, Sonora sucker and desert sucker) were taken (27% of species). Largemouth bass and mosquitofish were collected at all three stations. Native Sonora sucker, yellow bullhead and rainbow trout were collected from two stations. Native longfin dace and desert sucker, and sailfin molly were only encountered at the middle station, and red shiner, bluegill and black crappie were collected only at the lower station.

Assemblage Structure – Total catch from the Salt River was 352 individuals. Native fishes comprised 80% of the total catch (Tables 3 and 5C). This atypical native species composition was due to the capture of 256 desert sucker in the middle station where it predominated (86% of catch in middle reach). Desert sucker was also the most abundant species overall (73% of total catch), Sonora sucker was fourth overall (5%), and longfin dace was fifth (about 3%). This is the second year in a row that native longfin dace and desert sucker were collected after a two year absence (Marsh & Kesner 2007).

Largemouth bass was the second most abundant species captured overall (9% of total catch). Mosquitofish was third (5%), red shiner and sailfin molly were sixth (about 2% each) followed by rainbow trout and yellow bullhead (about 1% each). A single specimen each of bluegill and black crappie was captured in the lower station.

CENTRAL ARIZONA PROJECT CANAL

Sampling Notes and Deviations from Protocol – The three stations upstream from (west of) Phoenix were sampled by Reclamation with assistance from Marsh & Associates between July 31 and August 2, 2007 (Table 1). Sampling of the four stations downstream of Phoenix was

performed between November 12 and 15, 2007. Boat-mounted electrofishing, minnow trapping, trammel netting, and trot lining were conducted at all stations sampled.

Species Richness and Distribution – Ten taxa (exclusive of undetermined or hybrid *Lepomis*), all non-native, were captured from the CAP Canal. No new species were detected. Eight species were taken from the reach upstream of Phoenix, six at the Salt-Gila station (middle reach), and nine in the downstream reach (Tables 4 and 5D). Grass carp, common carp, channel catfish, bluegill, and striped bass were taken from all three reaches. Red shiner, redear sunfish and largemouth bass were collected from two reaches, and black bullhead and smallmouth bass from one.

Assemblage Structure – Redear sunfish was the most abundant species overall (43% of total catch), followed by largemouth bass (13%) and bluegill (12%) in the sample of 478 individuals from the CAP Canal (Table 5D). Fourth most abundant was channel catfish (10%), followed by common carp (7%), striped bass (6%), grass carp (4%) and unidentified sunfish (about 3%). Other species each contributed 1% or less to the total numbers.

Common carp was the most abundant species in the reach upstream of Phoenix (28%), striped bass was second (24%), followed by largemouth bass, channel catfish and unidentified sunfish (13% each), bluegill (5%), grass carp (2%), and smallmouth bass and redear sunfish (about 1% each).

In the single station middle reach channel catfish (10 of 31 total captures, 32%), grass carp (8 fish), and striped bass (7 fish) were common. Three red shiner, two bluegill, and one common carp were also captured.

Redear sunfish dominated the catch in the lower reach (57%) followed by bluegill (15%) and largemouth bass (14%). Channel catfish was fourth most abundant species (8%), and common carp and grass carp were fifth (about 3% each). Other species each contributed 1% or less to the total numbers.

SRP SOUTH CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed by Marsh & Associates with assistance from Reclamation on November 18 and 19, 2007 (Table 1). Five stations were sampled during routine monitoring; one above the electrical fish barrier and four downstream at just below fish barrier (0.1 miles below the barrier), River Road Siphon (2.5 miles), RWCD turnout (4.0 miles), and Triple Junction (9.0 miles) where the South Canal ends. The above and just below barrier sites were sampled with a bag seine, the RWCD turnout was sampled with a straight seine, River Road Siphon and Triple Junction were sampled using 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 – Seventeen species, including three natives, were captured from the SRPs Canal (Tables 2 and 4). No new species were detected. 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). Fourteen species were taken above the electric fish barrier and ten were from collective downstream canal stations. Native Sonora sucker, plus non-native red shiner, channel catfish, green sunfish, bluegill, largemouth bass, and flathead catfish were encountered above and below the electrical fish barrier. Native roundtail chub and desert sucker, plus non-native goldfish, common carp, rainbow trout, blue and redbelly tilapia were encountered above but not below, while grass carp, mosquitofish and striped bass were encountered below but not above the barrier.

Below the fish barrier, six species were at the upper, one at the upper-middle, seven at the lower-middle, and two at the lower station. Non-native red shiner and channel catfish had the widest distribution of all species each having been contacted at four of five stations.

Assemblage Structure – Native fishes comprised 30% of the total catch (325 fish) above the fish barrier, but only 7% below the barrier (1,028 fish, Table 3). However, a single station sample of red shiner comprises the vast majority of the catch below the barrier (845 individuals, 82% of catch), also resulting in red shiner comprising the majority of overall catch (63%, Table 5E). Sonora sucker was the second most abundant species, and contributed 12% to the total, while desert sucker comprised about 1%. 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 third most abundant fish overall, accounting for 8% of total catch, and followed among non-natives by common carp (5%), blue tilapia (about 3%), largemouth bass (2%), green sunfish, bluegill and flathead catfish (each about 1%). Other non-native fishes each contributed less than 1% to the total catch.

Predominant fishes above the electrical fish barrier were native Sonora sucker (26%), common carp (22%), blue tilapia (14%) and channel catfish (12%). Fourth most abundant was largemouth bass (6%), followed by bluegill, flathead catfish and native desert sucker (each about 4%), green sunfish (3%), rainbow trout (2%) and native roundtail chub (1%, Table 5E). Other species each contributed less than 1% to the total catch above the barrier.

Below the fish barrier, red shiner was the most abundant species captured in combined catch (83%), followed by native Sonora sucker and non-native channel catfish (about 7% each). 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 7 and 11, 2008 (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. 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 eight were collected from below. Native Sonora sucker, channel catfish, bluegill and largemouth bass were collected above and below the barrier. Yellow bullhead, common carp, threadfin shad, roundtail chub, rainbow trout, desert sucker, and flathead catfish were encountered above but not below the barrier, while grass carp, red shiner, mosquitofish and redear sunfish were taken below but not above.

Assemblage Structure – Native fishes collectively comprised 22% of the total number of 512 individuals taken from the SRPn Canal (Table 3). Sonora sucker was the second most abundant fish species overall (21% of total catch), while only four desert suckers were encountered (0.8% of total numbers).

Non-native common carp dominated the overall catch (38% of total numbers), followed among non-natives by channel catfish (14%), rainbow trout (8%), largemouth bass (7%) and mosquitofish and flathead catfish (2% each). Other species each contributed 1% or less to the total numbers.

Above the fish barrier common carp was the most abundant species captured (45% of catch), followed by Sonora sucker (17%), channel catfish (16%), rainbow trout (9%), largemouth bass (6%), and flathead catfish (2%). Other species each contributed less than 1% to the total catch above the barrier (Table 5F).

Below the fish barrier, native Sonora sucker was the dominant species (40%), followed by bluegill (26%), mosquitofish (12%), largemouth bass (11%), redear and grass carp (about 4% each), two red shiner (2%) and one channel catfish (1%, Table 4F).

FLORENCE-CASA GRANDE CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed by Marsh & Associates on October 29, 2007 (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 first turnout 11.4 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 variable 1 to 5 m wide, mostly shallow with deepest pools ca. 1 m, and substrate sandy-gravel with some fines. China Wash and Pima Lateral stations were sampled using a straight seine, and the station at the first turnout was sampled with a backpack electrofisher. Flow at China Wash was about 0.5 cfs; water was bank-

to-bank and up to 0.5 m deep. Flow in the FCG Canal at the Pima Lateral Canal (PLC) turnout was a few tenths of a cfs that seeped through the stop boards, and flow in the PLC also was a few tenths of a cfs; only a trickle was in the adjacent Pima Lateral Feeder Canal.

Species Richness and Distribution – Seven species were taken from the Florence-Casa Grande Canal (Tables 2 and 4); none was native. A single specimen of black bullhead was collected at the Pima Lateral Canal station. This represents the first collection of black bullhead in the Florence-Casa Grande Canal since routine monitoring began there in 1995. The six other species were above and below the electric fish barrier at China Wash. Yellow bullhead and mosquitofish were captured at all stations and had the widest distribution.

Assemblage Structure – No native species were represented in the total sample of 279 individuals from the FCG Canal (Table 3). Above the electrical fish barrier, the catch was predominated by red shiner (44%) and mosquitofish (29%), while channel catfish and yellow bullhead were common (19% and 7% respectively). Below the electrical fish barrier, mosquitofish was most abundant (49%), followed by yellow bullhead (27%), red shiner (17%), and channel catfish (5%). Two green sunfish and the single black bullhead constitute the remainder of the catch below the barrier (Table 5G).

CIENEGA CREEK

Sampling Notes and Deviations from Protocol – Sampling was performed on September 20, 2007 (Table 1). This was the inaugural 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 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). Both species were collected at both stations.

Assemblage Structure – Native longfin dace dominated the catch overall (851 individuals, 98% of total catch), as well as at the upstream and downstream stations (98% and 95% respectively). Gila topminnow made up the remainder of the catch (Table 5H).

RECOMMENDATIONS

The process of acquiring required authorization to access established stations will again be initiated early in the sample year in attempt to ensure that all permissions are in hand when the field season begins.

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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 2007 (period July 31, 2007 to January 11, 2008). 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), and electric seine (ES). 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 31 07	Bp	Marsh & Associates (M & A)
1-1-2 Lewis Springs	10 31 07	Bp	M & A
1-1-3 Charleston	10 31 07	Bp	M & A
1-2-1 Hughes Ranch	11 01 07	Bp	M & A
1-2-3 Three Links Farm	10 01 07	Bp	M & A
1-3-1 Aravaipa Creek	11 01 07	Bp	M & A
1-3-2 Dudleyville	11 02 07	Bp	M & A
1-3-3 Mouth	11 02 07	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 08 07	Bp	M & A
2-2-2 Christmas	11 08 07	Bp	M & A
2-2-3 O'Carroll Canyon	11 08 07	Bp	M & A
2-3-1 San Pedro River	11 08 07	D	M & A
2-3-2 Kearny	11 09 07	Bp	M & A
2-3-3 Kelvin	11 09 07	Bp	M & A
2-4-1 A-Diamond Ranch	11 09 07	Bp	M & A
2-4-2 Cochran	11 10 07	Bp	M & A
2-4-3 Box-O Wash	11 10 07	Bp	M & A

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Station	Date	Gear	Lead
Salt River			
3-1-1 Stewart Mountain Dam	11 21 07	Bp, SS, T	M & A
3-1-2 Blue Point RS	11 21 07	Bp, T	M & A
3-1-3 Granite Reef Dam	11 20 07	Ef, T	M & A
CAP Pumping Plants			
4-1-1 Bouse	08 02 07	Ef, M, T, TL	Reclamation
4-1-2 Little Harquahala	08 01 07	Ef, M, T, TL	Reclamation
4-1-3 Hassayampa	07 31 07	Ef, M, T, TL	Reclamation
4-2-1 Salt-Gila	11 12 07	Ef, M, T, TL	Reclamation
4-3-1 Brady	11 13 07	Ef, M, T, TL	Reclamation
4-3-2 Red Rock	11 14 07	Ef, M, T, TL	Reclamation
4-3-3 San Xavier	11 15 07	Ef, M, T, TL	Reclamation
SRP South Canal			
5 0.0 Above fish barrier	11 19 07	BS	M & A
0.1 Below fish barrier	11 18 07	BS	M & A
2.5 River Road siphon	11 18 07	D	M & A
4.0 RWCD turnout	11 18 07	SS	M & A
9.0 Triple Junction	11 18 07	D	M & A
SRP North (Arizona) Canal			
6 0.0 Above fish barrier	01 07 08	BS	M & A
0.2 Below fish barrier	No sample		
8.0 Evergreen Drain	No sample		
14.5 Indian Bend Wash	01 11 08	Ef, T	M & A
FCG			
7 0.0 Below diversion dam	10 29 07	Bp, SS	M & A
2.6 Below China Wash	10 29 07	SS	M & A
11.4 First turnout	10 29 07	Bp	M & A
15.2 Pima Lateral	10 29 07	SS	M & A
Cienega Creek			
9-1-1 Head Cut	09 20 07	Bp, SS	M & A
9-1-2 Three Bridges	09 20 07	Bp, SS	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 2007 (period July 31, 2007 to January 11, 2008). 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	X	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	X	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	X	O	O	X	O	X
Black crappie <i>Pomoxis nigromaculatus</i>	PONI	O	O	X	O	O	O	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	X	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
Flathead catfish <i>Pylodictis olivaris</i>	PYOL	O	X	O	O	X	X	O	O	X
Goldfish <i>Carassius auratus</i>	CAAU	O	O	O	O	X	O	O	O	X
Grass carp <i>Ctenopharyngodon idella</i>	CTID	O	O	O	X	X	X	O	O	X
Green sunfish <i>Lepomis cyanellus</i>	LECY	X	X	O	O	X	O	X	O	X
Largemouth bass <i>Micropterus salmoides</i>	MISA	X	O	X	X	X	X	O	O	X
Mosquitofish <i>Gambusia affinis</i>	GAAF	X	X	X	O	X	X	X	O	X
Rainbow trout <i>Oncorhynchus mykiss</i>	ONMY	O	O	X	O	X	X	O	O	X

TABLE 2. Concluded.

Species		SanP	Gila	Salt	CAP	SRPs	SRPn	FCG	Cien	All sites
Red shiner <i>Cyprinella lutrensis</i>	CYLU	O	X	X	X	X	X	X	O	X
Redbelly tilapia <i>Tilapia zilli</i>	TIZI	O	O	O	O	X	O	O	O	X
Redear sunfish <i>Lepomis microlophus</i>	LEMI	O	O	O	X	O	X	O	O	X
Sailfin molly <i>Poecilia latipinna</i>	POLA	O	O	X	O	O	O	O	O	X
Smallmouth bass <i>Micropterus dolomieu</i>	MIDO	O	O	O	X	O	O	O	O	X
Striped bass <i>Morone saxatilis</i>	MOSA	O	O	O	X	X	O	O	O	X
Threadfin shad <i>Dorosoma petenense</i>	DOPE	O	O	O	O	O	X	X	O	X
Undetermined or hybrid sunfish ¹	LEPO	O	O	O	X	O	O	O	O	X
Yellow bullhead <i>Ameiurus natalis</i>	AMNA	O	X	X	O	O	X	X	O	X
Total species (taxa) ²		7	7	11	10	17	16	7	2	26
Native		2	0	3	0	3	3	0	2	5
Non-native		5	7	8	10	14	13	7	0	21
Percent native		29	0	27	0	18	19	0	100	24

¹ Undetermined or hybrid sunfish may include juveniles of all species of *Lepomis* plus juvenile and adult individuals that represent crosses among the several species of *Lepomis*, which are known to hybridize freely.

² Total species (taxa) excludes undetermined or hybrid sunfishes, which are assumed to be subsumed into the individual parental 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 2007 (period July 31, 2007 to January 11, 2008). 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	13		256		12		4					285
*Gila topminnow											26	26
*Longfin dace	682		9								851	1542
*Roundtail chub					4		2					6
*Sonora sucker			17		83	76	74	32				282
Black bullhead	32			1						1		34
Black crappie			1									1
Blue tilapia					47		3					50
Bluegill			1	59	14	1	2	21				98
Channel catfish		96		50	40	73	69	1	28	6		363
Common carp	2	14		35	71		195					317
Flathead catfish		12			12	1	10					35
Goldfish					2							2
Grass carp				20		1		3				24
Green sunfish	12	11			10	9				2		44
Largemouth bass	8		32	62	20	4	26	9				161
Mosquitofish	8	219	18			9		10	43	65		372
Rainbow trout			3		7		40					50
Red shiner		368	6	4	2	853		2	65	22		1322
Redbelly tilapia					1							1
Redear sunfish				206				3				209
Sailfin molly			6									6
Smallmouth bass				1								1
Striped bass				28		1						29
Threadfin shad							3			1		4
Undetermined or hybrid sunfish				12								12
Yellow bullhead		10	3				3		11	35		62
Total	757	730	352	478	325	1028	431	81	147	132	877	5338
Total native	695	0	282	0	99	76	80	32	0	0	877	2141
Total nonnative	62	730	70	478	226	952	351	49	147	132	0	3197
Percent native	91.8	0.0	80.1	0.0	30.5	7.4	18.6	39.5	0.0	0.0	100.0	40.1

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) 2007 (period July 31, 2007 to January 11, 2008). Species counts exclude undetermined plus hybrid *Lepomis* (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 2006; 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	5	NS	3	5	14	12	6	2
1-2	1	--	8	4	--	--	--	2
1-3	4	NS	7	4	--	--	--	--
total	7		11	8	14	12	6	2
n/nn	2/5		3/8	0/8	3/11	3/9	0/6	2/0
2-1	2	6	--	6	6	NS	3	--
2-2	--	4	--	--	1	NS	4	--
2-3	5	6	--	--	7	8	5	--
2-4	--	--	--	--	2	--	--	--
total	5	6		6	10	8	7	
n/nn	1/4	0/6		0/6	1/9	1/7	0/7	
3-1	1	4	--	6	--	--	--	--
3-2	2	2	--	5	--	--	--	--
3-3	0	5	--	7	--	--	--	--
total	2	5		9				--
n/nn	1/1	0/5		0/9				
4-1	--	4	--	--	--	--	--	--
4-2	--	3	--	--	--	--	--	--
4-3	--	6	--	--	--	--	--	--
total		6						
n/nn		0/6						
Total all reaches	7	7	11	10	17	16	7	2
n/nn	2/5	0/7	3/8	0/10	3/14	3/13	0/7	2/0
percent native	29	0	27	0	18	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 2007 (period July 31, 2007 to January 11, 2008). 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		CYCA	GAAF		LECY		MISA		PACL		Sum	No Spp
	0	1	0	1		0	1	0	1	0	1				
1-1-1	0	8	13	2	6	5	3	1	0	0	0	0	38	5	
1-1-2	0	1	1	0	0	0	0	0	0	0	0	0	2	1	
1-1-3	47	3	3	0	0	0	0	2	1	10	3	69	4		
Subtotal	47	12	17	2	6	5	3	3	1	10	3	109	7		
1-2-1	5	0	0	0	1	0	0	0	0	0	0	6	2		
1-2-3	437	1	1	0	1	4	0	1	3	0	0	448	5		
Subtotal	442	1	1	0	2	4	0	1	3	0	0	454	5		
1-3-1	191	0	0	0	0	0	0	0	0	0	0	191	1		
1-3-2	2	0	1	0	0	0	0	0	0	0	0	3	2		
1-3-3	0	0	0	0	0	0	0	0	0	0	0	0	0		
Subtotal	193	0	1	0	0	0	0	0	0	0	0	194	2		
Total	682	13	19	2	8	9	3	4	4	10	3	757	7		

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 2007 (period July 31, 2007 to January 11, 2008). 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	AMNA		CYCA		CYLU	GAAF	ICPU		LECY		PYOL		Sum	No Spp
	0	1	0	1			0	1	0	1	0	1		
2-2-1	0	0	1	1	98	8	12	0	7	2	1	0	130	6
2-2-2	0	0	1	4	44	49	6	1	0	0	0	0	105	4
2-2-3	0	0	0	3	2	3	5	0	0	2	1	0	16	6
Subtotal	0	0	2	8	144	60	23	1	7	4	2	0	251	6
2-3-1	0	0	0	0	5	150	6	2	0	0	0	5	267	4
2-3-2	0	0	0	0	15	0	11	0	0	0	0	0	26	2
2-3-3	0	0	0	2	2	4	27	0	0	0	1	0	36	5
Subtotal	0	0	0	2	22	154	44	2	0	0	1	5	329	5
2-4-1	0	0	0	0	16	2	7	2	0	0	1	1	29	4
2-4-2	1	0	0	0	54	0	16	0	0	0	0	0	71	3
2-4-3	1	8	0	2	132	3	0	1	0	0	1	1	149	6
Subtotal	2	8	0	2	202	5	23	3	0	0	2	2	249	6
Total	2	8	2	12	368	219	90	6	7	4	5	7	730	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 2007 (period July 31, 2007 to January 11, 2008). 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	AGCH	AMNA		CAIN		CYLU	GAAF	LEMA	MISA		ONMY	PACL		POLA	PONI	Sum	No Spp
		0	1	0	1			1	0	1	1	0	1		1		
3-1-1	0	0	1	0	0	0	9	0	5	0	0	0	0	0	0	15	3
3-1-2	9	1	1	5	10	0	3	0	3	2	1	231	25	6	0	297	8
3-1-3	0	0	0	0	2	6	6	1	16	6	2	0	0	0	1	40	7
Total	9	1	2	5	12	6	18	1	24	8	3	231	25	6	1	352	11

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 2007 (period July 31, 2007 to January 11, 2008). 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	AMME	CTID	CYCA	CYLU	ICPU	LEMA	LEMI	LEPO	MIDO	MISA	MOSA	Sum	No Spp				
	1	1	1		1	0	1	0	1	0	1	0	1				
4-1-1	0	0	0	0	1	0	4	0	1	3	0	0	6	20	35	5	
4-1-2	0	1	0	0	1	0	0	0	0	3	0	1	0	3	9	4	
4-1-3	0	1	24	0	9	0	0	0	0	5	0	0	0	2	41	4	
Subtotal	0	2	24	0	11	0	4	0	1	11	0	1	0	11	20	85	8
4-2-1	0	8	1	3	10	0	2	0	0	0	0	0	0	0	7	31	6
Subtotal	0	8	1	3	10	0	2	0	0	0	0	0	0	0	7	31	6
4-3-1	0	3	6	1	1	5	0	0	0	0	0	0	0	4	0	20	6
4-3-2	0	0	1	0	2	0	0	0	1	0	0	0	0	3	1	8	5
4-3-3	1	7	3	0	26	29	19	158	46	0	1	0	7	37	0	334	7
Subtotal	1	10	10	1	29	34	19	158	47	0	1	0	7	44	1	362	9
Total	1	20	35	4	50	34	25	158	48	11	1	1	7	55	28	478	10

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 2007 (period July 31, 2007 to January 11, 2008). 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	CAAU	CAIN	CTID	CYCA	CYLU	GAAF	GIRO	ICPU	LECY	LEMA	MISA	MOSA	ONMY	ORAU	PACL	PYOL	TIZI	Sum	No Spp					
Station Code	1	1	1	1			1	0	1	0	1	0	1	1	1	0	1	0	1	0				
Above barrier	2	83	0	71	2	0	4	1	39	2	8	2	12	12	8	0	7	5	42	12	12	1	325	14
Subtotal	2	83	0	71	2	0	4	1	39	2	8	2	12	12	8	0	7	5	42	12	12	1	325	14
0.1 below dam	0	64	1	0	0	0	0	0	32	0	0	0	0	0	1	1	0	0	0	0	1	0	100	6
2.5 below dam	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	1
4.0 below dam	0	12	0	0	845	9	0	28	1	9	0	1	0	3	0	0	0	0	0	0	0	0	908	7
9.0 below dam	0	0	0	0	5	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	2
Subtotal	0	76	1	0	853	9	0	40	33	9	0	1	0	3	1	1	0	0	0	0	1	0	1028	10
Total	2	159	1	71	855	9	4	41	72	11	8	3	12	15	9	1	7	5	42	12	13	1	1353	17

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 2007 (period July 31, 2007 to January 11, 2008). 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	CAIN	CTID	CYCA	CYLU	DOPE	GAAF	GIRO	ICPU	LEMA	LEMI	MISA	ONMY	ORAU	PACL	PYOL	Sum	No Spp
	1	0 1	1	1		0 1		1	0 1	1	1	0 1	1	1	0 1	0 1		
above barrier	3	7 67	0	195	0	2 1	0	2	29 40	2	0	1 25	40	3	1 3	1 9	431	12
Subtotal	3	7 67	0	195	0	2 1	0	2	29 40	2	0	1 25	40	3	1 3	1 9	431	12
14.5 below dam	0	0 32	3	0	2	0 0	10	0	0 1	21	3	0 9	0	0	0 0	0 0	81	8
Subtotal	0	0 32	3	0	2	0 0	10	0	0 1	21	3	0 9	0	0	0 0	0 0	81	8
Grand Total	3	7 99	3	195	2	2 1	10	2	29 41	23	3	1 34	40	3	1 3	1 9	512	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 2007 (period July 31, 2007 to January 11, 2008). 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	AMME	AMNA	CYLU	DOPE	GAAF	ICPU	LECY	Sum	No Spp		
	1	0	1	0		0	1	0			
above barrier	0	10	1	65	0	43	28	0	0	147	6
Subtotal	0	10	1	65	0	43	28	0	0	147	6
2.6 below dam	0	1	0	3	0	47	0	0	0	51	3
11.4 below dam	0	10	0	0	0	17	0	0	2	29	4
15.2 below dam	1	20	4	19	1	1	5	1	0	52	5
Subtotal	1	31	4	22	1	65	5	1	2	132	7
Total	1	41	5	87	1	108	33	1	2	279	7

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 2007 (period July 31, 2007 to January 11, 2008). 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	577	11	588	2
9-1-2	274	15	289	2
Total	851	26	877	2

Appendix A. Numbers of fishes captured in non-quantitative stream and CAP canal samples in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2007 (period July 31, 2007 to January 11, 2008). Abbreviations as in Table 2.

Stream	Gear	Species Code	Count	Comment
San Pedro River				
	backpack shocker	AGCH	68	SAMPLE @ OLD 06 SITE
	backpack shocker	AMME	1	QUAL SAMP U/S SITE
Gila River				
	dip net	CYLU	5	NOTED AS RARE
	dip net	GAAF	150	
	dip net	ICPU	8	ISOLATED POOL DIPNET
	dip net	PYOL	5	
Cienega Creek				
	straight seine	AGCH	350	100S IN RIFL & POOL
	straight seine	POOC	15	FEW IN PERIPHERY