

CENTRAL ARIZONA PROJECT FISH MONITORING

FINAL

SUMMARY OF SAMPLE YEAR 2002 FISH SURVEYS IN BEHALF OF A
LONG-TERM MONITORING PLAN FOR FISH POPULATIONS IN
SELECTED WATERS OF THE GILA RIVER BASIN, ARIZONA

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This report summarizes fish sampling by Arizona Game and Fish Department (AZGFD), Arizona State University (ASU), U.S. Bureau of Reclamation (USBR) and U.S. Fish and Wildlife Service (FWS) in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year (SY) 2002 (period July 15, 2002 to January 13, 2003). 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) Arizona (North) Canal (SRPn), (6) SRP South Canal (SRPs), and (7) Florence-Casa Grande (FCG) Canal (Table 1).

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 25 taxa (excluding undetermined and hybrid *Lepomis*, but including undifferentiated cichlids) was captured during SY 2002 monitoring. No new species were recorded. Seven species were taken in FCG, nine were in San Pedro River, 11 in Gila River, 12 in CAP, 14 in SRPn, and 15 were in Salt River and SRPs (Table 2). Four native species (16% of total taxa) were collected: roundtail chub, longfin dace, Sonora sucker, and desert sucker. Three were in Salt River and SRPs, two in SanP and SRPn, one in Gila River, and none was in CAP or FCG canals. Natives comprised 9 to 25% of all species among stations, except in the CAP and FCG canals where there were none. The remaining 23 taxa were non-native, which among stations numbered between seven (SanP and FCG) and 12 (CAP 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, SRPs, and FCG were opportunistic and qualitative (except for samples above the electrical fish barriers on the SRP canals, which represented near-complete censuses). Native fishes overall accounted for 13.3% of 6,048 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% (CAP and FCG canals) to 66.8% (Salt River). San Pedro and Gila rivers were 23.7 and 0.8% natives, respectively. SRPn, SRPs samples were 9.1 and 3.6% natives above the electric fish barriers, respectively, and 79.3 and 12.1% natives below those structures (Table 3).

Community structure differed substantially among streams, reaches, and stations (Table 3). Mosquitofish was the most abundant species in combined samples from the San Pedro River (followed by native longfin dace) and Gila River (followed by red shiner). Native Sonora sucker predominated the Salt River catch (followed by native desert sucker). Redear sunfish followed by undetermined or hybrid *Lepomis* were the most abundant fishes in the CAP Canal. Channel catfish and flathead catfish predominated in above the electrical

fish barrier in both SRPn and SRPs, while Sonora sucker was the most abundant species below the SRPn barrier and channel catfish predominated below the barrier on SRPs. Mosquitofish and red shiner were the most abundant species in FCG (Table 3).

SAN PEDRO RIVER

Sampling Notes and Deviations from Protocol – Sampling was performed between 16 and 18 October 2002 (Table 1). Seven of eight currently available stations were sampled; no sample was taken at station 1-3-3 (Mouth) because the channel was dry. A ninth station, 1-2-3 (Gage Station) has never been sampled and has been permanently deleted from the monitoring plan. Backpack electrofishing was conducted at all sites except Aravaipa (1-3-1), and seines were also used to collect fishes at the three, upper reach stations.

Species Richness and Distribution – Nine species were captured in the San Pedro River (Tables 4 and 5A). No new species were detected. Seven were taken in the upper reach, four in the middle, and one in the lower. Two natives were encountered (longfin dace and desert sucker), comprising about one-fifth of total species. Longfin dace found at five of seven 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, three in the middle, and one in the lower. Mosquitofish was at six of seven stations across all reaches. Carp, fathead minnow, and yellow bullhead were only in the upper reach, green sunfish was in upper and middle reaches, and black bullhead was only found in the middle reach.

Assemblage Structure – Non-natives outnumbered natives overall (23.7% of a total catch of 646 individuals), at all reaches, and at six of seven stations (Tables 3 and 5A). Native longfin dace was the second most abundant fish species overall (16% of total numbers), and at the upper and middle reaches (Table 5A). Desert sucker comprised slightly less than 8% of the overall catch. Sonora sucker was not encountered.

Mosquitofish was the most abundant non-native and the most abundant species overall, making up nearly 61% of the catch. Black bullhead was 6%, fathead minnow 5%, and green sunfish 3% of total fishes. Carp and yellow bullhead were represented by one and two specimens, respectively and contributed less than 1% to the total catch.

GILA RIVER

Sampling Notes and Deviations from Protocol – Sampling was performed between 15 and 23 July 2002 (Table 1). Sampling usually is done later in the year during autumn-winter months (see Clarkson 1998, Marsh 1999), however, regional drought and local desiccation of aquatic habitats resulted in a decision to conduct Gila River fish monitoring during summer 2002 (see Clarkson 2002). Collections were made by USBR accompanied by FWS or ASU. Eight of eleven currently available stations were sampled; stations 2-3-2 (Kearny), 2-4-2 (Cochran) and 2-4-3 (Box-O Wash) were not sampled because they were dry. Station 2-1-2 (Hawk Spring Canyon) is inaccessible and has been permanently deleted from the monitoring program. Backpack electrofishing was used at all sites in the upper and upper-

middle reaches, and at 2-3-1 (San Pedro River) in the lower-middle reach. Seines were used at all sites except 2-1-3 (Hook & Line Ranch). These methods were augmented by trammel nets (three stations), tote-barge mounted electrofisher (two stations), and boat shocker (one station).

Species Richness and Distribution – Nine species were captured in the Gila River (Tables 4 and 5B). No new species were detected. Ten were taken in the upper reach, nine in the upper-middle reach, three in the lower-middle reach, and seven in the lower. One native was encountered, Sonora sucker, comprising about one-tenth of total species. Sonora suckers were found at two stations in the upper-middle reach and at the one station that comprised sampling in the lowermost reach.

Ten non-native species were in the upper reach, nine were in the upper-middle, three were taken from the lower-middle reach, and seven were found in the lower reach. Red shiner and mosquitofish found at all sites and were the most widely distributed non-native species. Carp was in all four reaches, green sunfish, yellow bullhead, channel catfish and flathead catfish were at three, largemouth bass was at two, and bluegill and black crappie were at one reach each. Carp, green sunfish, channel catfish and flathead catfish were at six or seven sites each, largemouth bass was at five sites, and bluegill and black crappie were found at one site each.

Assemblage Structure –The one native species comprised less than 0.1 percent of total catch of 3,202 individuals from the Gila River (Table 3). Sonora sucker was represented by a single individual at each of two sites in the upper-middle reach, and by 24 specimens (about 1% of the catch) from the lower reach. Sonora sucker is characterized as rare.

Non-native mosquitofish was by far the most abundant species overall (72% of total catch) but predominated only in reach four (one station) where it comprised 94% of total fishes. Red shiner was second in overall abundance (15% of total numbers) and was predominant in the three upstream reaches and at most stations. Carp was 4% of total catch, largemouth bass and channel catfish were about 2% each, and other species each contributed less than a percent to the total.

SALT RIVER

Sampling Notes and Deviations from Protocol – Sampling was performed on 20 November and 03 December 2002 (Table 1). All three stations were sampled. Boat-mounted electrofishing was conducted at all stations, backpack electrofishing and trammel netting were performed at the two upper stations, and gill nets were deployed at the upper station.

Species Richness and Distribution – Fourteen fish species (excluding undetermined or hybrid *Lepomis* but including undetermined cichlids) were taken from the Salt River. No new species were detected. Nine species were at the upper, 11 at the middle, and six at the lower station (Table 4). Three (21%) species were native (longfin dace, desert sucker, and Sonora sucker) and 11 were non-native. Only desert sucker and largemouth bass were at all sites; most other common species were at two stations, while uncommon and rare ones were at only one station (Table 5C).

Assemblage Structure -- Native fishes comprised 68.1% of the total Salt River catch of 370 individuals (Tables 3 and 5C). Sonora sucker was the most abundant species overall (48%) and at the middle station. Desert sucker was the second most abundant species overall (19%) at the middle sites. Longfin dace (five individuals) was only at the middle station where it was considered rare.

Largemouth bass was the third most abundant species overall (15% of total catch) and the most abundant fish at the upper and lower stations. Undetermined cichlids were the second most common fishes in the upper reach and comprised 6% of the overall catch. Other non-native fishes each contributed less than about 2% to total numbers, as follow: three each carp and sailfin molly, five each red shiner and smallmouth bass, six each bluegill and yellow bullhead, eight green sunfish, two each undetermined or hybrid *Lepomis* and mosquitofish, and one threadfin shad. These latter species were captured at one (mostly) or two (three taxa) stations.

CENTRAL ARIZONA PROJECT CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed upstream from Phoenix on 28 and 29 October 2002, and downstream from Phoenix between 04 and 07 November 2002 (Table 1). Six of seven stations were sampled; station 4-1-2 (Little Harquahala) in the upper reach was not sampled because of safety issues related to sediment dredging in the forebay. Boat-mounted electrofishing was conducted at all stations; hoop netting, minnow trapping, trammel netting, and trot lining were done at all except station 4-4-1 (Bouse); and spin-cast angling augmented sampling at the three stations in the lower reach (Brady, Red Rock, and San Xavier).

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. Eight were in the upper, four in the middle (one station), and ten were in the lower reach (Tables 4 and 5D). Grass carp, carp, largemouth bass, bluegill and striped bass were taken from all three reaches. No species was found at all stations, although grass carp and largemouth bass were at five of the six stations that were sampled.

Assemblage Structure – Centrarchids were predominant in the sample of 286 individuals from the CAP Canal (Table 5D). Redear sunfish was the most abundant overall (28% of total numbers), followed by undetermined or hybrid *Lepomis* (23%), bluegill (10%), striped bass (9%), grass carp (8%), and largemouth bass and black bullhead (6% each). Other species, goldfish, carp, red shiner, and channel catfish each contributed 3% or less to the total.

Grass carp was predominant in the upper reach (8 specimens), where the total catch was only 33 fish. Five each carp, bluegill and striped bass; three each largemouth channel catfish, two red shiner, and one redear sunfish were also caught there (Table 5D). Striped bass (12 fish) was the most abundant species in the one-station middle reach, where other species (grass carp, largemouth bass, and bluegill) were rare; 17 total fish were captured there. Redear sunfish and undetermined or hybrid *Lepomis* predominated in the lower

reach; the first was predominant at San Xavier (station 4-3-3) and the second at Brady (station 4-3-1). No species was clearly dominant at Red Rock (station 4-3-2).

SRP NORTH (ARIZONA) CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed on 12 and 13 January 2002 (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 were used to collect fishes at the other two stations.

Species Richness and Distribution – Thirteen species including undetermined (mostly young-of-year) 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 for 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 nine were collected from downstream canal reaches. Grass carp, red shiner, and green sunfish were encountered below but not above the barrier, while carp, black crappie, flathead catfish, and undetermined cichlids were taken above but not below.

Below the fish barrier, five species (two native) were taken from the upper station, and seven (two native) were from the lower (Table 4). Grass carp, Sonora sucker, and largemouth bass were distributed among both stations; roundtail chub and channel catfish were only at the upper station; and red shiner, bluegill, green sunfish, and undetermined cichlids were found only at the lower station.

Assemblage Structure – Native fishes collectively comprised 42.4% of the total number of 731 individuals taken from the SRPn Canal (Table 3). Sonora sucker was the most abundant fish species overall (42%) total catch, while roundtail chub was rare (0.3% of total numbers). Relative abundance of the native sucker almost certainly was a gross underestimate, 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 species overall (23% of total numbers), followed by flathead catfish (10%), largemouth bass (8%), and undetermined cichlids and grass carp (5% each). Other species each contributed 2% or less to the total numbers.

Ictalurid catfishes were predominant above the electric fish barrier (44% of total fishes) but uncommon (1%) below (Table 5E). Next in close order above the barrier came flathead catfish, largemouth bass, undetermined cichlids, and Sonora sucker. All other species were uncommon-to-rare.

Below the fish barrier, Sonora sucker was predominant in both upper (85%) and lower

(71%) stations. Grass carp was common at the upper station (14%), while other species were uncommon or rare at the respective station(s) where they occurred (Table 5E).

SRP SOUTH CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed on 29 and 30 November and 02 December 2002 (Table 1). Five stations were sampled during routine monitoring; one above the electrical fish barrier and four downstream at River Road Siphon (2.5 km below the barrier), Roosevelt Water Conservation District turnout (RWCD; 4.0 km), “Demossing Station” (5.8 km), and Triple Junction (9.0 km) where the South Canal ends. The above barrier site was sampled with a bag seine after partial drainage, River Road Siphon was sampled by experimental gill net, and the other three samples were accomplished using dip nets and straight seines. Locked gates across canal roadways caused delays and inconveniences, but these were minor.

Species Richness and Distribution – Fifteen species, including undetermined (primarily young of year) cichlids and 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 5F) although these latter reaches were not designated in the monitoring protocol (Clarkson 1996a). Nine species were taken above the electric fish barrier and 13 were from collective downstream canal stations. Red shiner, desert sucker, smallmouth bass, mosquitofish, and striped bass were encountered below but not above the barrier, while grass carp, carp, and rainbow trout were taken above but not below.

Below the fish barrier, eight species were at the upper, four at the upper-middle, seven at the lower-middle, and five at the lower station. Native desert sucker was at all stations, Sonora sucker was at 3 of 4, and roundtail chub was at 2 of 4. Only largemouth bass among non-native fishes was encountered at all stations.

Assemblage Structure – Native fishes comprised 9.3% of the total catch of 666 individuals from SRPs Canal (Table 3). Sonora sucker was the fourth most abundant species (Table 5F), and contributed 8.7% to the total, while desert sucker comprised 0.6% and roundtail chub added 0.9%. As in the SRPn canal (above), relative abundances of the two native suckers likely were underestimated.

Non-native channel catfish and flathead catfish were the two most abundant fishes overall (Tables 3 and 5F), accounting for 28 and 23% of total catch, respectively, and followed among non-natives by channel catfish (20%), undetermined cichlids (5%), red shiner (4%), grass carp and carp (3% each). Other non-native fishes each contributed 2% or less to the total catch.

Predominant fishes above the electrical fish barrier were channel catfish (31%), flathead catfish (20%), undetermined cichlids (15%), grass carp and largemouth bass (10% each) and carp (8%) (Table 5F). Next in order of abundance came Sonora sucker and bluegill. Roundtail chub was represented by two individuals and rainbow trout by one specimen.

Below the fish barrier, native desert sucker and non-native red shiner were co-dominant at the upper station (each about 42% of catch), and desert sucker predominated among small samples from the upper- and lower-middle stations. Other species were uncommon-to-rare at the three upper stations. At the lowermost station, non-native channel catfish, flathead catfish, and largemouth bass each contributed about 31% of the total catch; grass carp and native desert sucker each were represented by one fish (Table 5F).

FLORENCE-CASA GRANDE CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed on 30 October 2002 (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 downstream at below China Wash barrier (2.6 km downstream from the diversion dam), turnout at 14.5 km, and Pima Lateral Canal (15.2 km). The above barrier and turnout at 14.5 km, and Pima Lateral Canal sites were sampled with a back pack electrofisher and dip nets after partial drainage, and the below China Wash site was sampled with seines. Lapses in communication between San Carlos Irrigation District (SCID) and ASU/BR resulted in confusion regarding timing of changes in canal operations, however, this did not compromise monitoring.

Species Richness and Distribution – Seven species were taken from the Florence-Casa Grande Canal (Tables 2 and 4); none was native. No new species were detected. Red shiner and mosquitofish were above and below the electric fish barrier at China Wash, while other species were found only below.

Assemblage Structure – No native species were represented in the total sample of 147 individuals from the FCG Canal (Table 3). Among non-natives, mosquitofish was the predominant species above (59%) and below (87%) the electrical fish barrier, and overall (Table 5G, 82% of catch). Next in abundance were red shiner (12%) and carp (3%). Largemouth bass, bluegill, yellow bullhead, and channel catfish were represented by one specimen each.

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.

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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 2002 (period July 15, 2002 to January 13, 2003). 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 (00 or 01). 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=bnk 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.

Station	Date	Gear	Lead
San Pedro River			
1-1-1 Hereford	10 16 02	Bp, S	AZGFD
1-1-2 Lewis Springs	10 16 02	Bp, S	AZGFD
1-1-3 Charleston	10 16 02	Bp, S	AZGFD
1-2-1 Hughes Ranch	10 17 02	Bp	AZGFD
1-2-2 Soza Ranch	10 17 02	Bp	AZGFD
1-3-1 Aravaipa Creek	10 18 02	S	AZGFD
1-3-2 Swingle Wash	10 18 02	Bp	AZGFD
1-3-3 Mouth	10 18 02	Bp	AZGFD
Gila River			
2-1-1 Coolidge Dam	07 23 02	Bp, S, T, Tb	USBR
2-1-3 Hook & Line Ranch	07 23 02	Bp, T, Tb	USBR
2-2-1 Dripping Springs Wash	07 15 02	Bp, S	USBR
2-2-2 Christmas	07 16 02	Bp, S	USBR
2-2-3 O'Carrol Canyon	07 16 02	Bp, S, T	USBR
2-3-1 San Pedro River	07 16 02	Bp, S	USBR
2-3-2 Kearny	dry -- no sample		
2-3-3 Kelvin	07 16 02	S	USBR
2-4-1 A-Diamond Ranch	07 16 02	Ef, S, T	USBR
2-4-2 Cochran	dry --no sample		
2-4-3 Box-O Wash	dry --no sample		

Table 1. Concluded

Station	Dates	Gear	Lead
Salt River			
3-1-1 Stewart Mountain Dam	11 20 02	Bp, Ef, G, T	AZGFD
3-1-2 Blue Point RS	12 03 02	Bp, Ef, T	AZGFD
3-1-3 Granite Reef Dam	12 03 02	Ef	AZGFD
CAP Pumping Plants			
4-1-1 Bouse	10 28 02	Ef, T, TI	BR
4-1-2 Little Harquahala	no sample		
4-1-3 Hassayampa	10 29 02	Ef, H, M, T, TI	BR
4-2-1 Salt-Gila	11 04 02	Ef, H, M, T, TI	BR
4-3-1 Brady	11 05 02	Ef, H, M, T, TI, Sc	BR
4-3-2 Red Rock	11 06 02	Ef, H, M, T, TI, Sc	BR
4-3-3 San Xavier	11 07 02	Ef, H, M, T, TI, Sc	BR
SRP South Canal			
5 0.0 Above fish barrier	12 02 02	S	AZGFD
0.1 Below fish barrier	11 29 02	S	ASU
2.5 River Road siphon	11 29 02	G	ASU
4.0 RWCD turnout	11 29 02	S	ASU
9.0 Triple Junction	11 30 02	S	ASU
SRP North (Arizona) Canal			
6 0.0 Above fish barrier	01 13 03	S	AZGFD
0.2 Below fish barrier	01 12 03	Ef	ASU
14.7 Indian Bend Wash	01 12 03	Ef	ASU
Florence-Casa Grande Canal			
7 0.0 Below diversion dam	10 30 02	Bp	ASU
2.6 below China Wash	10 30 02	S	ASU
14.5 turnout	10 30 02	Bp	ASU
15.2 Pima Lateral	10 30 02	Bp	ASU

TABLE 2. Common 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 2002 (period July 15, 2002 to January 13, 2003). Native fishes indicated by asterisks. Abbreviations as in Clarkson 1996a.

Species		SanP	Gila	Salt	CAP	SRPn	SRPs	FCG	All sites
*Roundtail chub	GIRO	0	0	0	0	X	X	0	X
Fathead minnow	PIPR	X	0	0	0	0	0	0	X
Goldfish	CAAU	0	0	0	X	0	0	0	X
*Longfin dace	AGCH	X	0	X	0	0	0	0	X
Grass carp	CTID	0	0	0	X	X	X	0	X
Carp	CYCA	X	X	X	X	X	X	X	X
Red shiner	CYLU	0	X	X	X	X	X	X	X
*Sonora sucker	CAIN	0	X	X	0	X	X	0	X
*Desert sucker	PACL	X	0	X	0	0	X	0	X
Smallmouth bass	MIDO	0	0	X	0	0	X	0	X
Largemouth bass	MISA	0	X	X	X	X	X	X	X
Bluegill	LEMA	0	X	X	X	X	X	X	X
Green sunfish	LECY	X	X	X	X	X	0	0	X
Redear sunfish	LEMI	0	0	0	X	0	0	0	X
Undetermined or hybrid sunfish (1)	LEPO	0	0	X	X	0	0	0	X
Black crappie	PONI	0	X	0	0	X	0	0	X
Black bullhead	AMME	X	0	0	X	0	0	0	X
Yellow bullhead	AMNA	X	X	X	0	0	0	X	X
Channel catfish	ICPU	0	X	0	X	X	X	X	X
Flathead catfish	PYOL	0	X	0	0	X	X	0	X
Mosquitofish	GAAF	X	X	X	0	0	X	X	X
Sailfin molly	POLA	0	0	X	0	0	0	0	X
Rainbow trout	ONMY	0	0	0	0	X	X	0	X
Threadfin shad	DOPE	0	0	X	0	0	0	0	X
Undetermined Cichlid (2)	TILA	0	0	X	0	X	X	0	X
Striped bass	MOSA	0	0	0	X	0	X	0	X

TABLE 2. Concluded

Stream	San P	Gila	Salt	CAP	SRPn	SRPs	FCG	All sites
Total species (taxa) (3)	9	11	15	12	13	15	7	25
Native	2	1	2	0	2	3	0	3
Non-native	7	10	13	12	11	12	7	23
Percent native	22	9	13	0	18	25	0	12

Notes:

(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) 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 zilli*.

(3) 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 a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2002 (period July 15, 2002 to January 13, 2003). Native fishes indicated by asterisks. Abbreviations as in Clarkson (1996 a). Ab and Bb respectively indicate Above and Below electrical fish barriers on SRPn, SRPs and FCG canals.

Species	SanP	Gila	Salt	CAP	SRPn		SRPs		FCG		Total
					Ab	Bb	Ab	Bb	Ab	Bb	
*Roundtail chub					3	2	2	4			11
Fathead minnow	35										35
Goldfish				4							4
*Longfin dace	102		5								107
Grass carp				23		35	22	1			81
Carp	1	123	3	9	15		17			5	173
Red shiner		496	5	2		1		26	12	6	548
*Sonora sucker		26	177		35	275	8	50			571
*Desert sucker	51		70					4			125
Smallmouth bass			5					1			6
Largemouth bass		66	54	18	44	16	21	112		1	332
Bluegill		1	6	29	7	7	3	10		1	64
Green sunfish	22	59	8	9		7					105
Redear sunfish				80							80
Undet or hybrid sunfish			2	67							69
Black crappie		8			1						9
Black bullhead	41			16							57
Yellow bullhead	2	30	6							1	39
Channel catfish		56		4	166	3	69	121		1	420
Flathead catfish		31			75		44	111			261
Mosquitofish	392	2306	2					2	17	103	2822
Sailfin molly			3								3
Rainbow trout					1		1				2
Threadfin shad			1								1
Undet Cichlid			23		37	1	34	1			96
Striped bass				25				2			27
Total	646	3202	370	286	384	347	221	445	29	118	6048
Total native	153	26	252	0	35	275	8	54	0	0	803
Total nonnative	493	3176	118	286	349	72	213	391	29	118	5245
Percent native	23.7	0.8	68.1	0.0	9.1	79.3	3.6	12.1	0.0	0.0	13.3

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) 2002 (period July 15, 2002 to January 13, 2003). Species counts include undetermined Cichlids but 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 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 2002; 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	SRPn	SRPs	FCG
1-1	5	8	8	5	10	9	2
1-2	2	NS	10	NS	--	--	--
1-3	5	9	6	4	--	--	--
total	7	10	14	8	10	9	2
n/nn	2/5	0/10	3/11	0/8	2/8	2/7	0/2
2-1	3	9	--	4	5	8	6
2-2	3	9	--	--	7	4	2
2-3	--	8	--	--	--	7	2
2-4	--	--	--	--	--	5	--
total	4	9	--	4	9	13	7
n/nn	1/3	1/9	--	0/4	2/7	3/10	0/7
3-1	1	3	--	5	--	--	--
3-2	1	NS	--	6	--	--	--
3-3	NS	2	--	7	--	--	--
total	1	3	--	10	--	--	--
n/nn	0/1	0/3	--	0/10	--	--	--
4-1	--	8	--	--	--	--	--
4-2	--	NS	--	--	--	--	--
4-3	--	NS	--	--	--	--	--
total	--	8	--	--	--	--	--

Table 4. Concluded

Reach/Station	SanP	Gila	Salt	CAP	SRPn	SRPs	FCG
n/nn	--	1/7	--	--	--	--	--
all reaches	9	11	14	11	13	15	7
n/nn	2/7	1/10	3/11	0/11	2/11	3/12	0/7
percent native	22	9	21	0	18	25	0

TABLE 5A. Fish catch at San Pedro River stations (see TABLE 1) during sampling in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2002 (period July 15, 2002 to January 13, 2003). Fish species listed alphabetically using standard abbreviations per Clarkson (1996), 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.

	AGCH	CYCA		CYLU	PIPR	PACL		LECY		AMME		AMNA		GAAF	sum	no spp	
		0	1			0	1	0	1	0	1	0	1				
1-1-1	9					1		4	14					2	16	46	5
1-1-2	1													201	202	2	
1-1-3	58		1		34	8	43							76	220	5	
subtotal	68	0	1	0	35	8	43	4	14	0	0	0	2	293	468	7	
1-2-1	24								4		38				66	3	
1-2-2	10										3		5	18	3		
subtotal	34	0	0	0	0	0	0	0	4	0	41	0	0	45	84	4	
1-3-1														47	47	1	
1-3-2														7	7	1	
1-3-3	site dry -- no sample																
subtotal	0	0	0	0	0	0	0	0	0	0	0	0	0	54	54	1	
Total	102	0	1	0	35	8	43	4	18	0	41	0	2	392	646	9	

TABLE 5B. Fish catch at Gila River stations (see TABLE 1) during sampling in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2002 (period July 15, 2002 to January 13, 2003). Fish species listed alphabetically using standard abbreviations per Clarkson (1996); 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.

	CYCA		CYLU	CAIN		MISA		LECY		LEMA		PONI		AMNA		ICPU		PYOL		GAAF	Sum	No Spp
	0	1		0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1			
2-1-1	10	18	44			4	3	29	9					1		3	1	1	86	209	8	
2-1-3		8	34			12	3	14	7		1		8			4	1	1	26	119	9	
subtotal	10	26	78	0	0	16	6	0	16	0	1	0	8	0	1	0	7	2	2	112	285	10
2-2-1	25	11	118		1	30		2	2					7		3			11	42	252	9
2-2-2	4	2	126		1	11		12	1					3		4	1		2	73	240	9
2-2-3	26	1	21			3		9	12						14	1	2	5	44	138	8	
subtotal	55	14	265	0	2	44	0	23	15	0	0	0	0	10	14	7	2	15	5	159	630	9
2-3-1 (new)	7		7																	31	45	3
2-3-2	no sample																					
2-3-3			99																	1	100	2
subtotal	7	0	106	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	145	3
2-4-1	7	4	47		24			2	3					4	1		40	7		2003	2142	8
2-4-2	no sample																					
2-4-3	no sample																					
subtotal	7	4	47	0	24	0	0	2	3	0	0	0	0	4	1	0	40	7	0	2003	2142	8
Total number	79	44	496	0	26	60	6	25	34	0	1	0	8	14	16	7	49	24	7	2306	3202	11

TABLE 5C. Fish catch at Salt River stations (see TABLE 1) during sampling in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2002 (period July 15, 2002 to January 13, 2003). Fish species listed alphabetically using standard abbreviations per Clarkson (1996), 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.

	AGCH		CYCA		CYLU		CAIN		PACL		MIDO		MISA		LEMA		LECY		LEPO		AMNA		GAAF POLA		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	0	1		
3-1-1						15		8			4	5	18		2		6		2			3				20	83	9
3-1-2	5		3		5	56	100	0	62		1	9	7								1	2	2	3		1	257	11
3-1-3						1	5					8	7		4		2								1	2	30	6
Total	5	0	3	5	57	120	0	70	0	5	22	32	0	6	0	8	0	2	1	5	2	3	1	0	23	370	14	

TABLE 5D. Fish catch at Central Arizona Project (CAP) canal stations (see TABLE 1) during sampling in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2002 (period July 15, 2002 to January 13, 2003). Fish species listed alphabetically using standard abbreviations per Clarkson (1996); 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.

	CAAU		CTID		CYCA		CYLU	MISA		LEMA		LECY		LEMI		LEPO		AMME		ICPU		MOSA		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				1				1	2	5				1								1	4	15	5
4-1-2	no sample																								
4-1-3				8		5	2														3			18	4
subtotal	0	0	0	9	0	5	2	1	2	5	0	0	0	0	1	0	0	0	0	0	3	1	4	33	8
4-2-1				1					3	1												9	3	17	4
4-3-1				3		3			4				1									2		13	5
4-3-2				10		1			4		3				21							6		45	6
4-3-3		4							4	1	19		8	19	39	59	8	1	15	1				178	8
subtotal	0	4	0	13	0	4	0	0	12	1	22	1	8	19	60	59	8	1	15	1	0	8	0	236	10
Total	0	4	0	23	0	9	2	1	17	7	22	1	8	19	61	59	8	1	15	1	3	18	7	286	11

TABLE 5E. Fish catch at Salt River Project (SRP) North (Arizona) Canal stations (see TABLE 1) during sampling in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2002 (period July 15, 2002 to January 13, 2003). Fish species listed alphabetically using standard abbreviations per Clarkson (1996), 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.

	GIRO		CTID		CYCA		CYLU		CAIN		MISA		LECY		LEMA		PONI		ICPU		PYOL		ONMY		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			
Above barrier	3				15				35	7	37			7		1	132	34		75		1	37	384	10		
0.2 below dam		2		33					200	3	1									3					242	5	
13.0 below dam				2			1		75	5	7	7		5	2									1	105	7	
subtotal below	0	2	0	35	0	0	1	0	275	8	8	7	0	5	2	0	0	0	3	0	0	0	0	1	347	9	
Total	3	2	0	35	0	15	1	0	310	15	45	7	0	5	9	0	1	132	37	0	75	0	1	38	731	13	

TABLE 5F. Fish catch at Salt River Project (SRP) South Canal stations (see TABLE 1) during sampling in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2002 (period July 15, 2002 to January 13, 2003). Fish species listed alphabetically using standard abbreviations per Clarkson (1996), 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.

	GIRO		CTID		CYCA		CYLU	CAIN		PACL		MIDO		MISA		LEMA		ICPU		PYOL		GAAF	ONMY		TILA		MOSA	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				0
Above barrier		2		22		17		5	3				1	20		3	15	54		44				1		34		221	9	
0.1 below dam		3					26		25		1		1	1				5		1						1		61	8	
3.0 below dam									6		2		1		2												11	4		
4.0 below dam		1							18		1			7	10				6				2				2	46	7	
9.0 below dam				1					1					100	1			100	10	100	10						323	5		
subtotal below	0	4	0	1	0	0	26	0	50	0	4	0	1	101	11	10	0	100	21	100	11	2	0	0	0	1	0	2	445	13
Total	0	6	0	23	0	17	26	5	53	0	4	0	1	102	31	10	3	115	75	100	55	2	0	1	0	35	0	2	666	15

TABLE 5G. Fish catch at Florence-Casa Grande canal stations (see TABLE 1) during sampling in behalf a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2002 (period July 15, 2002 to January 13, 2003). Fish species listed alphabetically using standard abbreviations per Clarkson (1996), data are total number of 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.

	CYCA		CYLU	MISA		LEMA		AMNA		ICPU		GAAF	Sum	No spp
	0	1		0	1	0	1	0	1	0	1			
Above barrier			12									17	29	2
Below barrier														
2.6 km	2		1	1		1		1		1			7	6
14.5 km	2		5									101	108	2
15.2 km	1											2	3	2
subtotal below	5	0	6	1	0	1	0	1	0	1	0	103	118	7
Total number	5	0	18	1	0	1	0	1	0	1	0	120	147	7