

DRAFT CENTRAL ARIZONA PROJECT FISH MONITORING FINAL REPORT

SUMMARY OF SAMPLE YEAR 2015 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 in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year (SY) 2015 (collections over the period June 2, 2015 to January 11, 2016). Reclamation's monitoring program is a result of several biological opinions on impacts of transportation and delivery of Central Arizona Project (CAP) water from the Colorado River at Lake Havasu to the Gila River basin. Its primary intention is to establish baseline data on the presence and distribution of non-native fishes and to detect changes in species composition or distribution in the CAP aqueduct and selected river, stream, and canal reaches in Arizona.

Protocols implemented during this monitoring are provided by Clarkson (1996 a-c) and Clarkson et al. (2011), and will not be reiterated in detail here. In general, streams were stratified according to geomorphology or flow characteristics, and replicate 200-m "quantitative," fixed sampling stations were established as the source for distribution and assemblage structure data. The plan calls for electrofishing as the primary gear for this purpose, but use of other methods is encouraged if electrofishing is deemed inadequate. Following collection of quantitative data from fixed stream stations, qualitative sampling may be performed up- and/or downstream of each station to search for rare species.

In canals, sampling is more opportunistic, and is usually conducted during low flow or "dry-up" conditions. Sampling reaches are fixed, but only in the CAP canal are fixed stations sampled. For logistical reasons, pumping plant forebays are the primary source of CAP canal fishery data, and sampling there requires the use of a large array of sampling gears to be effective. Sampling in the Salt River Project (SRP) and Florence-Casa Grande (FCG) canals typically requires searches for available water and fish concentrations during flow outages, and primarily relies upon seines, dip nets, and entanglement gears for collection of fishes. SRP canals above the electrical fish barriers are sampled repeatedly with large seines and capture nearly all fishes in these short, confined reaches. See Clarkson et al. (2011) for more detailed descriptions of monitored streams and canals and the methods used to sample them.

Waters sampled during this SY 2015 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) CAP Canal at selected pumping plants, (4) SRP South Canal (SRPs), (5) SRP Arizona (North) Canal (SRPn), and (6) FCG Canal (Table 1).

Comparisons are not made with data acquired during prior years of this monitoring program as reported by Clarkson (1998, 1999, 2001), Kesner and Marsh (2008, 2009), Marsh (1999, 2004a-c), and Marsh and Kesner (2004, 2005, 2006a-b, 2007a-b, 2008-2011) (available online at <http://www.usbr.gov/lc/phoenix/biology/azfish/aznativefish.html>), or with data reported under other studies of these waters (e.g., Marsh and Minckley 1982, Mueller 1996). The reader is referred to those documents for comparisons with prior years. A comprehensive list including common and scientific names and four-letter code of aquatic vertebrate taxa encountered during routine fish monitoring is provided in Table 2.

MONITORING OVERVIEW

A total of 22 fish taxa (excluding undetermined or hybrid sunfish) was captured during SY 2015 monitoring (Table 3). No new taxa were detected. Seven species were taken in San Pedro River, six in Gila River, 11 in CAP, 12 in SRPs, 13 in SRPn, and five were taken in FCG (Table 3). Three native species (14% of total taxa) were collected: longfin dace, desert sucker, and Sonora sucker. Two of these were in San Pedro River, SRPs and SRPn and no native species were in the Gila River, CAP, or FCG. Native species comprised 15 to 29% of all species among streams where natives occurred. The remaining 19 taxa were non-native, which among streams numbered between 5 (San Pedro River and FCG Canal) and 11 (CAP Canal) species.

Total number of fish captured varied widely among waters, reaches, and stations (Table 4), a reflection of differences in sampling effort and gear type as well as fish abundance. Canal samples were not strictly comparable because those from SRPn, SRPs, and FCG were opportunistic and qualitative (except for samples above the electrical fish barriers on the SRP canals, which represented near-complete censuses). Monitoring in streams and rivers, and in the CAP Canal, is designed to be quantitative and accompanied by recorded effort data, but at times may be supplemented by some qualitative sampling, which is opportunistic and is not necessarily accompanied by recorded effort.

Native fishes overall accounted for 23% of 1,400 individuals captured at all Gila River basin stations during the sample year (Table 4). Proportion that native fishes comprised of total catch ranged from 0% (Gila River, CAP canal, and FCG) to 92% (San Pedro River). SRPs and SRPn samples were 11 and 2% natives above the electrical fish barriers, respectively, and 2 and 0% natives below those structures (Table 4).

Community structure differed substantially among waters, reaches, and stations (Table 4). Native longfin dace was the most abundant species in combined samples from the San Pedro River (followed by desert sucker). Red shiner followed closely by channel catfish was the most abundant species from samples in the Gila River. Common carp followed by striped bass was the most abundant fish in the CAP Canal. Channel catfish followed by blue tilapia was most abundant above the electrical fish barrier in SRPs, and red shiner was predominant below that structure. Channel catfish also was the most abundant species in SRPn above the electrical fish barrier followed by bluegill. Below the barrier, grass carp predominated the catch followed by common carp. In FCG channel catfish predominated the catch above the barrier, followed by mosquitofish, and below the barrier red shiner was most numerous, followed by threadfin shad.

SAN PEDRO RIVER

Sampling Notes and Deviations from Protocol – Sampling was led by Marsh & Associates (M&A) October 12-13, 2015 (Table 1). Six of eight currently available stations were sampled (station 1-2-2 was eliminated from the protocol in 2005). The sites at Hughes Ranch (station 1-2-1) and Mouth (station 1-3-3) were dry. Backpack electrofishing was conducted at all wetted sites.

Species Richness and Distribution – Seven species were captured in the San Pedro River (Tables 5 and 6A). Seven species were taken in the upper reach, three in the middle, and none in the lower. Two natives were encountered (longfin dace and desert sucker). Longfin dace was found at four stations, while desert sucker was collected at two.

Five non-natives were in the upper reach, two in the middle, and none in the lower. Common carp, fathead minnow, and mosquitofish were found only in the upper reach. Black bullhead and green sunfish both were found in the upper and middle reaches. Non-native bullfrog *Lithobates catesbeianus* and northern crayfish *Orconectes virilis* were present in the stream.

Assemblage Structure – Native desert sucker and longfin dace dominated the catch overall (90% of a total catch of 324 individuals), and in all reaches (Tables 4 and 6A). Longfin dace was the most abundant species overall and in the middle reach, while desert sucker was predominant in the middle reach.

Nonnative fishes represented only 10% of the total catch. Mosquitofish was the most abundant non-native (4% of catch), followed by green sunfish (2% of the catch), and black bullhead (1%); these last two species were represented both by young-of-year (age-0) and adults (age-1+).

GILA RIVER

Sampling Notes and Deviations from Protocol – Reaches 2 through 4 were sampled November 9-11, 20105 (Table 1); the upper reach (1) was not sampled in SY 2015 because permission to access the area was unavailable from the land owner. All nine currently available stations in Reaches 2 through 4 were sampled. In 2015, the lower-most station (number 2-4-3, Box-O Wash or Box Canyon) was relocated downstream to immediately upstream of Ashurst-Diversion Dam to alleviate access issues; this site will hereafter be labeled “Ashurst-Hayden Dam.” Backpack electrofishing was used at all sites.

Species Richness and Distribution – Six fish species, all non-native, were captured in the Gila River (Tables 5 and 6B). No species new to the basin were detected. All six species were taken in the upper middle reach, four in the lower middle, and five in the lower. No native species were encountered. A single specimen of desert sucker captured in 2007 comprises the entirety of native fish catch for the Gila River in the past 13 years (see prior year reports). Non-native northern crayfish were collected throughout the stream.

Assemblage Structure – Channel catfish, flathead catfish, green sunfish, and red shiner were found in all three reaches. Common carp were encountered in upper middle and lower reaches, while mosquitofish was only in the upper middle reach. Red shiner was the most abundant species overall (35% of a total catch of 101 individuals) and was predominant in the lower middle reach. Channel catch was second in overall abundance (32% of catch) and was predominant in the upper middle reach. Flathead catfish and mosquitofish each comprised 12% of the catch, and common carp (3%) and green sunfish (7%) made up the remainder.

Channel; catfish, flathead catfish, and green sunfish all were represented by both age-0 and age-1+ individuals.

CENTRAL ARIZONA PROJECT CANAL

Sampling Notes and Deviations from Protocol – Six of seven stations currently available were sampled by Reclamation with assistance from M&A; Hassayampa (station 4-1-3) was not sampled due to flows that rendered watercraft operations and sampling unsafe. The upper reach was visited June 2-4, 2015, and middle and lower reaches between October 19-23, 2015 (Table 1). Boat-mounted electrofishing, minnow trapping, trammel netting, and trot lining were conducted at all stations.

Species Richness and Distribution – Eleven taxa, all non-native, were captured from the CAP Canal. No new species were detected. Five species were taken from the upper reach, ten from the Salt-Gila station (middle reach), and eight in the downstream reach (Tables 5 and 6C). Channel catfish, grass carp, redear sunfish, and striped bass were taken from all reaches. Bluegill and red shiner were in middle and lower reaches, smallmouth bass was in upper and middle, common carp and largemouth bass were in the lower reach, and green sunfish and threadfin shad were in the middle reach.

Assemblage Structure – Common carp was the most abundant species overall (18% of total catch), followed closely by channel catfish, largemouth bass, and striped bass (each 14%) in the sample of 198 individuals from the CAP Canal (Table 6C). Bluegill, grass carp, and red shiner each was 12% of the catch, and the remainder was comprised of redear sunfish (3%), smallmouth bass (2%), and green sunfish and threadfin shad (< 1% each). Bluegill, common carp, largemouth bass, smallmouth bass, and striped bass all were represented by both age-0 and age-1+ individuals.

Channel catfish was the predominant species in the upper reach (36% of 22 individuals), followed by striped bass (27%) and grass carp (23%). Smallmouth bass was 9% and redear sunfish was 5% of catch in the upper reach. Bluegill was the most abundant fish in the middle reach (23% of 79 individuals), closely followed by striped bass (22%), grass carp (19%), and common carp (18%). Channel catfish was 11% of catch and green sunfish, redear sunfish, smallmouth bass, and threadfin shad each were 3% or less of total catch in the middle reach. Largemouth bass was the most abundant species captured in the lower reach (28% of 97 individuals), followed by common carp (23%), red shiner (22%), channel catfish (10%), bluegill and striped bass (5% each), grass carp (4%), and redear sunfish (3%).

SRP SOUTH CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed by M&A with assistance from Reclamation and SRP November 22-23, 2015 (Table 1). Three stations were sampled during routine monitoring, one above the electrical fish barrier and two below the fish barrier. The station above the electrical fish barrier (5-1-1) was sampled with a 75- ft bag seine.

The station immediately below the barrier (5-2-0) was sampled with a 25-ft bag seine, and dip nets were used at Triple Junction (5-2-9). Visual inspections were done at River Road Siphon (5-2-2.5) and the Demossing Station (5-2-6.1), but no collection gears were deployed.

Species Richness and Distribution – Twelve species including two natives were captured from the SRPs Canal (Tables 4 and 5). No new species were detected. The canal was subdivided into two reaches: “above” (one station) and “below” (two stations) the electrical fish barrier (Table 6D), although these reaches were not designated in the original monitoring protocol (Clarkson 1996a). Ten species including two natives were captured from above the barrier on the SRPs Canal, and six below. Native Sonora sucker, plus non-native bluegill, channel catfish, and flathead catfish were encountered above and below the fish barrier. Native desert sucker plus blue tilapia, common carp, largemouth bass, yellow bullhead were only captured above the fish barrier, while grass carp and red shiner were only captured below.

Assemblage Structure – Native fishes comprised 7% of the total catch (302 fish) taken from the SRPs Canal (Table 4). Native desert sucker was <1% of total catch and Sonora sucker was about 7% of the total. Non-native red shiner was the most abundant species overall (41%) followed by channel catfish (29%), blue tilapia (7%), largemouth bass (5%), rainbow trout (4%), common carp (3%), and yellow bullhead (2%). Other species, bluegill, flathead catfish, and grass carp each contributed 1% or less to total catch. Only flathead catfish was represented by both age 0 and age-1+ individuals.

Above the fish barrier, non-native channel catfish was the most abundant species captured (51% of 167 individuals), followed by blue tilapia (13%), native Sonora sucker (10%), largemouth bass (8%), rainbow trout (7%), common carp (5%), yellow bullhead (3%), and flathead catfish and native desert sucker (<1% each) (Table 6D).

Below the fish barrier, non-native red shiner was the predominant species (93% of 135 individuals captured), followed by flathead catfish and native Sonora sucker (2% each), and bluegill, channel catfish, and grass carp (about 1% each; Table 6D).

SRP NORTH (ARIZONA) CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed by M&A with assistance from Reclamation and SRP on January 11, 2016 (Table 1). Two stations were sampled during routine monitoring: one above the electrical fish barrier and one below the fish barrier. The above barrier site was sampled with a 75-ft bag seine. A boat-mounted electrofisher was used to collect fishes below the barrier in the reach between the 101 (Pima) freeway and Indian Bend Wash, 14.5 miles downstream from Granite Reef Diversion Dam. Other stations were not sampled because there was no reach-wide outage that would have provided an opportunity to safely and effectively make collections.

Species Richness and Distribution – Thirteen species, including two natives were captured from the SRPn Canal (Tables 4 and 5). No new species were detected. The canal was subdivided into

two reaches: “above” (one station) and “below” (one station) the electrical fish barrier (Table 6E), although these reaches were not designated in the monitoring protocol (Clarkson 1996a). Eleven species were taken above the electrical fish barrier and five were collected from below. Non-native bluegill, common carp, and largemouth bass collected both above and below the barrier. Native desert sucker and Sonora sucker, channel catfish, flathead catfish, rainbow trout, smallmouth bass, yellow bass, and yellow bullhead were encountered above but not below the barrier, while grass carp and striped bass were taken below but not above.

Assemblage Structure – Native fishes collectively comprised about 2% of the total number of 334 individuals taken from the SRPn Canal (Table 4). Non-native channel catfish was the predominant species overall (52% of total catch) followed by bluegill (13%), grass carp and largemouth bass (10% each), common carp (5%), rainbow trout (4%), and yellow bullhead (3%). Native desert sucker and Sonora sucker, plus smallmouth bass and yellow bass each comprised 1% or less of the total catch.

Above the fish barrier, non-native channel catfish was the most abundant species captured (63% of 277 individuals), followed by bluegill (13%), largemouth bass (10%), and rainbow trout and yellow bullhead (4% each). Native desert sucker and Sonora sucker, and non-native common carp, flathead catfish, smallmouth bass, and yellow bass each contributed 1% or less to total catch (Table 6E).

Below the fish barrier, non-native grass carp was the dominant species (56% of 57 individuals captured), followed by common carp (26%), bluegill (9%), largemouth bass (7%), and striped bass (2%; Table 6E).

FLORENCE-CASA GRANDE CANAL

Sampling Notes and Deviations from Protocol – Sampling was performed by M&A on October 26, 2015 (Table 1). Six stations were visited during routine monitoring: one immediately below the canal headworks at Ashurst-Hayden Diversion Dam (above the electrical fish barrier located at China Wash, 2.6 miles downstream from the diversion dam), and three below China Wash. Stations below the barrier were at China Wash, at the first irrigation turnout 11.4 miles downstream from Ashurst-Hayden, and at the Pima Lateral Canal (15.2 miles downstream). In addition to the four stations on the main FCG Canal, we sampled the Pima Lateral Canal with a straight seine (station 7-2-15.3) and visually inspected the Pima Lateral Feeder Canal (station 7-2-15.4). The station at the dam was sampled using a backpack electrofisher and a straight seine. Seepage through the turnout gates was minimal. The wetted channel was variably 1 to 3 m wide, mostly shallow with deepest pools ca. 1 m, and substrate was sandy-gravel with some fines. China Wash was sampled using a straight seine, the first irrigation turnout with a backpack electrofisher, and the station at Pima Lateral was sampled with a straight seine.

Species Richness and Distribution – Five species were taken from the Florence-Casa Grande Canal (Tables 4 and 5); none was native. Four species were collected above and five below the electric fish barrier at China Wash. Channel catfish, flathead catfish, mosquitofish, and red

shiner were found immediately below the dam, while those four fishes plus threadfin shad were encountered in the reach at and below the fish barrier at China Wash (Table 4).

Assemblage Structure – Channel catfish predominated above the electrical fish barrier making up 54% of the catch of 35 individuals (Table 4). Second most abundant there was mosquitofish (31%), followed by red shiner (11%) and flathead catfish (a single young-of-year that comprised 3% of the catch). Red shiner predominated the catch in the reach below the fish barrier where it comprised 80% of 106 individuals (Table 6F). Threadfin shad was the second most common species below the barrier (10% of catch), followed by channel catfish (7%), flathead catfish (2%) and mosquitofish (1%); Table 6F.

RECOMMENDATIONS

The process of acquiring authorization to access established stations should be initiated early in the sample year in attempt to ensure that all permissions are in hand when the field season begins. A suitable long-term alternate to Gila River station 2-4-3 (Box-O Wash) has been identified and evaluated to eliminate access issues; that new station is “Ashurst-Hayden Dam” located immediately upstream of that structure.

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Table 1. Stream, station, date, gear type, effort, and lead entity for sampling activities conducted in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, for sample year 2015 (period June 2, 2010 to January 11, 2016). Stations are identified by 3-digit numeric codes that respectively indicate stream or canal name, reach name, (1 up- to 4 downstream), 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 (2015-2016). Gear codes, names, and acronyms by category are Entrapment/Entanglement: gill net (G), trammel net (T), hoop net (H), fyke net (F), trap net (TR), minnow trap (M), shock/gill net (SGN), shock/trammel net (STN), experimental gill net (EXPG); Seining: straight seine (SS), bag seine (BS), kick seine (KS), dip net (D); Angling: spin-cast (SC), fly rod (FR), drop line (DL), trotline (TL); Electrofishing: backpack shocker (Bp), boat shocker (Ef), bank shocker (BKS); and Miscellaneous: trammel net/drifted (TND), gill net/drifted (GND), electric seine (ES), dry station (DS) and visual observation (VO). Effort is given in seconds (electrofishing), hours (entrapment/entanglement and angling gears), and haul numbers (seining gears). CAP Canal stations all are associated with pumping plants, which are named for each station, while FCG and SRP canal stations are given as approximate miles downstream from canal origin and a verbal location description.

Stream	Station	Date	Gear	Effort	Lead	
San Pedro River (SanP)	1-1-1	Hereford	10 12 2015	Bp	621	M & A
	1-1-2	Lewis Springs	10 12 2015	Bp	702	M & A
	1-1-3	Charleston	10 12 2015	Bp	843	M & A
	1-2-1	Hughes Ranch	10 13 2015	DS		M & A
	1-2-3	Three Links Farm	10 13 2015	Bp	529	M & A
	1-3-1	Aravaipa Creek	10 13 2015	Bp	257	M & A
	1-3-2	Dudleyville	10 13 2015	Bp	271	M & A
	1-3-3	Mouth	10 13 2015	DS		M & A
	Gila River (Gila)	2-2-1	Dripping Springs Wash	11 09 2015	Bp	637
2-2-2		Christmas	11 09 2015	Bp	509	M & A
2-2-3		O'Carrol Canyon	11 09 2015	Bp	681	M & A
2-3-1		San Pedro River	11 09 2015	Bp	661	M & A
2-3-2		Kearny	11 10 2015	Bp	664	M & A
2-3-3		Kelvin	11 10 2015	Bp	626	M & A
2-4-1		A Diamond Ranch	11 10 2015	Bp	773	M & A
2-4-2		Cochran	11 11 2015	Bp	1182	M & A
2-4-3		Ashurst-Hayden Dam	11 11 2015	Bp	925	M & A
CAP Canal (CAP)	4-1-1	Bouse Hills	06 02 2015	Ef		Reclamation
	4-1-1	Bouse Hills	06 02 2015	M		Reclamation
	4-1-1	Bouse Hills	06 02 2015	T		Reclamation
	4-1-1	Bouse Hills	06 02 2015	TL		Reclamation
	4-1-2	Little Harquahala	06 03 2015	Ef		Reclamation
	4-1-2	Little Harquahala	06 03 2015	M		Reclamation
	4-1-2	Little Harquahala	06 03 2015	T		Reclamation
	4-1-2	Little Harquahala	06 03 2015	TL		Reclamation
	4-2-1	Salt-Gila	10 19 2015	Ef	900	M & A
4-2-1	Salt-Gila	10 19 2015	M		M & A	
4-2-1	Salt-Gila	10 19 2015	T		M & A	
4-2-1	Salt-Gila	10 19 2015	TL		M & A	

Table 1. Concluded.

Stream		Station	Date	Gear	Effort	Lead
	4-3-1	Brady	10 20 2015	Ef	450	M & A
	4-3-1	Brady	10 20 2015	M		M & A
	4-3-1	Brady	10 20 2015	T		M & A
	4-3-1	Brady	10 20 2015	TL		M & A
	4-3-2	Red Rock	10 21 2015	Ef	600	M & A
	4-3-2	Red Rock	10 21 2015	M		M & A
	4-3-2	Red Rock	10 21 2015	T		M & A
	4-3-2	Red Rock	10 21 2015	TL		M & A
	4-3-3	San Xavier	10 22 2015	Ef	500	M & A
	4-3-3	San Xavier	10 22 2015	M		M & A
	4-3-3	San Xavier	10 22 2015	T		M & A
	4-3-3	San Xavier	10 22 2015	TL		M & A
SRP South Canal (SRPs)	5-1-1	0.0 Above fish barrier	11 23 2015	BS		M & A
	5-2-0	0.0 Below fish barrier	11 22 2015	BS		M & A
	5-2-9	9.0 Triple Junction	11 22 2015	D		M & A
SRP North Canal (SRPn)	6-1-0	0.0 Above fish barrier	01 11 2016	BS		M & A
	6-2-14.5	14.5 Indian Bend Wash	01 11 2016	Ef	840	M & A
FCG Canal (FCG)	7-1-0	0.0 Below diversion dam	10 26 2015	Bp	336	M & A
	7-1-0	0.0 Below diversion dam	10 26 2015	SS		M & A
	7-2-2.6	2.6 Below China Wash	10 26 2015	SS		M & A
	7-2-11.4	11.4 First turnout	10 26 2015	Bp	199	M & A
	7-2-15.2	15.2 FCG at Pima Lateral	10 26 2015	SS		M & A
	7-2-15.3	15.3 Pima Lateral Canal	10 26 2015	SS		M & A
	7-2-15.4	Canal	10 26 2015	D		M & A

Table 2. Common and scientific names and four-letter species codes of fishes and other aquatic vertebrates encountered during routine monitoring of waters in the Gila River basin, Arizona.

Common Name	Species Name	Species Code
Threadfin shad	<i>Dorosoma petenense</i>	DOPE
Bigmouth buffalo	<i>Ictiobus cyprinella</i>	ICCY
Black buffalo	<i>Ictiobus niger</i>	ICNI
Common carp	<i>Cyprinus carpio</i>	CYCA
Fathead minnow	<i>Pimephales promelas</i>	PIPR
Gila chub	<i>Gila intermedia</i>	GIIN
Goldfish	<i>Carassius auratus</i>	CAAU
Grass carp	<i>Ctenopharyngodon idella</i>	CTID
Loach minnow	<i>Tiaroga cobitis</i>	TICO
Longfin dace	<i>Agosia chrysogaster</i>	AGCH
Red shiner	<i>Cyprinella lutrensis</i>	CYLU
Roundtail chub	<i>Gila robusta</i>	GIRO
Speckled dace	<i>Rhinichthys osculus</i>	RHOS
Desert sucker	<i>Pantosteus clarkii</i>	PACL
Hybrid sucker	<i>Pantosteus X Catostomus</i>	HYBR
Sonora sucker	<i>Catostomus insignis</i>	CAIN
Pacu	<i>Colossoma sp</i>	COLO
Black bullhead	<i>Ameiurus melas</i>	AMME
Channel catfish	<i>Ictalurus punctatus</i>	ICPU
Flathead catfish	<i>Pylodictis olivaris</i>	PYOL
Yellow bullhead	<i>Ameiurus natalis</i>	AMNA
Rainbow trout	<i>Oncorhynchus mykiss</i>	ONMY
Gila topminnow	<i>Poeciliopsis occidentalis</i>	POOC
Mosquitofish	<i>Gambusia affinis</i>	GAAF
Sailfin molly	<i>Poecilia latipinna</i>	POLA
Striped bass	<i>Morone saxatilis</i>	MOSA
White bass	<i>Morone chrysops</i>	MOCH
Yellow bass	<i>Morone mississippiensis</i>	MOMI
Black crappie	<i>Pomoxis nigromaculatus</i>	PONI
Bluegill	<i>Lepomis macrochirus</i>	LEMA
Green sunfish	<i>Lepomis cyanellus</i>	LECY
Largemouth bass	<i>Micropterus salmoides</i>	MISA
Redear sunfish	<i>Lepomis microlophus</i>	LEMI
Smallmouth bass	<i>Micropterus dolomieu</i>	MIDO
Undetermined or hybrid sunfish	<i>Lepomis?</i>	LEPO
Walleye	<i>Sander vitreus (Stizostedion vitreum)</i>	SAVI
Yellow perch	<i>Perca flavescens</i>	PEFL
Blue tilapia	<i>Oreochromis aureus (Tilapia aurea)</i>	ORAU
Mozambique tilapia	<i>Oreochromis mossambicus (Tilapia mossambica)</i>	ORMO
Redbelly tilapia	<i>Tilapia zilli</i>	TIZI
Undetermined cichlid	<i>Tilapia?</i>	TILA

Table 2. Concluded.

Common Name	Species Name	Species Code
American bullfrog	<i>Lithobates catesbeianus (Rana catesbeiana)</i>	LICA
Lowland leopard frog	<i>Lithobates yavapaiensis (Rana yavapaiensis)</i>	LIYA
No fish caught	<i>No fish caught</i>	0000
Sonora mud turtle	<i>Kinosternon sonoriense</i>	KISO
Spiny softshell turtle	<i>Apalone spinifera (Trionyx spinifera)</i>	APSP
Undetermined frog	<i>Lithobates? (Rana ?)</i>	LITH
Unknown fish species	<i>Unknown fish species</i>	FISH
Unknown species	<i>Unknown species</i>	UNKN

Table 3. Occurrence of 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 2015 (period June 2, 2015 to January 11, 2016). Native fishes indicated by asterisks. Abbreviations as in Table 1.

Species	SanP	Gila	CAP	SRPs	SRPn	FCG	All sites
Black bullhead	X	O	O	O	O	O	X
Blue tilapia	O	O	O	X	O	O	X
Bluegill	O	O	X	X	X	O	X
Channel catfish	O	X	X	X	X	X	X
Common carp	X	X	X	X	X	O	X
Desert sucker*	X	O	O	X	X	O	X
Fathead minnow	X	O	O	O	O	O	X
Flathead catfish	O	X	O	X	X	X	X
Grass carp	O	O	X	X	X	O	X
Green sunfish	X	X	X	O	O	O	X
Largemouth bass	O	O	X	X	X	O	X
Longfin dace*	X	O	O	O	O	O	X
Mosquitofish	X	X	O	O	O	X	X
Rainbow trout	O	O	O	X	X	O	X
Red shiner	O	X	X	X	O	X	X
Redear sunfish	O	O	X	O	O	O	X
Smallmouth bass	O	O	X	O	X	O	X
Sonora sucker*	O	O	O	X	X	O	X
Striped bass	O	O	X	O	X	O	X
Threadfin shad	O	O	X	O	O	X	X
Yellow bass	O	O	O	O	X	O	X
Yellow bullhead	O	O	O	X	X	O	X
Total species (taxa)	7	6	11	12	13	5	22
Native	2	0	0	2	2	0	3
Non-native	5	6	11	10	11	5	19
Percent native	29	0	0	17	15	0	14

¹ Total species (taxa) excludes undetermined or hybrid sunfish, which are assumed to be subsumed into the individual species.

Table 4. 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 2015 (period June 2, 2015 to January 11, 2016). Native fishes indicated by asterisks. Ab and Bb respectively indicate Above and Below electrical fish barriers on SRPn, SRPs, and FCG canals.

Species	SanP	Gila	CAP	SRPs		SRPn		FCG		Total
				Ab	Bb	Ab	Bb	Ab	Bb	
Black bullhead	4									4
Blue tilapia				21						21
Bluegill			23	3	1	37	5			69
Channel catfish		32	27	86	2	175		19	7	348
Common carp	1	3	36	8		3	15			66
Desert sucker*	85			1		2				88
Fathead minnow	1									1
Flathead catfish		12		1	3	2		1	2	21
Grass carp			24		1		32			57
Green sunfish	8	7	1							16
Largemouth bass			27	14		28	4			73
Longfin dace*	212									212
Mosquitofish	13	12						11	1	37
Rainbow trout				11		12				23
Red shiner		35	23		125			4	85	272
Redear sunfish			5							5
Smallmouth bass			3			2				5
Sonora sucker*				17	3	4				24
Striped bass			28				1			29
Threadfin shad			1						11	12
Yellow bass						1				1
Yellow bullhead				5		11				16
Total	324	101	198	167	135	277	57	35	106	1,400
Total native	297	0	0	18	3	6	0	0	0	324
Total nonnative	234	66	112	48	132	60	37	16	99	804
Percent native	91.7	0.0	0.0	10.8	2.2	2.2	0.0	0.0	0.0	23.1

Table 5. 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 2015 (period June 2, 2015 to January 11, 2016). Species counts exclude undetermined cichlids (see notes accompanying Table 1). See Table 1 for reach and station names (see also Clarkson 1996 a-c). Distances between stations and reaches are variable. Totals for each reach (and for all reaches) followed by number of native and non-native (n/nn) species; NS indicates no sample during SY 2015; 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	CAP	SRPs	SRPn	FCG
1-1	4	--	5	10	11	4
1-2	6	--	4	--	--	--
1-3	4	--	NS	--	--	--
total	7	--	5	10	11	4
n/nn	2/5	--	0/5	2/8	2/9	0/4
2-1	0	4	10	3	NS	4
2-2	--	5	--	NS	5	3
2-3	3	5	--	5	0	3
2-4	--	--	--	--	--	--
total	3	6	10	6	5	5
n/nn	1/2	0/6	0/10	1/5	0/5	0/5
3-1	0	4	7	--	--	--
3-2	0	0	3	--	--	--
3-3	0	2	8	--	--	--
total	0	4	8	--	--	--
n/nn		0/4	0/8			
4-1	--	2	--	--	--	--
4-2	--	1	--	--	--	--
4-3	--	5	--	--	--	--
total	--	5	--	--	--	--
n/nn		0/5				
Total all reaches	7	6	11	12	13	5
n/nn	2/5	0/6	0/11	2/9	2/11	0/5
Percent native	29	0	0	17	15	0

Table 6A. 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 2015 (period June 2, 2015 to January 11, 2016). Fish species listed alphabetically using standard abbreviations in Table 2, data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥1), if specified; subtotals and total number are for each age class.

Species	Age	Reach				Reach				Reach			Totals
		1-1-1	1-1-2	1-1-3	Sum	1-2-1	1-2-3	Sum	1-3-1	1-3-2	1-3-3	Sum	
Black bullhead	0	1	0	0	1	0	0	0	0	0	0	0	1
	1	1	1	0	2	0	1	1	0	0	0	0	3
Common carp	0	0	1	0	1	0	0	0	0	0	0	0	1
Desert sucker*	0	0	1	80	81	0	0	0	0	0	0	0	81
	1	0	1	3	4	0	0	0	0	0	0	0	4
Fathead minnow		0	0	1	1	0	0	0	0	0	0	0	1
Green sunfish	0	3	2	0	5	0	1	1	0	0	0	0	6
	1	0	2	0	2	0	0	0	0	0	0	0	2
Longfin dace*		23	1	33	57	0	155	155	0	0	0	0	212
Mosquitofish		3	5	5	13	0	0	0	0	0	0	0	13
Totals		31	14	122	167	0	157	157	0	0	0	0	324

Table 6B. 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 2015 (period June 2, 2015 to January 1111, 2016). Fish species listed alphabetically using standard abbreviations in Table 2; data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; subtotals and total number are for each age class.

Species	Age	Reach				Reach				Reach			Totals	
		2-2-1	2-2-2	2-2-3	Sum	2-3-1	2-3-2	2-3-3	Sum	2-4-1	2-4-2	2-4-3		Sum
Channel catfish	0	6	9	5	20	2	0	0	2	1	3	2	6	28
	1	1	0	1	2	1	0	0	1	0	1	0	1	4
Common carp	0	0	1	0	1	0	0	0	0	0	0	2	2	3
Flathead catfish	0	0	1	1	2	3	0	1	4	2	0	1	3	9
	1	3	0	0	3	0	0	0	0	0	0	0	0	3
Green sunfish	0	0	0	0	0	3	0	0	3	0	0	2	2	5
	1	0	0	2	2	0	0	0	0	0	0	0	0	2
Mosquitofish		7	4	1	12	0	0	0	0	0	0	0	0	12
Red shiner		8	12	1	21	2	0	10	12	0	0	2	2	35
Totals		25	27	11	63	11	0	11	22	3	4	9	16	101

Table 6C. 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 2015 (period June 2, 2015 to January 11, 2016). Fish species listed alphabetically using standard abbreviations in Table 2; data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; subtotals and total number are for each age class.

Species	Age	Reach			Reach			Reach			Totals
		4-1-1	4-1-2	Sum	4-2-1	Sum	4-3-1	4-3-2	4-3-3	Sum	
Bluegill	0	0	0	0	16	16	2	0	0	2	18
	1	0	0	0	2	2	0	0	3	3	5
Channel catfish	1	7	1	8	9	9	3	3	4	10	27
Common carp	0	0	0	0	0	0	0	0	1	1	1
	1	0	0	0	14	14	7	0	14	21	35
Grass carp	1	1	4	5	15	15	2	0	2	4	24
Green sunfish	1	0	0	0	1	1	0	0	0	0	1
Largemouth bass	0	0	0	0	0	0	0	0	17	17	17
	1	0	0	0	0	0	1	0	9	10	10
Red shiner		0	0	0	2	2	1	15	5	21	23
Redear sunfish	1	1	0	1	1	1	0	0	3	3	5
Smallmouth bass	0	1	0	1	0	0	0	0	0	0	1
	1	0	1	1	1	1	0	0	0	0	2
Striped bass	0	1	0	1	5	5	2	1	1	4	10
	1	3	2	5	12	12	0	1	0	1	18
Threadfin shad		0	0	0	1	1	0	0	0	0	1
Totals		14	8	22	79	79	18	20	59	97	198

Table 6D. 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 2015 (period June 2, 2015 to January 11, 2016). Fish species listed alphabetically using standard abbreviations in Table 2, data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; total number is for each age class. See Table 1 for sampling dates.

Species	Age	Reach			Reach		Totals
		5-1-1	Sum	5-2-0	5-2-9	Sum	
Blue tilapia	1	21	21	0	0	0	21
Bluegill	1	3	3	1	0	1	4
Channel catfish	1	86	86	0	2	2	88
Common carp	1	8	8	0	0	0	8
Desert sucker*	1	1	1	0	0	0	1
Flathead catfish	0	0	0	0	3	3	3
	1	1	1	0	0	0	1
Grass carp	1	0	0	0	1	1	1
Largemouth bass	1	14	14	0	0	0	14
Rainbow trout	1	11	11	0	0	0	11
Red shiner		0	0	25	100	125	125
Sonora sucker*	1	17	17	3	0	3	20
Yellow bullhead	1	5	5	0	0	0	5
Totals		167	167	29	106	135	302

Table 6E. 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 2015 (period June 2, 2015 to January 11, 2016). Fish species listed alphabetically using standard abbreviations in Table 2, data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; total number is for each age class. See Table 1 for sampling dates.

Species	Age	Reach		Reach		Totals
		6-1-0	Sum	6-2-14.5	Sum	
Bluegill	0	5	5	5	5	10
	1	32	32	0	0	32
Channel catfish	0	1	1	0	0	1
	1	174	174	0	0	174
Common carp	1	3	3	15	15	18
Desert sucker*	1	2	2	0	0	2
Flathead catfish	0	2	2	0	0	2
Grass carp	1	0	0	32	32	32
Largemouth bass	0	1	1	2	2	3
	1	27	27	2	2	29
Rainbow trout	1	12	12	0	0	12
Smallmouth bass	1	2	2	0	0	2
Sonora sucker*	1	4	4	0	0	4
Striped bass	1	0	0	1	1	1
Yellow bass	1	1	1	0	0	1
Yellow bullhead	1	11	11	0	0	11
Totals		277	277	57	57	334

Table 6F. Fish catch at Florence Casa Grande (FCG) Canal stations (see Table 1) during sampling in behalf of a long-term monitoring plan for fish populations in selected waters of the Gila River basin, Arizona, during sample year 2015 (period June 2, 2015 to January 11, 2016). Fish species listed alphabetically using standard abbreviations in Table 2, data are total fish or number of young-of-year (age-0) followed by number of older age classes (age ≥ 1), if specified; total number is for each age class. See Table 1 for sampling dates.

Species	Age	Reach					Reach			Totals
		7-1-0	Sum	7-2-2.6	7-2-11.4	7-2-15.2	7-2-15.3	7-2-15.4	Sum	
Channel catfish	0	19	19	3	0	0	0	0	3	22
	1	0	0	0	0	4	0	0	4	4
Flathead catfish	0	0	0	0	1	1	0	0	2	2
	1	1	1	0	0	0	0	0	0	1
Mosquitofish		11	11	1	0	0	0	0	1	12
Red shiner		4	4	59	1	25	0	0	85	89
Threadfin shad	0	0	0	1	10	0	0	0	11	11
Totals		35	35	64	12	30	0	0	106	141