

**RESULTS OF FISH MONITORING OF SELECTED WATERS
OF THE GILA RIVER BASIN, 1997**

Prepared For

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INTRODUCTION

The Central Arizona Project (CAP) is a series of aqueducts and pipelines that transports Colorado River water from Lake Havasu, Arizona-California, to central and southern Arizona for agricultural, municipal, and industrial uses. The CAP was authorized by Congress in the Colorado River Basin Project Act of 1968, and construction was largely completed by the U.S. Bureau of Reclamation (Reclamation) in 1993. A U.S. Fish and Wildlife Service (FWS) Biological Opinion (BO) on transportation and delivery of CAP water to the Gila River Basin (FWS 1994) determined that the project would jeopardize the continued existence of four threatened or endangered fishes: Gila topminnow *Poeciliopsis occidentalis*, spikedace *Meda fulgida*, loach minnow *Tiaroga cobitis*, and razorback sucker *Xyrauchen texanus*. FWS (1994) also determined that the project would adversely modify designated critical habitat of the latter three species. The primary justification for the jeopardy opinion was the potential for transfers of nonindigenous fishes and other aquatic organisms from the lower Colorado River to various drainages in the Gila River Basin via the CAP, where they could negatively impact threatened or endangered fishes.

A reasonable and prudent alternative (RPA) of the BO directed that Reclamation, in cooperation with the Arizona Game and Fish Department (AZGFD) and FWS, "...develop and implement a baseline study and long-term monitoring of the presence and distribution of non-native fish..." in the CAP aqueduct and selected river and canal reaches in Arizona. The goal of the monitoring plan is "...to establish baseline data on the presence and distribution of non-native fishes in the target reaches and to detect changes in the species composition or distribution" (FWS 1994). Target reaches to be monitored include: 1) CAP aqueduct; 2) Salt River Project (SRP) canals; 3) Florence-Casa Grande (FCG) Canal; 4) Salt River between Stewart Mountain Dam and Granite Reef Dam; 5) Gila River between Coolidge and Ashurst-Hayden dams; and 6) San Pedro River downstream from the U.S.-Mexico border.

The BO directed Reclamation to begin monitoring by October 1994. Monitoring for years 1994 (and earlier) were partially reported in memoranda to files that were distributed to FWS and AGFD (Jakle 1991, 1992, 1993a-b, 1995a-c). Monitoring data for these years were also assembled, summarized, and discussed by Clarkson (1998), who also reported on data for the years 1995 and 1996. This report presents results of Reclamation and subcontractor/cooperator monitoring of target streams and canals for 1997, which was undertaken according to provisions of the most recent revision (No.2) of the "Long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona" (Clarkson 1996). Partial results of 1997 monitoring were also presented by Clark et al. (1998) and Marsh (1998). Habitat data collected under the monitoring plan methodologies will be reported in a comprehensive report that will be prepared in 2000.

METHODS

Detailed sampling methodologies were presented in the 1996 monitoring plan and appendices (Clarkson 1996), and will not be reiterated in detail here. In general, streams were stratified according to geomorphology or flow characteristics, and replicate "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. In practice, only the relatively small habitats of the San Pedro River rely nearly exclusively upon electrofishing

for data collection. Other gear types including gill nets, trammel nets, hoop nets, minnow traps, seines, dip nets, trot lines, and angling were deployed to varying extent in other streams and canals. Attempts are made to sample all available habitat, but that is only practical in the San Pedro River and certain reaches with "small" habitats in the Gila and Salt rivers. Following collection of quantitative data from fixed stream stations, qualitative sampling is to be performed upstream and/or downstream of each station for the purpose of collecting rare species.

In canals, sampling is more opportunistic, and is 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 SRP and FCG canals 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. See Clarkson (1998) for more detailed descriptions of monitored streams and canals and the methods used to sample them.

Reclamation has sought help from various sources to conduct this work. The Boulder City Regional Office of Reclamation has had primary responsibility for CAP sampling. AZGFD undertook primary sampling of the Gila, Salt, and San Pedro rivers, and Arizona State University (ASU) conducted primary monitoring of SRP and FCG canals. AZGFD has lead a multi-agency sampling of the SRP canals above the electrical fish barriers since 1990. Reclamation's Phoenix Area Office assists all these efforts to varying degrees, and oversees the monitoring program in total.

RESULTS AND DISCUSSION

Monitoring in 1997 was accomplished for all stations identified in the 1996 monitoring plan (Clarkson 1996) with the following exceptions: 1) the middle station (Hawk Spring Canyon) of the upper Gila River sampling reach is inaccessible by automobile, and has been deleted as a permanent monitoring station; and 2) the lower station (Gage Station) of the middle San Pedro River sampling reach cannot be accessed due to inability to obtain right-of-entry from the landowner. This station also has been deleted as a permanent monitoring station. Should circumstances change in the future, these stations will be reinstated to the sampling design.

Right-of-entry concerns necessitated moving certain sampling station locations in 1997 from those identified in the 1996 monitoring plan: 1) the upper station (Copper Canyon) of the upper middle reach of Gila River was moved upstream 3.2 km to SE $\frac{1}{4}$ Sec. 16, T4S, R16E, and that station is now referred to as Dripping Springs Wash; 2) the middle station (Deer Creek) of the upper middle reach of Gila River was moved 1.6 km upstream to NW $\frac{1}{4}$ Sec. 28, T4S, R16E, and that station is now referred to as Christmas; 3) the middle station (Indian Camp Wash) of the lower middle reach of Gila River was moved downstream 3.3 km to SW $\frac{1}{4}$ Sec. 28, T4S, R14E, and that station is now referred to as Kearny; and 4) the lower station (Riverside) of the lower middle reach of Gila River was moved downstream 1.6 km to N $\frac{1}{2}$ Sec. 12, T4S, R13E, and that station is now referred to as Kelvin.

Admonitions by Clarkson (1998) regarding data quality, sampling design, and suitability of data acquired under the monitoring program to cross-year and cross-site comparisons remain pending a comprehensive review of the statistical design, assumptions, and data analysis features of the program. This review should be completed in the first half of 2000, at which time the monitoring plan will be updated and revised accordingly. For these reasons, only very general conclusions regarding assemblage structure are presented in this report.

Table 1 lists sampling sites, sampling dates, and gears used for stream and canal monitoring during 1997. Table 2 provides a list of common and scientific species names, and their acronyms used in subsequent tabulation. Table 3 is a matrix of recent (since 1970) species occurrences in the target streams and canals.

Monitoring Overview

A total of 27 taxa (including 2 species of *Tilapia*) was captured during sampling efforts in 1997 (including the January 1998 samples from the SRP Arizona Canal; Tables 4-5). Species richness was greatest in SRP Arizona (North) Canal below the electrical fish barrier (16), followed by Gila River (15), SRP Arizona Canal above the electrical barrier (13), CAP Canal (12), San Pedro River (11), Salt River (11), SRP South Canal below the electrical barrier (11), SRP South Canal above the electrical barrier (10), and FCG Canal above (6) and below (5) the electrical barrier. Total species richness in the canals with electrical barriers was 18 in the Arizona Canal, 13 in the South Canal, and 7 in the FCG Canal. A total of 4 native species was encountered (roundtail chub, longfin dace, desert sucker, Sonora sucker): all were taken from the SRP Arizona Canal; 3 from Gila River, San Pedro River, FCG Canal (longfin dace, desert sucker, Sonora sucker), and SRP South Canal (roundtail chub, desert sucker, Sonora sucker); 2 from Salt River (desert sucker, Sonora sucker), and; 0 from CAP Canal. Percentage native fish ranged between 0 (CAP Canal) and 33 (FCG Canal above the electrical barrier).

Red shiner was the only species encountered within all streams or canals sampled (but not within every sampling reach or station; Table 5). Carp, green sunfish, and largemouth bass were found in all streams and canals except the FCG Canal, desert sucker in all but the CAP Canal, and yellow bullhead in all but the SRP canals. Roundtail chub, rainbow trout, walleye, and goldfish only were found in the SRP canals, striped bass only in the CAP Canal, smallmouth bass only in the Gila River, and yellow bass and *Tilapia* spp. only in the Salt River and connected SRP canals. Black bullhead only was found in the upper San Pedro River and lower CAP canal, grass carp only in the CAP and SRP canals, redear sunfish only in lower CAP Canal and Salt River, black crappie only in upper Gila River and Arizona Canal (above barrier), flathead catfish only in upper Gila River and SRP canals, and threadfin shad only in lower CAP Canal and Gila River. Not surprisingly, assemblage structure was highly variable across streams and canals. No new species were captured in 1997 that had not been previously recorded.

Central Arizona Project Canal

Sampling Notes and Deviations From Protocol--As typical, CAP monitoring in 1997 utilized the greatest number of gear types in an attempt to more comprehensively sample its deep, swift, monotonous habitats

(Table 1). As also is becoming routine, sampling in the canal above Lake Pleasant occurred in summer (June 15-18) and sampling below Lake Pleasant occurred in winter (November 30-December 4), to exploit relatively low (<400 cfs) discharges that facilitate effective sampling during those periods (Table 1). Although all CAP pumping plants identified in the 1996 monitoring plan were sampled in 1997, electrofishing was not employed in lower reaches because of mechanical breakdown immediately prior to the winter low-flow sampling period.

Species Richness and Distribution--More species (9) were captured in reach 3 (lowermost) of the CAP Canal than in reaches 1 (7) and 2 (4) (Tables 4-5). A maximum of 7 species was taken any single station, and a total of 12 species was encountered overall. Two (bluegill, green sunfish) of the four centrarchids captured in the CAP canal only were taken from reach 3, as was threadfin shad and the two species of bullhead. In contrast, grass carp only was taken in reach 1, a distribution which likely only reflects a failure to employ electrofishing in lower reaches; grass carp is routinely stocked throughout the CAP Canal. Common carp and channel catfish only were taken from the upper reaches of the CAP Canal. Red shiner was rare and only taken from two widely separated stations. Largemouth bass, bluegill, and striped bass were captured in all reaches of the canal.

Assemblage Structure--Striped bass, largemouth bass, channel catfish, and common carp were numerically dominant among the relatively few captures of fishes from the upper reach of the CAP Canal, while sunfishes and threadfin shad (at one station) were most abundant in the lower reach (Table 5). Young-of-year bluegill was especially abundant at the San Xavier pumping plant (lowermost station) in 1997, and by far outnumbered captures of all other species at all other stations combined. Excepting capture of a single yellow bullhead, all fish taken at San Xavier were sunfishes. All species captured from the CAP Canal in 1997 were non-native.

Gila River Between Coolidge and Ashurst-Hayden Dams

Sampling Notes and Deviations From Protocol--Discharge (except leakage) from Coolidge Dam to the Gila River downstream was ceased on October 26, and downstream sampling commenced October 28 through November 12 (Table 1). All designated sampling stations on the Gila River were monitored in 1997. A canoe-mounted electroshocker was employed for the first time in the upper reaches, which proved an effective gear to sample large, deep pools. Upgrading of backpack shockers that could handle the high conductivities of the uppermost reach also resulted in more effective sampling than in years past. In 1995 and 1996, discharges along the lower reaches of the Gila River were inexplicably greater than inflows from the San Pedro River and leakage for Coolidge Dam could account for, and sampling with backpack shockers was inefficient. A tote barge-mounted electroshocker was purchased for use in the lowermost reaches of the river for 1997, but as it turned out, discharges were again normal (low) in 1997 and the tote barge was not needed. No qualitative sampling to search for rare species was conducted in the upper middle reach (stations 2-1, 2-2, 2-3) in 1997.

Species Richness and Distribution--Fifteen identified species were collected from the Gila River during 1997 monitoring, with a maximum of 12 taken at any one station (Tables 4-5). The upper reaches had the greatest number of species, while the fewest number of species encountered at any single station was 3

(Kelvin). Smallmouth bass, black crappie, and flathead catfish were encountered only in the uppermost sampling reach, largemouth bass only in the upper 2 reaches, and fathead minnow only at a single station in the middle lower reach. Yellow bullhead was captured at every station, and native suckers (desert and Sonora) and red shiner were captured at nearly every station. Common carp, channel catfish, green sunfish, and mosquitofish were distributed widely in all reaches but were not taken at all stations. A large school of threadfin shad was enumerated from the Coolidge Dam station. Only a few native longfin dace were captured in middle reaches in 1997.

Assemblage Structure--Native suckers in several instances numerically dominated the Gila River fish assemblage in 1997 (Table 5), but red shiner, yellow bullhead, and sporadically, mosquitofish and common carp also predominated at one or more stations. Where suckers were not abundant (for example, close to Coolidge Dam), common carp usually was. Yellow bullhead often comprised the largest percentage of the assemblage in lower reaches, suckers were often most numerous in the upper middle reach, and common carp was most abundant in the uppermost reach. Percent native fish species captured in the Gila River in 1997 ranged from 15 to 25, with a maximum of 3 native species captured at 3 stations. Highest relative proportions of native species were in the lower two reaches.

San Pedro River

Sampling Notes and Deviations From Protocol--All San Pedro River stations identified by Clarkson (1996) (except the Gage Station site 2-3) were sampled during 1997 between October 6 and October 21 (Table 1). Qualitative sampling to detect rare species was not undertaken at station 2-2 (Soza Wash) in 1997. Monitoring of the station at Aravaipa Creek in 1997 only sampled the eastern course of a newly-split channel that had apparently formed earlier in the year; monitoring crews were unable to obtain right-of-entry to the property on which the main channel traverses. In addition, flows were high and muddy at this and lower sites at the time of sampling, reducing sampling efficiency.

Species Richness and Distribution--A total of 11 species was captured from the San Pedro River among the 8 stations monitored in 1997 (Tables 4-5). A maximum of 9 species was taken from the Charleston site (1-3), and a minimum of 3 from the Aravaipa Creek (3-1) and Soza Wash (2-2) sites. Native longfin dace was the only species taken at every station, but mosquitofish, yellow bullhead, and green sunfish were present at nearly all stations. Black bullhead, largemouth bass, and bluegill were restricted to the upper reach, and red shiner and Sonora sucker were found only in the lower reach. Relatively low numbers of fathead minnow were found sporadically throughout the length of the San Pedro River. Desert sucker was common in the upper reach (all stations), but was not detected downstream except at the lowermost station.

Assemblage Structure--Longfin dace, desert sucker, and mosquitofish generally co-dominated the ichthyofauna in the upper reach, but with green sunfish and bullheads ever-present (Table 5). The comparatively depauperate middle reach contained mostly longfin dace, with only very low numbers of other species present. The lower reach was numerically dominated by red shiner, but very few fishes were captured overall. Greatest proportion of native species was in the lower reach (38%; 3 of 8). Native species comprised 20% (1 of 5) of the ichthyofauna in the middle reach, and 22% (2 of 9) in the upper reach.

Florence-Casa Grande Canal

Sampling Notes and Deviations From Protocol--Monitoring of the Florence-Casa Grande (FCG) Canal in 1997 was conducted the day of and the day immediately following closure of the headgates at Ashurst-Hayden Dam on October 27-28 (Table 1). Also, the Pima Lateral and Pima Lateral Feeder Canal was sampled on October 18, the originally-scheduled date of the planned dry-up. As is typical, sampling concentrated on drying and isolated pools between the dam and immediately below the junction with the Pima Lateral Canal. No significant deviations from written protocol were noted.

Species Richness and Distribution--A total of 7 species was captured from the FCG Canal in 1997; 6 were taken from above the canal, and 5 below (Tables 4-5). The natives longfin dace and Sonora sucker were taken only above the China Wash electrical fish barrier, and desert sucker was taken only below the barrier. Red shiner, channel catfish, yellow bullhead, and mosquitofish were captured from both reaches. Common carp and green sunfish were the only species taken from the reach of the Gila River immediately upstream that were not taken from the canal. Longfin dace was the only species captured in the canal that was not taken from the reach of the Gila River immediately upstream.

Assemblage Structure--Mosquitofish was the most abundant species captured above the electrical barrier, with only low numbers of other species taken (Table 5). Red shiner dominated the catch from the canal below the barrier, followed by channel catfish, mosquitofish, desert sucker, and yellow bullhead (Table 5). Native species comprised 1/3 (2 of 6) of the ichthyofauna in the FCG canal above the electrical barrier, and 20% (1 of 5) below the barrier.

Salt River Between Stewart Mountain and Granite Reef Dams

Sampling Notes and Deviations From Protocol--Flows down the Salt River below Stewart Mountain Dam were dropped to the 8 cfs minimum on November 1 in 1997, and monitoring of the 3 Salt River stations occurred November 7 and November 17-18 (Table 1). A canoe-mounted electroshocker and entanglement nets were the primary sampling gears at all stations, supplemented with a backpack shocker in shallow habitats at the upper and middle sites. No qualitative sampling to detect rare species above or below the quantitative stations was undertaken in 1997.

Species Richness and Distribution--Eleven species were captured in the Salt River sampling stations in 1997, with 7 taken at the upper site, 9 at the middle, and 6 at the lower (Tables 4-5). The upper station captured no species that were not also taken at lower stations, while the middle and lower stations detected species unique only to those sites. Common carp, channel catfish, and yellow bullhead were only caught at the middle station, and yellow bass was caught only at the lower station. The two native suckers, largemouth bass, and redear sunfish were taken at all three sites. No roundtail chub was captured in the Salt River in 1997 despite its relatively common presence in the SRP canals immediately downstream (see below).

Assemblage Structure--Post young-of-year native suckers and mixed age largemouth bass by far comprised the highest proportion of fishes captured in the Salt River in 1997, all stations considered (Table

5). Of remaining species, only mosquitofish at the middle station also comprised a high proportion of the catch (second in rank abundance). No young-of-year Sonora sucker were captured, despite the relatively high number of older fish of this species taken. Captures of desert sucker fell dramatically at the lower station, a result likely due to the deep, lentic habitat representative of that site. Native species comprised 18% (2 of 11) of the total number of species captured.

Salt River Project South Canal

Sampling Notes and Deviations From Protocol--The South Canal dry-up began on October 24, and sampling of the reach below the barrier occurred on October 25 (Table 1). The reach above the electrical barrier was "censused" following draining on October 27. Multiple passes with long (23 m), 8 mm mesh bag seines was the primary sampling gear above the electrical barrier, while downstream collections used shorter seines and entanglement and entrapment devices. No major deviations from established sampling protocol were noted during 1997.

Species Richness and Distribution--Thirteen species were taken in total from the SRP South Canal (above and below the electrical barrier) in 1997. Ten species were captured above the barrier, and 11 below (Tables 4-5). Grass carp, flathead catfish, and rainbow trout were unique to the canal below the barrier, while bluegill and walleye were found only above the barrier. Roundtail chub, common carp, red shiner, Sonora sucker, desert sucker, largemouth bass, channel catfish, and *Tilapia* spp. were common to both reaches. Roundtail chub, red shiner, grass carp, bluegill, flathead catfish, rainbow trout, and walleye were species found in the South Canal but not in the Salt River immediately upstream.

Assemblage Structure--Red shiner, desert sucker, channel catfish, and *Tilapia* spp. were the top-ranked species in relative abundance above the electrical barrier in 1997, while desert sucker, red shiner, and Sonora sucker were the most abundant fish taken from below the barrier. Note, however, that captures from above the barrier represent a near-complete census of the fauna, while samples from below are sporadic and opportunistic. In addition, as fishes enter the canal through Granite Reef Diversion Dam, they tend to become concentrated above the barrier due to the presence of the electrical field downstream. Degree of concentration likely varies across species, further compounding interpretation and comparisons of fish assemblage structure. Native species represented 30% (3 of 10) of the fauna captured above the electrical barrier, and 27% (3 of 11) of the fauna captured below the barrier.

Salt River Project Arizona Canal

Sampling Notes and Deviations From Protocol--The dry-up period for the Arizona Canal began January 9, 1998, and sampling of the canal both above and below the electrical barrier occurred January 12. Sampling gears were as described for the SRP South Canal. No major deviations from established sampling protocol were noted during 1997, except that *Tilapia* spp. numbers were estimated (not directly enumerated) from the canal above the electrical barrier.

Species Richness and Distribution--The Arizona Canal had the highest species richness of any stream or canal reach monitored during 1997, with 13 species recorded above the electrical barrier and 16 below

(Tables 4-5). In both reaches, a total of 18 species was captured. Goldfish, longfin dace, red shiner, grass carp, and green sunfish were only taken below the barrier, and black crappie and walleye were only taken above the barrier. Roundtail chub, common carp, Sonora sucker, desert sucker, largemouth bass, bluegill, flathead catfish, channel catfish, rainbow trout, *Tilapia* spp., and yellow bass were common to the reaches above and below the electrical barriers. Roundtail chub, goldfish, longfin dace, red shiner, grass carp, bluegill, black crappie, flathead catfish, rainbow trout, and walleye were species captured from the canal but not from the Salt River immediately upstream.

Assemblage Structure--Channel catfish, *Tilapia* spp., and native suckers comprised the greatest percentages of fishes captured in the Arizona Canal above the electrical barrier in 1997 (Table 5). Downstream, red shiner, desert sucker, Sonora sucker, and common carp were most abundant (in rank order). Cautions made for the SRP South Canal regarding comparisons of fish assemblage structure above and below the electrical barrier apply equally to the Arizona Canal. Twenty-three percent (3 of 13) of the species captured above the barrier were native, and 25% (4 of 16) of the species from below the barrier were native.

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Table 1. Dates of sampling of target reaches and stations (numeric designations in parentheses) monitored for fish populations in 1997. Note that samples for the Salt River Project Arizona Canal were collected in 1998, but are considered part of 1997 samples. AZ Canal=Arizona Canal; SO Canal=South Canal. Gears: Bp=backpack electroshocker; S=seine; Ef=boat electroshocker; T=trammel net; G=gill net; M=minnow trap; A=angling; TI=trot line; D=dip net; V=visual observation.

STREAM OR CANAL REACH	STATION	GEAR	DATES SAMPLED
San Pedro River			
Hereford to Fairbank	Hereford (1-1)	Bp	October 6
	Lewis Springs (1-2)	Bp	October 6-7
	Charleston (1-3)	Bp	October 7
Cascabel to Redington	Hughes Ranch (2-1)	Bp	October 8
	Soza Wash (2-2)	Bp	October 8
Aravaipa Creek to Gila River	Aravaipa Creek (3-1)	Bp, S	October 9
	Swingle Wash (3-2)	Bp, S	October 9
	Gila River (3-3)	Bp	October 21
Gila River			
Coolidge Dam to Needles Eye	Coolidge Dam (1-1)	Bp, Ef, S	November 12
	Hook & Line Ranch (1-3)	Bp, Ef, S	November 12
Little Ash Creek to Hayden	Dripping Spring Wash (2-1)	Ef, S	October 28
	Christmas (2-2)	Bp, Ef	October 28-29
	O'Carroll Canyon (2-3)	Bp, Ef	October 29
Hayden to Mineral Creek	San Pedro River (3-1)	Bp, T	October 27
	Kearney (3-2)	Bp	October 28
	Kelvin (3-3)	Bp, S	October 28
Mineral Creek to Ashurst-Hayden Dam	Diamond A Ranch (4-1)	Bp	November 3
	Cochran (4-2)	Bp	November 3
	Box O Wash (4-3)	Bp	October 28
Salt River			
Stewart Mtn. Dam to Granite Reef Dam	Stewart Mtn. Dam (1-1)	Bp, Ef, G	November 18
	Blue Point (1-2)	Bp, Ef, T, G	November 17-18
	Granite Reef Dam (1-3)	Ef, T, G	November 7
CAP canal			
Hayden-Rhodes Aqueduct	Bouse Hills (1-1)	Ef, H, G, A	June 15-16
	Little Harquahala (1-2)	Ef, H, G, A	June 16-17
	Hassayampa (1-3)	Ef, H, G, A	June 17-18
Fannin-McFarland Aqueduct	Salt-Gila (2-1)	H, M, G, A, TI	November 30-December 1
Tucson Aqueduct	Brady (3-1)	H, M, G, A, TI	December 3-4
	Red Rock (3-2)	H, M, G, A, TI	December 2-3
	San Xavier (3-3)	T, H, M, G, A	December 1-2
Florence-Casa Grande canal			
above barrier (1-1)		S, D	October 27-28
	below barrier (1-2)	H, G, S, D	October 18, 27-28

SRP canals

AZ Canal above barrier (1-1)	S	January 12
AZ Canal below barrier (1-2)	T, H, S, V	January 12
SO Canal above barrier (1-1)	S	October 27
SO Canal below barrier (1-2)	T, G, S	October 25

Table 2. Common names, scientific names, and acronyms for species of fish collected during monitoring of streams and canals in the Gila River Basin. Acronyms formed by combining the first two letters of the genus name and specific epithet.

ACRONYM	SCIENTIFIC NAME	COMMON NAME
GIRO	<i>Gila robusta</i>	Gila chub
PIPR	<i>Pimephales promelas</i>	Fathead minnow
CAAU	<i>Carassius auratus</i>	Goldfish
AGCH	<i>Agosia chrysogaster</i>	Longfin dace
CYCA	<i>Cyprinus carpio</i>	Common carp
CYLU	<i>Cyprinella lutrensis</i>	Red shiner
CTID	<i>Ctenopharngodon idellus</i>	Grass carp
CAIN	<i>Catostomus insignis</i>	Sonora sucker
PACL	<i>Pantosteus clarki</i>	Desert sucker
MISA	<i>Micropterus salmoides</i>	Largemouth bass
LEMI	<i>Lepomis microlophus</i>	Redear sunfish
LECY	<i>Lepomis cyanellus</i>	Green sunfish
LEMA	<i>Lepomis macrochirus</i>	Bluegill sunfish
MIDO	<i>Micropterus dolomieu</i>	Smallmouth bass
PONI	<i>Pomoxis nigromaculatus</i>	Black crappie
AMME	<i>Ameirus melas</i>	Black bullhead
PYOL	<i>Pygodictis olivaris</i>	Flathead catfish
ICPU	<i>Ictalurus punctatus</i>	Channel catfish
AMNA	<i>Ameirus natalis</i>	Yellow bullhead
GAAF	<i>Gambusia affinis</i>	Mosquitofish
ONMY	<i>Oncorhynchus mykiss</i>	Rainbow trout
STVI	<i>Stizostedion vitreum</i>	Walleye
TILA	<i>Tilapia sp.</i>	Tilapia species
MOMI	<i>Morone mississippiensis</i>	Yellow bass
MOCH	<i>Morone chrysops</i>	White bass
MOSA	<i>Morone saxatilis</i>	Striped bass
DOPE	<i>Dorosoma petenense</i>	Threadfin shad

Table 3. Recent (since 1970) occurrence of fishes in target canals and streams in the Gila River Basin. SPR=San Pedro River north of Mexican border, GILA=Gila River between Coolidge Dam and Ashurst-Hayden Dam, SALT=Salt River between Stewart Mountain Dam and Granite Reef Dam, CAP=Central Arizona Project aqueduct, FCG=Florence-Casa Grande canal, SRP=Salt River Project canals. Table updated from Clarkson (1996).

Common name	Scientific name	SPR	GILA	SALT	CAP	FCG	SRP
Roundtail chub ¹	<i>Gila robusta</i>	-	-	+	-	-	+
Fathead minnow	<i>Pimephales promelas</i>	+	+	-	-	+	+
Goldfish	<i>Carassius auratus</i>	-	-	-	+	-	+
Longfin dace ¹	<i>Agosia chrysogaster</i>	+	+	-	-	+	+
Grass carp	<i>Ctenopharyngodon idella</i>	-	-	-	+	-	+
Grass carp X bighead carp	<i>Ctenopharyngodon idella X Aristichthys nobilis</i>	-	-	-	-	-	+
Carp	<i>Cyprinus carpio</i>	+	+	+	+	+	+
Red shiner	<i>Cyprinella lutrensis</i>	+	+	-	+	+	+
Spikedace ¹	<i>Meda fulgila</i>	-	+	-	-	-	-
Razorback sucker ¹	<i>Xyrauchen texanus</i>	-	-	-	+	-	-
Sonora sucker ¹	<i>Catostomus insignis</i>	+	+	+	+	+	+
Desert sucker ¹	<i>Pantosteus clarki</i>	+	+	+	+	+	+
Bigmouth buffalo	<i>Ictiobus cyprinellus</i>	-	-	-	-	-	+
Largemouth bass	<i>Micropterus salmoides</i>	+	+	+	+	+	+
Bluegill	<i>Lepomis macrochirus</i>	+	+	+	+	+	+
Green sunfish	<i>Lepomis cyanellus</i>	+	+	+	+	+	+
Smallmouth bass	<i>Micropterus dolomieu</i>	-	-	+	-	-	+
Redear sunfish	<i>Lepomis microlophus</i>	-	-	-	+	-	+
Green sunfish X bluegill	<i>Lepomis cyanellus X L. macrochirus</i>	-	+	-	-	-	-
Black crappie	<i>Pomoxis nigromaculatus</i>	-	+	+	+	-	-
Black bullhead	<i>Ameiurus melas</i>	+	-	-	+	-	+
Flathead catfish	<i>Pylodictis olivaris</i>	?	-	+	+	-	+
Channel catfish	<i>Ictalurus punctatus</i>	-	+	+	+	+	+
Yellow bullhead	<i>Ameiurus natalis</i>	+	+	+	+	+	+
Mosquitofish	<i>Gambusia affinis</i>	+	+	+	+	+	+
Sailfin molly	<i>Poecilia latipinna</i>	-	-	+	-	-	-
Rainbow trout	<i>Oncorhynchus mykiss</i>	-	-	+	-	-	+
Walleye	<i>Stizostedion vitreum</i>	-	-	+	-	-	+
Threadfin shad	<i>Dorosoma petenense</i>	-	+	+	+	+	+
Mossambique tilapia	<i>Tilapia mossambica</i>	-	-	-	-	-	+
Redbelly tilapia	<i>Tilapia zilli</i>	-	-	-	-	-	+
Blue tilapia	<i>Tilapia aurea</i>	-	-	-	-	-	+
Yellow bass	<i>Morone mississippiensis</i>	-	-	+	-	-	+
White bass	<i>Morone chrysops</i>	-	-	-	+	-	-
Striped bass	<i>Morone saxatilis</i>	-	-	-	+	-	+
Oscar	<i>Astronotus ocellatus</i>	-	-	-	-	-	+

¹Native species

Table 4. Numbers of species captured from target stream and canal reaches in 1997. Stream/canal acronyms as in Table 2, except SRPN=Salt River Project North (Arizona) Canal and SRPS=Salt River Project South Canal.

Reach-Station	SANP	GILA	SALT	CAP	SRPN		SRPS		FCG	
					above	below	above	below	above	below
1-1	7	11	7	4	13	16	10	11	6	5
1-2	7	-	9	4	-	-	-	-	-	-
1-3	9	12	6	6	-	-	-	-	-	-
TOTAL	9	13	11	7	13	16	10	11	6	5
% Native	22	15	18	0	23	25	30	27	33	20
2-1	4	8	-	4	-	-	-	-	-	-
2-2	3	9	-	-	-	-	-	-	-	-
2-3	-	9	-	-	-	-	-	-	-	-
TOTAL	5	12	-	4	-	-	-	-	-	-
% Native	20	17	-	0	-	-	-	-	-	-
3-1	3	11	-	2	-	-	-	-	-	-
3-2	6	9	-	7	-	-	-	-	-	-
3-3	7	3	-	4	-	-	-	-	-	-
TOTAL	8	12	-	9	-	-	-	-	-	-
% Native	38	25	-	0	-	-	-	-	-	-
4-1	-	7	-	-	-	-	-	-	-	-
4-2	-	6	-	-	-	-	-	-	-	-
4-3	-	8	-	-	-	-	-	-	-	-
TOTAL	-	8	-	-	-	-	-	-	-	-
% Native	-	25	-	-	-	-	-	-	-	-
All reaches	11	15	11	12	13	16	10	11	6	5
% Native	27	20	18	0	23	25	30	27	33	20

Table 5. Numbers of fish captured at each sampling station (including qualitative samples) in target reaches during 1997 (except Salt River Project Arizona Canal data, which were collected in January 1998). See Table 1 for species acronyms. Single numbers refer to totals of small-bodied fishes where age was not estimated; paired numbers refer to totals of putative age-0 fish, followed by totals of putative age-1+ fish; numbers in parentheses denote totals of large-bodied species where age was not estimated. Dashes denote no captures of a species at a particular site.

SAMPLING STATION	GIRO	PIPR	CAAU	AGCH	CYCA	CYLU	CTID	CAIN	PACL
CAP Canal-Upper									
Bouse Hills PP	-	-	-	-	-	-	0-2	-	-
Little Harquahala PP	-	-	-	-	0-1	-	0-16	-	-
Hassayampa PP	-	-	-	-	0-11	2	0-2	-	-
CAP Canal-Middle									
Salt-Gila PP	-	-	-	-	0-7	-	-	-	-
CAP Canal-Lower									
Brady PP	-	-	-	-	-	-	-	-	-
Red Rock PP	-	-	-	-	-	11	-	-	-
San Xavier PP	-	-	-	-	-	-	-	-	-
Gila River-Upper									
Coolidge Dam	-	-	-	-	(25)	5	-	-	1-0
Hook & Line Ranch	-	-	-	-	2-(47)	94	-	0-16	12-10
Gila River-Middle Upper									
Dripping Spring Wash	-	-	-	-	1-77	-	-	14-50	2-1
Christmas	-	-	-	1	-	74	-	17-108	27-18
O'Carrol Canyon	-	-	-	5	2-11	38	-	28-54	33-38
Gila River-Middle Lower									
San Pedro River	-	2	-	4	0-10	51	-	4-25	14-16
Kearny	-	-	-	-	0-6	26	-	1-23	2-12
Kelvin	-	-	-	-	-	4	-	0-2	-
Gila River-Lower									
Diamond A Ranch	-	-	-	-	0-1	2	-	0-2	13-26
Cochran	-	-	-	-	-	52	-	2-2	10-24
Box O Wash	-	-	-	-	0-1	22	-	1-9	1-2
San Pedro River-Upper									
Hereford	-	1	-	27	-	-	-	-	21-7
Lewis Springs	-	-	-	9	-	-	-	-	6-1
Charleston	-	38	-	45	-	-	-	-	49-1
San Pedro River-Middle									
Hughes Ranch	-	4	-	30	-	-	-	-	-
Soza Ranch	-	-	-	31	-	-	-	-	-
San Pedro River-Lower									
Aravaipa Creek	-	2	-	1	-	1	-	-	-
Swingle Wash	-	2	-	2	-	21	-	4-0	-
Mouth	-	-	-	7	-	45	-	5-0	8-0
Florence-Casa Grande Canal									
Above barrier	-	-	-	1	-	4	-	0-1	-
Below barrier	-	-	-	-	-	235	-	-	7-13
Salt River									
Stewart Mtn. Dam	-	-	-	-	-	-	-	0-45	8-199
Blue Point	-	-	-	-	0-5	-	-	0-67	0-175
Granite Reef Dam	-	-	-	-	-	-	-	0-41	0-3
Salt River Project Canals									
AZ Canal above barrier	8-2	-	-	-	0-12	-	-	142-51	85-104
AZ Canal below barrier	0-12	-	0-1	4	0-50	413	0-104	0-82	1-767
SO Canal above barrier	0-18	-	-	-	0-16	358	-	8-51	11-311
SO Canal below barrier	2-2	-	-	-	0-3	105	0-5	19-17	48-194

¹ Species determinations for *Tilapia* not definitive in all cases. Category likely includes *T. aurea* and *T. zilli*

² Number estimated

Table 5. Extended.

SAMPLING STATION	MISA	MIDO	LEMI	LECY	LEMA	PONI	AMME	PYOL	ICPU
CAP Canal-Upper									
Bouse Hills PP	0-2	-	-	-	0-2	-	-	-	-
Little Harquahala PP	-	-	-	-	-	-	-	-	0-12
Hassayampa PP	0-34	-	-	-	-	-	-	-	0-1
CAP Canal-Middle									
Salt-Gila PP	-	-	-	-	6-0	-	-	-	0-3
CAP Canal-Lower									
Brady PP	0-1	-	-	-	-	-	-	-	-
Red Rock PP	0-4	-	0-11	-	7-2	-	-	-	-
San Xavier PP	-	-	12-16	34-7	359-8	-	0-1	-	-
Gila River-Upper									
Coolidge Dam	8-1	1-0	-	12-3	-	-	-	1-1	0-1
Hook & Line Ranch	5-4	-	-	7-2	-	5-2	-	2-0	6-0
Gila River-Middle Upper									
Dripping Spring Wash	6-8	-	-	0-3	-	-	-	-	0-3
Christmas	16-3	-	-	1-3	-	0-3	-	-	-
O'Carrol Canyon	2-1	-	-	2-4	-	-	-	-	2-0
Gila River-Middle Lower									
San Pedro River	-	-	-	6-6	-	-	-	-	2-1
Kearny	1-0	-	-	2-3	-	-	-	-	1-0
Kelvin	-	-	-	-	-	-	-	-	-
Gile River-Lower									
Diamond A Ranch	-	-	-	-	-	-	-	-	0-1
Cochran	-	-	-	-	-	-	-	-	13-0
Box O Wash	-	-	-	7-0	-	-	-	-	1-0
San Pedro River-Upper									
Hereford	-	-	-	0-3	-	-	24-0	-	-
Lewis Springs	0-7	-	-	10-3	-	-	1-2	-	-
Charleston	0-1	-	-	10-2	1-0	-	1-0	-	-
San Pedro River-Middle									
Hughes Ranch	-	-	-	-	-	-	-	-	-
Soza Ranch	-	-	-	1-0	-	-	-	-	-
San Pedro River-Lower									
Aravaipa Creek	-	-	-	-	-	-	-	-	-
Swingle Wash	-	-	-	1-0	-	-	-	-	-
Mouth	-	-	-	1-0	-	-	-	-	-
Florence-Casa Grande Canal									
Above barrier	-	-	-	-	-	-	-	-	2-0
Below barrier	-	-	-	-	-	-	-	-	41-1
Salt River									
Stewart Mtn. Dam	25-16	-	0-1	3-2	-	-	-	-	-
Blue Point	36-13	-	5-0	3-2	-	-	-	-	0-3
Granite Reef Dam	10-11	-	0-1	-	-	-	-	-	-
Salt River Project Canals									
AZ Canal above barrier	58-75	-	-	-	0-14	2-0	-	6-4	305-29
AZ Canal below barrier	16-1	-	-	0-1	9-0	-	-	2-0	5-7
SO Canal above barrier	0-17	-	-	-	0-4	-	-	-	207-71
SO Canal below barrier	5-7	-	-	-	-	-	-	6-0	3-3

Table 5. Extended.

SAMPLING STATION	AMNA	GAAF	ONMY	STVI	TILA ¹	MOMI	MOSA	DOPE
CAP Canal-Upper								
Bouse Hills PP	-	-	-	-	-	-	1-28	-
Little Harquahala PP	-	-	-	-	-	-	0-3	-
Hassayampa PP	-	-	-	-	-	-	0-6	-
CAP Canal-Middle								
Salt-Gila PP	-	-	-	-	-	-	0-7	-
CAP Canal-Lower								
Brady PP	-	-	-	-	-	-	0-1	-
Red Rock PP	0-2	-	-	-	-	-	0-1	56
San Xavier PP	-	-	-	-	-	-	-	-
Gila River-Upper								
Coolidge Dam	3-0	1	-	-	-	-	-	1359
Hook & Line Ranch	2-1	15	-	-	-	-	-	8
Gila River-Middle Upper								
Dripping Spring Wash	0-2	96	-	-	-	-	-	-
Christmas	4-4	-	-	-	-	-	-	3
O'Carrol Canyon	12-3	-	-	-	-	-	-	-
Gila River-Middle Lower								
San Pedro River	10-0	2	-	-	-	-	-	2
Kearny	18-3	6	-	-	-	-	-	-
Kelvin	0-1	-	-	-	-	-	-	-
Gile River-Lower								
Diamond A Ranch	5-1	1	-	-	-	-	-	-
Cochran	23-4	2	-	-	-	-	-	-
Box O Wash	13-3	55	-	-	-	-	-	-
San Pedro River-Upper								
Hereford	0-2	22	-	-	-	-	-	-
Lewis Springs	0-1	85	-	-	-	-	-	-
Charleston	1-0	26	-	-	-	-	-	-
San Pedro River-Middle								
Hughes Ranch	6-1	4	-	-	-	-	-	-
Soza Ranch	-	1	-	-	-	-	-	-
San Pedro River-Lower								
Aravaipa Creek	-	-	-	-	-	-	-	-
Swingle Wash	-	18	-	-	-	-	-	-
Mouth	2-0	8	-	-	-	-	-	-
Florence-Casa Grande Canal								
Above barrier	5-0	21	-	-	-	-	-	-
Below barrier	4-5	30	-	-	-	-	-	-
Salt River								
Stewart Mtn. Dam	-	3	-	-	12-2	-	-	-
Blue Point	0-3	124	-	-	-	-	-	-
Granite Reef Dam	-	-	-	-	0-1	0-2	-	-
Salt River Project Canals								
AZ Canal above barrier	-	-	0-62	16-1	(300) ²	0-37	-	-
AZ Canal below barrier	-	-	0-3	-	0-8	0-3	-	-
SO Canal above barrier	-	-	-	7-1	22-93	-	-	-
SO Canal below barrier	-	-	0-2	-	1-3	-	-	-