

CENTRAL ARIZONA PROJECT FISH MONITORING

SUMMARY OF SAMPLE YEAR 2003 FISH SURVEYS IN BEHALF OF A LONG-TERM MONITORING PLAN FOR FISH POPULATIONS IN SELECTED WATERS OF THE GILA RIVER BASIN, ARIZONA

Submitted in partial fulfillment of
U.S. Bureau of Reclamation
Agreement Number 01-FC-32-0150

Submitted to

Robert W. Clarkson
U.S. Bureau of Reclamation
Lower Colorado Region
Phoenix Area Office
P.O. Box 81169
Phoenix, Arizona 85069-1169

Prepared by

Paul C. Marsh and Brian R. Kesner
Chandler, Arizona 85224

January 19, 2007

This report summarizes fish sampling by Arizona Game and Fish Department (AZGFD), Arizona State University (ASU), and U.S. Bureau of Reclamation (USBR) in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year (SY) 2003 (period August 19, 2003 to January 29, 2004). Protocols implemented during this monitoring are detailed by Clarkson 1996 a-c.

Waters (stations) sampled during this monitoring were (1) San Pedro River (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) Central Arizona Project (CAP) Canal at selected pump plants, (5) Salt River Project (SRP) South (SRPs) Canal, (6) and SRP Arizona or North (SRPn) Canal (Table 1). Florence-Casa Grande (FCG) Canal was dry and thus not sampled during this period.

Comparisons are not made herein with monitoring data acquired during prior years as reported by Clarkson (1998) and Marsh (1999, 2004), or to earlier years (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 20 taxa (excluding undetermined and hybrid *Lepomis*, but including undifferentiated cichlids) was captured during SY 2003 monitoring. No new species were recorded. Seven species were taken in San Pedro River, 8 in Gila River, 11 in CAP, 12 in SRPn, 13 in Salt River, and 14 were in SRPs (Table 2). Three native species (15% of total taxa) were collected: longfin dace, Sonora sucker, and desert sucker. Three were in Salt River, two in San Pedro River, SRPs and SRPn, and none was in CAP canal or Gila River. Natives comprised 14 to 29% of all species among stations, except in the CAP canal and Gila River where there were none. The remaining 17 taxa were non-native, which among stations numbered between five (San Pedro River) and 12 (SRPs Canal) species.

Total number of fish varied widely among streams, 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 and SRPs 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. Species collected only in qualitative samples are noted in Table 2. Numbers presented in all tables include both quantitative and non-quantitative sampling data, and Appendix A provides non-quantitative fish data for samples from the three rivers and CAP canal, from which quantitative data typically is acquired. Native fishes overall accounted for 10.1% of 4,432 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 and CAP Canal) to 63.5% (SRPn below electric fish barrier). Salt and San Pedro rivers were 35.0 and 62.3% native respectively. SRPs, SRPn samples were 0.9 and 3.1% natives above the electric fish barriers, respectively, and SRPs was 36.9% native below the barrier (Table 3).

Community structure differed substantially among streams, reaches, and stations (Table 3). Mosquitofish was the most abundant species in samples from the Gila River (followed by red shiner). Largemouth bass predominated the Salt River catch (followed by native Sonora sucker), and native longfin dace was the most abundant species in the San Pedro River (followed by black bullhead). Redear sunfish followed by bluegill were the most abundant fishes in the CAP Canal. Undetermined cichlids and channel catfish predominated in samples above the electrical fish barrier in SRPs and SRPn respectively (followed by channel catfish and flathead catfish respectively). While Sonora sucker was the most abundant species below the barrier in SRPs and SRPn (followed by channel catfish and grass carp respectively) (Table 3).

SAN PEDRO RIVER

Sampling Notes and Deviations from Protocol – Sampling was performed between 14 and 15 October 2003 (Table 1). Five of eight currently available stations were sampled; no sample was taken at the three stations for reach 3 (1-3-1, 1-3-2, 1-3-3) because the streambed was dry there. . A ninth station, 1-2-3 (Gage Station) has never been sampled and has been permanently deleted from the monitoring plan. Backpack electrofishing was the collection method used at all sites.

Species Richness and Distribution – Seven species were captured in the San Pedro River (Tables 4 and 5A). No new species were detected. Seven were taken in the upper reach and four in the middle. Two natives were encountered (longfin dace and desert sucker), comprising about 29% of total species. Longfin dace was found at three of five stations and had the broadest representation among native species, and desert sucker was at one station in the upper reach.

Five non-natives were in the upper reach and three in the middle. Mosquitofish was at four of five stations across all reaches. Common carp and green sunfish were only in the upper reach, whereas black bullhead and fathead minnow were in upper and middle reaches.

Assemblage Structure – Natives outnumbered non-natives overall (62.3% of a total catch of 106 individuals), at all reaches, and at two of five stations (Tables 3 and 5A). Native longfin dace was the most abundant fish species overall (54% of total numbers), and at the upper and middle reaches (Table 5A). Desert sucker comprised slightly more than 8% of the overall catch. Sonora sucker was not

encountered.

Black bullhead was the most abundant non-native making up 16% of the catch. Fathead minnow was 10% and mosquitofish 9%. Common carp and green sunfish were represented by one specimen and each contributed less than 1% to the total catch.

GILA RIVER

Sampling Notes and Deviations from Protocol – Sampling was performed between 3 and 13 November 2003 (Table 1). Collections were made by AZGFD. Five of eleven currently available stations were sampled and positive data were acquired. Stations 2-1-1 (Coolidge Dam) and 2-1-3 (Hook & Line Ranch) were not sampled due to logistical issues, while no fishes were encountered at 2-3-1 (San Pedro River), 2-3-2 (Kearny), 2-4-2 (Cochran) and 2-4-3 (Box-O Wash). Backpack electrofishing was used at all sites in the upper middle. Stations 2-3-3 (Kelvin) and 2-4-1 (A-Diamond Ranch) were sampled with dip nets.

Species Richness and Distribution – Eight species were captured in the Gila River (Tables 4 and 5B). No new species were detected. Eight were taken in the upper-middle reach, two in the lower-middle reach, and one in the lower. No native species were encountered. Sonora sucker and longfin dace have been encountered in the past (Marsh 1999, 2004); both species were captured in 2001, and only Sonora sucker was encountered in 2002.

Red shiner and mosquitofish were found at four of the five sites, were the most widely distributed non-native species, and were the only species encountered in the lower middle reach. Mosquitofish was the sole species encountered in the lower reach. All other species were captured in the upper middle reach. Green sunfish, channel catfish, and red shiner were found in all three stations of the upper middle reach, common carp and mosquitofish in two, and yellow bullhead, bluegill and fathead minnow in one.

Assemblage Structure – Non-native mosquitofish was by far the most abundant species overall (82% of total catch) predominating the catch in three of the four stations in which it was encountered. Red shiner was second in overall abundance (13% of total numbers) and was the second most abundant species in the upper middle reach, predominating at station 2-2-2. Green sunfish was 2% of total catch and other species each contributed less than a percent to the total.

SALT RIVER

Sampling Notes and Deviations from Protocol – Sampling was performed on January 28 and 29, 2004 (Table 1). All three stations were sampled. Boat-mounted electrofishing was conducted at all stations, backpack electrofishing was performed at the middle station.

Species Richness and Distribution – Thirteen fish species (excluding undetermined or hybrid *Lepomis* but including undetermined cichlids) were taken from the Salt River. No new species were detected. Seven species were at the upper, ten at the middle, and two at the lower station (Table 4). Three (23%) species were native (longfin dace, desert sucker, and Sonora sucker) and 10 were non-native. Largemouth bass, bluegill, and yellow bullhead were at all sites; common carp, Sonora sucker, and undetermined cichlids were at two, while all other species were at only one station (Table 5C).

Assemblage Structure -- Largemouth bass was the most abundant species encountered (46% of total catch), predominating the catch at all three stations. Bluegill was the fourth most abundant species overall (5.4% of total catch) followed by yellow bullhead (4.9% of total catch). Common carp was about 3%, red shiner, undetermined cichlids and channel catfish about 2%, and all other non-native species made up less than a percent of the total catch.

Native fishes comprised 35.0% of the total Salt River catch of 185 individuals (Tables 3 and 5C). Sonora sucker was the most abundant native species and second overall (24% of total catch). Longfin dace and desert sucker capture was restricted to the middle station where they made up 12% and 6% of the catch respectively (7% and 3% of total catch respectively).

CENTRAL ARIZONA PROJECT CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed upstream from Phoenix between August 19 and September 30, 2003, and downstream from Phoenix between November 11-13, 2003 (Table 1). Six of seven stations were sampled; station 4-2-1 (Salt-Gila) in the middle reach was not sampled because there was “too much water.” Boat-mounted electrofishing and trammel netting were conducted at all stations; minnow trapping was performed at the upper stations and trot lining was done at all lower stations except station 4-3-1 (Brady) and at one upper station 4-1-3 (Hassayampa).

Species Richness and Distribution – Eleven taxa (exclusive of undetermined or hybrid *Lepomis*), all non-native, were captured from the CAP Canal. No new species were detected. Seven were in the upper, and ten were in the lower reach (Tables 4 and 5D). Grass carp, common carp, channel catfish, green sunfish, largemouth bass, and striped bass were taken from both reaches. Grass carp and largemouth bass were found at all stations sampled, channel catfish and striped bass at five of six, and green sunfish and common carp at three.

Assemblage Structure – Centrarchids were predominant in the sample of 449 individuals from the CAP Canal (Table 5D). Redear sunfish was the most abundant overall (31% of total numbers), followed by bluegill (23%), largemouth

bass (10%), common carp (9%), green sunfish, channel catfish, grass carp and undetermined or hybrid *Lepomis* (5% each), striped bass (4%), black bullhead (2%), and red shiner (1%). Flathead catfish was represented by a single specimen captured at Hassayampa (station 4-1-3).

Sixty-eight percent of the total catch (301 out of 444 fish) was obtained at one station, San Xavier (station 4-3-3). At this station, redear sunfish made up 39% of the catch followed by bluegill (29%). Redear sunfish was absent from all other stations while bluegill was also captured at Red Rock (4-3-2). In the upper reach, common carp was predominant (33% of catch) where only 97 fish were captured. Channel catfish and grass carp were also common, and sunfishes were represented by 12 green sunfish.

SRP SOUTH CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed on 24 November 2003 (Table 1). Five stations were sampled during routine monitoring; one above the electrical fish barrier, one just below the barrier (0.1 km) and three downstream at River Road Siphon (2.5 km below the barrier), Roosevelt Water Conservation District turnout (RWCD; 4.0 km), and Triple Junction (9.0 km) where the South Canal ends. The sites above and immediately below the barrier were sampled with a bag seine, River Road Siphon was sampled by trammel net, RWCD with a straight seine, and Triple Junction with dip nets. Locked gates across canal roadways caused delays and inconveniences, but these were minor.

Species Richness and Distribution – Fourteen species, including undetermined (primarily young of year) cichlids and two 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 5F) although these latter reaches were not designated in the monitoring protocol (Clarkson 1996a). Nine species were taken above the electric fish barrier and 11 were from collective downstream canal stations. Red shiner, smallmouth bass, grass carp, yellow bullhead, and striped bass were encountered below but not above the barrier, while common carp, undetermined cichlids, and rainbow trout were taken above but not below.

Below the fish barrier, seven species were at the upper, four at the upper-middle, two at the lower-middle, and five at the lower station. Non-native largemouth bass was the only species encountered at all stations. Native desert sucker and Sonora sucker were at half of the stations (2 of 4) as were non-native grass carp and channel catfish.

Assemblage Structure – Non-native undetermined cichlids dominated the catch overall due to 1,129 individuals captured (66% of total catch) from the single

station above the fish barrier comprising 83% of the catch at that station. Native fishes comprised 8.5% of the total catch of 1,715 individuals from SRPs Canal (Table 3). Sonora sucker was the third most abundant species (Table 5F), and contributed 7.9% to the total, while desert sucker comprised 0.6%. As in the SRPn canal (above), relative abundances of the two native suckers likely were underestimated.

Following undetermined cichlids, non-native channel catfish was second most abundant overall (13% of total catch), and largemouth bass and flathead catfish were fourth (7% of total catch) and fifth (4% of total catch) respectively (Tables 3 and 5F). Other species contributed 1% or less to the overall catch.

Results above the electrical fish barrier are similar to overall catch with channel catfish second most abundant followed by flathead catfish and largemouth bass (Table 5F). Other species contributed less than 1% of the catch.

Below the fish barrier, native Sonora sucker dominated the upper station (85% of catch) as well as the small sample from the upper-middle station (9 of 16 fish or 56%). Largemouth bass dominated the lower-middle station (83% of catch) where 14 bluegills (17% of catch) made up the rest of the 82 fish captured at that station. At the lowermost station, non-native channel catfish dominated the catch (82% of catch), while flathead catfish and largemouth bass each contributed about 8%. Native desert sucker and yellow bullhead each were represented by one fish (Table 5F).

SRP NORTH (ARIZONA) CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed above the fish barrier on 12 January 2003, and below on 5 January 2003 (Table 1). Three stations were sampled during routine monitoring: one above the electrical fish barrier, one immediately (0.2 km) below the barrier, and one in the reach extending from Indian Bend Wash (km 14.7) upstream to the 101-Pima freeway overpass. The above barrier site was sampled with a bag seine after partial drainage, and a boat-mounted electrofisher was used to collect fishes at the other two stations.

Species Richness and Distribution – Twelve species including undetermined cichlids were captured from the SRPn Canal (Tables 2 and 4). No new species were detected. Two native species were encountered. The canal was subdivided into two reaches: “above” (one station) and “below” (two stations) the electrical fish barrier (Tables 5E), although these reaches were not designated in the monitoring protocol (Clarkson 1996a). Ten species were taken above the electric fish barrier and eight were collected from downstream canal reaches. Grass carp and green sunfish were encountered below but not above the barrier, while common carp, yellow bullhead, rainbow trout, and desert sucker were taken above but not below.

Below the fish barrier, seven species (one native) were taken from the upper station, and six (one native) were from the lower (Table 4). Sonora sucker, bluegill, channel catfish, undetermined cichlids, and largemouth bass were distributed among both stations; grass carp and flathead catfish were only at the upper station; and green sunfish was found only at the lower station.

Assemblage Structure – Native fishes collectively comprised 25.6% of the total number of 677 individuals taken from the SRPn Canal (Table 3). Sonora sucker was the second most abundant fish species overall (25%) total catch, while only one desert sucker was collected. Relative abundance of native suckers almost certainly were grossly 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 most abundant species overall (49% of total numbers), flathead catfish was third (9%), grass carp was fourth (7%), and largemouth bass was fifth (6%). Other species each contributed less than 2% to the total numbers.

Ictalurid catfishes were predominant above the electric fish barrier (90% of total fishes) but uncommon (2%) below (Table 5E). Next in close order above the barrier came largemouth bass, Sonora sucker, and undetermined cichlids. Two bluegill sunfish were captured. All other species were represented by a single specimen.

Below the fish barrier, Sonora sucker was predominant in both upper (57%) and lower (71%) stations. Grass carp was common at the upper station (38%) and largemouth bass at the lower station (15%), while other species were uncommon or rare at the respective station(s) where they occurred (Table 5E).

RECOMMENDATIONS

Continue to work toward improved communication between canal operators (CAWCD, SRP, SCID) and those performing fish monitoring activities so that sampling can coincide closely with scheduled outages.

Explore potential techniques to safely, reliably, and effectively sample fishes from the SRP canal system during periods of normal flow.

LITERATURE CITED

Clarkson, R.W. 1996a. Long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona. Revision 2. U.S. Bureau of Reclamation, Phoenix AZ. 26 pages + figures + appendices.

Clarkson, R.W. 1996b. Standard operating procedures. Field Manual. Canals. Long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona. U.S. Bureau of Reclamation, Phoenix AZ. 12 pages.

Clarkson, R.W. 1996c. Standard operating procedures. Field Manual. Rivers and streams. Long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona. U.S. Bureau of Reclamation, Phoenix AZ. 19 pages.

Clarkson, R.W. 1998. Results of fish monitoring of selected waters of the Gila River basin, 1995-1996. U.S. Bureau of Reclamation, Phoenix AZ. 30 pages.

Marsh, P.C. 1999. Summary of FY 1999 Fish surveys in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona. Report, U.S. Bureau of Reclamation, Phoenix, Arizona, Agreement No. 1425-97-FC-32-00780. Arizona State University, Tempe. 25 pages.

Marsh, P.C. 2004. Statistical Analysis of Fish Population Monitoring Data for Selected Waters of the Gila River Basin, Arizona, for the Five-year Period 1995-1999. Report, U.S. Bureau of Reclamation, Phoenix, Arizona, Agreement No. 01-FC-32-0150. Arizona State University, Tempe. 146 pages.

Marsh, P.C. and W.L. Minckley. 1982. Fishes of the Phoenix metropolitan area in central Arizona. *North American Journal of Fisheries Management* 4:395-402.

Mueller, G. 1996. Establishment of a fish community in the Hayden-Rhodes and Salt-Gila aqueducts, Arizona. *North American Journal of Fisheries Management* 16:795-804.

TABLE 1. Station, date, gear type, and lead entity for sampling activities conducted in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, for sample year 2003 (period August 19, 2003 to January 29, 2004). Stations are identified by 3-digit numeric codes that respectively indicate stream 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 (03 or 04). 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: 1=gill net (G), 2=trammel net (T), 3=hoop net (H), 4=fyke net (F), 5=trap net (TR), 6=minnow trap (M), 7=shock/gill net (SGN), 8=shock/trammel net (STN), 9=experimental gill net (EXPG); Seining: 10=straight seine (SS), 11=bag seine (BS), 12=kick seine (KS), 13=dip net (D); Angling: 14=spin-cast (SC), 15=fly rod (FR), 16=drop line (DL), 17=trotline (TL); Electrofishing: 18=backpack shocker (Bp), 19=boat shocker (Ef), 20=bank shocker (BKS); 21 = tote barge shocker (TB); and Miscellaneous: 25=trammel net/drifted (TND), 26=gill net/drifted (GND), and 27=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. FCG was not sampled for 2003 because the canal was dry.

Station	Date	Gear	Lead
San Pedro River			
1-1-1 Hereford	10 14 03	Bp	AZGFD
1-1-2 Lewis Springs	10 14 03	Bp	AZGFD
1-1-3 Charleston	10 14 03	Bp	AZGFD
1-2-1 Hughes Ranch	10 15 03	Bp	AZGFD
1-2-2 Soza Ranch	10 15 03	Bp	AZGFD
1-3-1 Aravaipa Creek	No sample		
1-3-2 Swingle Wash	No sample		
1-3-3 Mouth	No sample		
Gila River			
2-1-1 Coolidge Dam	No sample		
2-1-3 Hook & Line Ranch	No sample		
2-2-1 Dripping Springs Wash	11 13 03	Bp	AZGFD
2-2-2 Christmas	11 13 03	Bp	AZGFD
2-2-3 O'Carrol Canyon	11 13 03	Bp	AZGFD
2-3-1 San Pedro River	No sample		
2-3-2 Kearny	No sample		
2-3-3 Kelvin	11 03 03	D	AZGFD
2-4-1 A-Diamond Ranch	11 04 03	D	AZGFD
2-4-2 Cochran	No sample		
2-4-3 Box-O Wash	No sample		

Salt River

3-1-1	Stewart Mountain Dam	01 29 04	Ef	AZGFD
3-1-2	Blue Point RS	01 28 04	Ef, Bp	AZGFD
3-1-3	Granite Reef Dam	01 29 04	Ef	AZGFD

CAP Pumping Plants

4-1-1	Bouse	09 29 03	M, T, Ef	USBR
4-1-2	Little Harquahala	09 30 03	M, T, Ef	USBR
4-1-3	Hassayampa	08 19 03	M, T, TI, Ef	USBR
4-2-1	Salt-Gila	No sample		
4-3-1	Brady	11 13 03	Ef, T	USBR
4-3-2	Red Rock	11 12 03	TI, T, Ef	USBR
4-3-3	San Xavier	11 11 03	TI, T, Ef	USBR

SRP South Canal

5	0.0 Above fish barrier	11 24 03	BS	AZGFD
	0.1 Below fish barrier	11 24 03	BS	ASU
	2.5 River Road siphon	11 24 03	T	ASU
	4.0 RWCD turnout	11 24 03	SS	ASU
	9.0 Triple Junction	11 24 03	D	ASU

SRP North (Arizona) Canal

6	0.0 Above fish barrier	01 12 04	BS	AZGFD
	0.2 Below fish barrier	01 05 04	Ef	ASU
	14.7 Indian Bend Wash	01 05 04	Ef	ASU

TABLE 2. Common names and four letter codes for fish species captured during sampling activities conducted in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2003 (period August 19, 2003 to January 29, 2004). Native fishes indicated by asterisks. Abbreviations as in Clarkson 1996a, but also see notes below.

Species		SanP	Gila	Salt	CAP	SRPs	SRPn	All sites
*Desert sucker	PACL	X	O	X	O	X	X	X
*Longfin dace	AGCH	X	O	X ¹	O	O	O	X
*Sonora sucker	CAIN	O	O	X	O	X	X	X
Black bullhead	AMME	X	O	O	X	O	O	X
Bluegill	LEMA	O	X	X	X	X	X	X
Channel catfish	ICPU	O	X	X ¹	X	X	X	X
Common carp	CYCA	X	X	X	X	X	X	X
Fathead minnow	PIPR	X	X	O	O	O	O	X
Flathead catfish	PYOL	O	O	O	X	X	X	X
Grass carp	CTID	O	O	O	X	X	X	X
Green sunfish	LECY	X	X	X	X	O	X	X
Largemouth bass	MISA	O	O	X	X	X	X	X
Mosquitofish	GAAF	X	X	X ¹	O	O	O	X
Rainbow trout	ONMY	O	O	X	O	X	X	X
Redear sunfish	LEMI	O	O	O	X	O	O	X
Red shiner	CYLU	O	X	X ¹	X	X	O	X
Smallmouth bass	MIDO	O	O	O	O	X	O	X
Striped bass	MOSA	O	O	O	X	X	O	X
Undetermined or hybrid sunfish ²	LEPO	O	O	O	X	O	O	X
Undetermined Cichlid ³	TILA	O	O	X	O	X	X	X
Yellow bullhead	AMNA	O	X	X	O	X	X	X

Stream	SanP	Gila	Salt	CAP	SRPs	SRPn	All sites
Total species (taxa) ⁴	7	8	13	11	14	12	20
Native	2	0	3	0	2	2	3
Non-native	5	8	10	11	12	10	17
Percent native	29	0	23	0	14	17	15

¹ Species was collected or observed in a non-quantitative stream sample.

² 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.

³ Undetermined Cichlids likely includes juvenile and adult Mozambique tilapia, *Tilapia (Oreochromis) mossambica*, and blue tilapia *Tilapia (Oreochromis) aurea* and their hybrids, plus juvenile redbelly (Zill's) tilapia, *Tilapia zillii*.

⁴ Total species(taxa) includes undetermined Cichlids, but excludes undetermined or hybrid sunfishes, the latter of 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 2003 (period August 19, 2003 to January 29, 2004). Native fishes indicated by asterisks. Abbreviations as in Clarkson (1996a). Ab and Bb respectively indicate Above and Below electrical fish barriers on SRPn and SRPs canals.

Species	SanP	Gila	Salt	CAP	SRPs		SRPn		Total
					Ab	Bb	Ab	Bb	
*Desert sucker	9		6		4	6	1		26
*Longfin dace	57		13						70
*Sonora sucker			44		8	127	12	160	351
Black bullhead	17		6	8					31
Bluegill		8	5	107	4	14	2	10	150
Channel catfish		5	3	22	113	102	325	4	574
Common carp	1	8	5	41	2		1		58
Fathead minnow	11	3							14
Flathead catfish				1	64	10	57	1	133
Grass carp				20		4		50	74
Green sunfish	1	32	1	24				3	61
Largemouth bass			85	42	28	84	17	21	277
Mosquitofish	10	1075	1						1086
Rainbow trout			1		3		4		8
Red shiner		173	4	6		10			193
Redear sunfish				136					136
Smallmouth bass						1			1
Striped bass				19		1			20
Undetermined Cichlid (4)			3		1129		5	3	1140
Undetermined or hybrid sunfish (1)				23					23
Yellow bullhead		1	3			1	1		6
Total	106	1305	180	449	1355	360	425	252	4432
Total native	66	0	63	0	12	133	13	160	447
Total nonnative	40	1305	117	449	1343	227	412	92	3985
Percent native	62.3	0.0	35.0	0.0	0.9	36.9	3.1	63.5	10.1

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) 2003 (period August 19, 2003 to January 29, 2004). Species counts include undetermined Cichlids but exclude undetermined plus hybrid *Lepomis* (see notes accompanying Table 2). See Table 1 for reach and station names (see also Clarkson 1996 a-c). Distances between stations and reaches are relative. 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 2003; 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
1-1	3	NS	7	5	9	10	NS
1-2	1	--	10	6	--	--	--
1-3	6	NS	2	6	--	--	--
total	7		13	7	9	10	
n/nn	2/5		3/10	0/7	2/7	2/8	
2-1	4	6	--	NS	7	7	NS
2-2	2	6	--	--	4	NS	NS
2-3	--	4	--	--	2	6	NS
2-4	--	--	--	--	5	--	--
total	4	8			11	8	
n/nn	1/3	0/8			2/9	1/7	
3-1	NS	NS	--	5	--	--	--
3-2	NS	NS	--	5	--	--	--
3-3	NS	2	--	8	--	--	--
total		2		10			
n/nn		0/2		0/10			
4-1	--	1	--	--	--	--	--
4-2	--	NS	--	--	--	--	--
4-3	--	NS	--	--	--	--	--
total		1					
n/nn		0/1					
all reaches	7	8	13	11	14	12	NS
n/nn	2/5	0/8	3/10	0/11	2/12	2/10	NS
percent native	29	0	23	0	14	17	NS

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 2003 (period August 19, 2003 to January 29, 2004). Fish species listed alphabetically using standard abbreviations per Clarkson (1996a), 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		PACL		PIPR	Sum	No Spp
		0	1	0	1		0	1	0	1			
1-1-1			5			1		1				7	3
1-1-2						4						4	1
1-1-3	34		1		1	3			1	8	5	53	6
subtotal	34	0	6	0	1	8	0	1	1	8	5	64	7
1-2-1	20		6			2					6	34	4
1-2-2	3		5									8	2
subtotal	23	0	11	0	0	2	0	0	0	0	6	42	4
Total	57	0	17	0	1	10	0	1	1	8	11	106	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 2003 (period August 19, 2003 to January 29, 2004). Fish species listed alphabetically using standard abbreviations per Clarkson (1996a); 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		LEMA		PIPR	Sum	No Spp
	0	1	0	1			0	1	0	1	0	1			
2-2-1	1				114	182	1		8	2			3	311	6
2-2-2				5	45	11		2	12	5		8		88	6
2-2-3			1	2	2			2	3	2				12	4
subtotal	1	0	1	7	161	193	1	4	23	9	0	8	3	411	8
2-3-1														no sample	
2-3-2														no sample	
2-3-3					12	648								660	2
subtotal	0	0	0	0	12	648	0	0	0	0	0	0	0	660	2
2-4-1						234								234	1
2-4-2														no sample	
2-4-3														no sample	
subtotal	0	0	0	0	0	234	0	0	0	0	0	0	0	234	1
Total	1	0	1	7	173	1075	1	4	23	9	0	8	3	1305	8

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 2003 (period August 19, 2003 to January 29, 2004). Fish species listed alphabetically using standard abbreviations per Clarkson (1996a), 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		CYCA		CYLU	GAAF	ICPU		LECY		LEMA		MISA		ONMY		PACL		TILA		Sum	No Spp
		0	1	0	1	0	1			0	1	0	1	0	1	0	1	0	1	0	1	0	1		
3-1-1			1		17		1						1		1	8	14						1	44	7
3-1-2	13	4	3		27		4	4	1	3				1	3	29	11			6				109	10
3-1-3			1												5	3	20		1				2	32	2
Total	13	4	5	0	44	0	5	4	1	3	0	0	1	1	9	40	45	0	1	0	6	0	3	185	13

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 2003 (period August 19, 2003 to January 29, 2004). Fish species listed alphabetically using standard abbreviations per Clarkson (1996a); 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		LECY		LEMA		LEMI		LEPO		MISA		MOSA		PYOL		Sum	No Spp	
	0	1	0	1	0	1		0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1			
4-1-1				2				2	2		9							3	3	1	3			25	5	
4-1-2				6		1			1		3								1		1			13	6	
4-1-3				6		31			12							6			2		1		1	59	6	
subtotal	0	0	0	14	0	32	0	2	15	12	0	0	0	0	0	0	6	0	3	6	1	5	0	1	97	7
4-3-1				3		9		5											1		2			20	5	
4-3-2				1					1				7					2	4		11			26	5	
4-3-3		8		2				1	4	7	5	87	8	85	51	16	1		26					301	8	
subtotal	0	8	0	6	0	9	6	0	5	7	5	87	15	85	51	16	1	2	31	2	11	0	0	347	10	
Total	0	8	0	20	0	41	6	2	20	19	5	87	15	85	51	22	1	5	37	3	16	0	1	444	11	

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 2003 (period August 19, 2003 to January 29, 2004). Fish species listed alphabetically using standard abbreviations per Clarkson (1996a), 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		CAIN		CTID		CYCA		CYLU	ICPU		LEMA		MIDO		MISA		MOSA		ONMY		PACL		PYOL		TILA*	Sum	No Spp
	0	1	0	1	0	1	0	1		0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1			
Above barrier				8				2		58	55		4			5	23			3	1	3		64	1129	1355	9	
subtotal	0	0	0	8	0	0	0	2	0	58	55	0	4	0	0	5	23	0	0	0	3	1	3	0	64	1129	1355	9
0.1 below dam				118		3			10		1					1		1				5				139	7	
2.5 below dam				9		1									1		5									16	4	
4.0 below dam													14			68										82	2	
9.0 below dam	1									100	1					10					1	10				123	5	
subtotal	1	0	0	127	0	4	0	0	10	100	2	14	0	0	1	78	6	0	1	0	0	0	6	10	0	0	360	11
Total	1	0	0	135	0	4	0	2	10	158	57	14	4	0	1	83	29	0	1	0	3	1	9	10	64	1129	1715	14

* No age information was given.

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 2003 (period August 19, 2003 to January 29, 2004). Fish species listed alphabetically using standard abbreviations per Clarkson (1996a), 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		CAIN		CTID		CYCA		ICPU		LECY		LEMA		MISA		ONMY		PACL		PYOL		TILA		Sum	No Spp
	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1		
above barrier	1		10	2			1	275	50			1	1	2	15		4	1			57		5	425	10	
subtotal	1	0	10	2	0	0	0	1	275	50	0	0	1	1	2	15	0	4	1	0	0	57	0	5	425	10
0.2 below dam				75		50				1			1		1	2					1		1	132	7	
8.0 below dam																								no sample		
14.7 below dam				85					1	2	2	1	9		15	3							2	120	6	
subtotal	0	0	0	160	0	50	0	0	1	3	2	1	10	0	16	5	0	0	0	0	0	1	0	3	252	8
Total	1	0	10	162	0	50	0	1	276	53	2	1	11	1	18	20	0	4	1	0	0	58	0	8	677	12

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 2003 (period August 19, 2003 to January 29, 2004). Abbreviations as in Clarkson (1996a).

	Gear	Species code	Count
Gila River			
	dip net	CYLU	12
	dip net	GAAF	648
Salt River			
	backpack shocker	AGCH	13
	backpack shocker	AMNA	6
	backpack shocker	CAIN	1
	backpack shocker	CYLU	4
	backpack shocker	GAAF	1
	backpack shocker	ICPU	3
	backpack shocker	LEMA	4
	backpack shocker	MISA	29
	boat shocker	LEMA	1
	boat shocker	MISA	15
	boat shocker	TILA	2