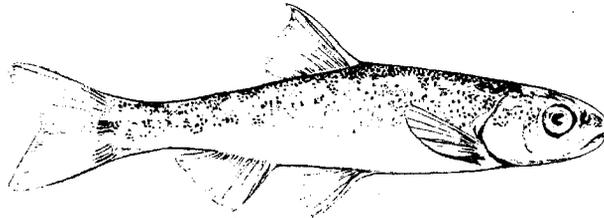


FISH MONITORING RELATIVE TO IMPACTS OF THE  
CENTRAL ARIZONA PROJECT  
IN THE GILA RIVER BASIN, ARIZONA:  
RESULTS OF THE WINTER 1997-98 FIELD SEASON

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#### RECOMMENDED CITATION

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FISH MONITORING RELATIVE TO IMPACTS OF THE CENTRAL ARIZONA  
PROJECT IN SELECTED REACHES OF THE GILA RIVER BASIN, ARIZONA:  
RESULTS OF THE WINTER 1997-98 FIELD SEASON

D. Andrew Clark, Bradley J. Duncan, and Kirk L. Young

INTRODUCTION

The U.S. Fish and Wildlife Service (USFWS) Biological Opinion on transportation and delivery of Central Arizona Project (CAP) water to the Gila River Basin (USFWS 1994) determined that the CAP 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*), and that the project would adversely modify designated critical habitat of the latter three species (Clarkson 1996). The primary justification for this 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. To determine whether such transfers occur, the Arizona Game and Fish Department (AGFD) and U. S. Bureau of Reclamation (USBR) have initiated a monitoring program. A Cooperative Agreement was established in support of the monitoring program in May 1998. This report provides results from the winter 1997-98 portion of that effort.

METHODS

Arizona Game and Fish Department, Bureau of Reclamation, and Salt River Project (SRP) personnel, as well as volunteers, surveyed the SRP South and Arizona canals by the electrical barriers on October 27, 1997 and January 12, 1998, respectively. Gear types employed consisted of bag and straight seines.

AGFD personnel conducted 1997 stream surveys between October 6 and November 18, 1997. Twenty-two (22) of the 24 fixed stream stations were monitored. Random sampling was conducted within 200 m of a fixed station. Backpack electrofishing was the primary sampling gear used in all stream stations, but canoe electrofishing, experimental and standard gill nets, bag and straight seines were also employed. Fishes sampled were separated into two age categories; age 0 for young of the year fish, and age 1+ for older than young of the year fish. Small-bodied fishes were not sorted by age, but were simply counted and released. Voucher specimens for each species collected were preserved and deposited at Arizona State University, Vertebrate Museum. Monitoring survey protocols, computerized data file protocols, and station/reach descriptions and maps are detailed in Clarkson (1996). Surveys and data file computerization were conducted following methods prescribed by Clarkson (1996).

RESULTS AND DISCUSSION

Twenty-two (22) of the 24 fixed stream stations were monitored (Table 1). Monitoring samples yielded a total of 6924 individuals (4416 = streams; 2508 = canals) comprising 23 fish species. Four native fishes--longfin dace (*Agosia chrysogaster*), Sonora sucker (*Catostomus insignis*), roundtail chub (*Gila robusta*), desert sucker (*Pantosteus clarki*); and 19 nonnatives--black bullhead (*Ameiurus melas*), yellow bullhead (*Ameiurus natalis*), common carp (*Cyprinus carpio*), red shiner (*Cyprinella lutrensis*), threadfin shad (*Dorosoma petenense*), mosquitofish (*Gambusia affinis*), channel catfish (*Ictalurus punctatus*), green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), redear sunfish (*Lepomis microlophus*), smallmouth bass (*Micropterus dolomieu*), largemouth bass (*Micropterus salmoides*), yellow bass (*Morone mississippiensis*), rainbow trout (*Oncorhynchus mykiss*), fathead minnow (*Pimephales promelas*), black crappie (*Pomoxis nigromaculatus*), flathead catfish (*Pylodictis olivaris*), walleye (*Stizostedion vitreum*), and tilapia (*Tilapia aurea* or *Tilapia mossambica*) were sampled. Species abbreviations are summarized in Appendix A.

#### SAN PEDRO RIVER

557 fish representing 3 native and 8 nonnative species were sampled at 8 stations within 3 reaches of the San Pedro River (Appendix B). Overall, mosquitofish was most abundant followed by longfin dace, red shiner, fathead minnow, desert sucker, green sunfish, black bullhead, yellow bullhead, Sonora sucker, largemouth bass, and bluegill. The capture of 1 bluegill at the Charleston site (1-1-3) represents a new occurrence in the San Pedro River (Clarkson 1996, 1998; Girmendonk and Young 1997), however, the specimen was not preserved. Common carp was not encountered in 1997 samples in contrast to 1991, 1993 and 1996. Black bullhead and largemouth bass were only sampled in Reach 1. Yellow bullhead was a new species to Reach 2, and black bullhead was absent from reach 2 surveys for the first time since 1992. Reach 3 was almost exclusively shallow run habitat and yielded only 128 fish from 3 stations. Eight (8) qualitative sites were sampled in addition to the fixed survey stations.

#### GILA RIVER

3038 fish representing 3 native and 12 nonnative species were sampled at 11 stations in 4 reaches of the Gila River (Appendix C). Overall, threadfin shad was most abundant followed by Sonora sucker, red shiner, desert sucker, common carp, mosquitofish, yellow bullhead (the only species sampled at every station), green sunfish, largemouth bass, channel catfish, longfin dace, black crappie, flathead catfish, fathead minnow, and smallmouth bass. Four species were encountered that represent new recent occurrences in Gila River monitoring area (Clarkson 1996, 1998; Girmendonk and Young 1997). The new species consist of: 1 juvenile smallmouth bass (specimen not preserved) from just below Coolidge Dam (2-1-1); several flathead catfish (specimen preserved) from the Coolidge Dam and Hook and Line Ranch (2-1-3) stations; threadfin shad (specimens preserved) in reaches 1-3, but not in Reach 4; several black crappie (specimens preserved) were collected from Hook and Line and Deer Creek sites (2-2-2). Eight (8) sites were qualitatively sampled.

#### SALT RIVER

821 fish were sampled representing 2 native species and 10 nonnative species (Appendix D). Three stations were sampled in 1 reach of the Lower Salt River. Overall, desert sucker was most abundant followed by largemouth bass, Sonora sucker, mosquitofish, channel catfish, tilapia, green sunfish, bluegill, common carp, yellow bullhead, yellow bass, and redear sunfish. One adult redear sunfish was collected (specimen preserved) at the Granite Reef Dam station (3-1-3) and represents a new recent species occurrence (Clarkson 1996, 1998; Girmendonk and Young 1997). Conspicuously absent from the survey were walleye (present 1995 and 1996) and roundtail chub (present 1996). Rainbow trout and black crappie have not been collected since 1995.

#### SRP CANAL ELECTRICAL BARRIER

2508 fishes representing 11 nonnative and 3 native species were collected from the electrical barrier forebays of the South and Arizona canals (Appendix E). Overall, channel catfish was most common, followed by desert sucker, tilapia, red shiner, Sonora sucker, largemouth bass, rainbow trout, yellow bass, roundtail chub, common carp, walleye, bluegill, flathead catfish, and black crappie. Grass carp (*Ctenopharyngodon idella*) were not sampled in either canal. Rainbow trout, flathead catfish, yellow bass, and black crappie were found exclusively in the Arizona Canal. Red shiner was only sampled in the South Canal.

A much larger effort was put forth in 1997 than in 1996. Only 2 of the 24 stations were not sampled. These stations could not be accessed by field crews. The Needles Eye station on the Gila River (2-1-2) could not be accessed by road, and distances were too great to travel up or down river. The San Pedro River site (1-2-3) was on private land and right of way could not be secured. All stations on the San Pedro River had additional qualitative sampling performed. Eight (8) of the 12 fixed stations on the Gila River had additional qualitative sampling performed. None of the Salt River stations had qualitative sampling performed because sampling at the fixed stations was extensive and comprehensive; as many as 5 gear types were used to collect 505 fish at 2 of the 3 fixed stations. Vouchers were almost always taken in all sampling. When vouchers were not taken, it was because field crews did not review historical collection lists and therefore did not know if a species collection was new to the system or station.

#### RECOMMENDATIONS

We recommend that up-to-date reach and/or stream specific species occurrence lists be developed for field reference. Inclusion of such lists will ensure that proper vouchers and new species occurrence notifications occur.

Table 1. Proposed sampling reaches and fixed station locations for stream fish monitoring (Clarkson 1996) and what was actually monitored by AGFD personnel during 1997.

Stream	Reach	Station	Sampled
San Pedro River	Hereford to Fairbank	Hereford (1-1-1)	yes
		Lewis Spring (1-1-2)	yes
		Charleston (1-1-3)	yes
	Cascabel to Redington	Hughes Ranch (1-2-1)	yes
		Soza Wash (1-2-2)	yes
		Above gaging station (1-2-3)	no
	Aravaipa Creek to Gila River	Aravaipa Creek (1-3-1)	yes
		Dudleyville (TNC property) (1-3-2)	yes
		Gila River (1-3-3)	yes
Gila River	Coolidge Dam to Needles Eye	Coolidge Dam (2-1-1)	yes
		2.8 mi downstream Coolidge Dam (2-1-2)	no
		Hook and Line Ranch (2-1-3)	yes
	Little Ash Creek to Hayden	Dripping Springs Wash (2-2-1)	yes
		Christmas (2-2-2)	yes
		O'Carroll Canyon (2-2-3)	yes
	Hayden to Mineral Creek	San Pedro River (2-3-1)	yes
		Kearney (2-3-2)	yes
		Kelvin (2-3-3)	yes
	Mineral Creek to Ashurst-Hayden Dam	Diamond A Ranch (2-4-1)	yes
		Cochran (2-4-2)	yes
		Box O Wash (2-4-3)	yes
Salt River	Stewart Mountain Dam to Granite Reef Dam	Stewart Mountain Dam (3-1-1)	yes
		Blue Point (3-1-2)	yes
		Granite Reef Dam (3-1-3)	yes

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- U.S. Fish and Wildlife Service. 1994. Endangered Species Act Section 7 Biological Opinion on transportation and delivery of Central Arizona Project water to the Gila River basin (Hassayampa, Agua Fria, Salt, Verde, San Pedro, Middle and upper Gila River and associated tributaries) in Arizona and New Mexico. 2-21-90-f-119, April 15, 1994.

Appendix A. List of abbreviations. Fish species abbreviations (based on first two letters of Genus and specific epithet).

Scientific Name	Common Name	Code
<i>Agosia chrysogaster</i>	longfin dace	AGCH
<i>Ameiurus melas</i>	black bullhead	AMME
<i>Ameiurus natalis</i>	yellow bullhead	AMNA
<i>Carassius auratus</i>	goldfish	CAAU
<i>Catostomus insignis</i>	Sonora sucker	CAIN
<i>Cyprinella lutrensis</i>	red shiner	CYLU
<i>Cyprinus carpio</i>	common carp	CYCA
<i>Dorosoma petenense</i>	threadfin shad	DOPE
<i>Gambusia affinis</i>	mosquitofish	GAAF
<i>Gila robusta</i>	roundtail chub	GIRO
<i>Ictalurus punctatus</i>	channel catfish	ICPU
<i>Lepomis cyanellus</i>	green sunfish	LECY
<i>Lepomis microlophus</i>	redeer sunfish	LEMI
<i>Lepomis macrochirus</i>	bluegill	LEMA
<i>Micropterus dolomieu</i>	smallmouth bass	MIDO
<i>Micropterus salmoides</i>	largemouth bass	MISA
<i>Morone mississippiensis</i>	yellow bass	MOMI
<i>Oncorhynchus mykiss</i>	rainbow trout	ONMY
<i>Pantosteus clarki</i>	desert sucker	PACL
<i>Pimephales promelas</i>	fathead minnow	PIPR
<i>Pomoxis nigromaculatus</i>	black crappie	PONI
<i>Pylodictis olivaris</i>	flathead catfish	PYOL
<i>Rhinichthys osculus</i>	speckled dace	RHOS
<i>Stizostedion vitreum</i>	walleye	STVI
<i>Tilapia mossambica</i>	Mozambique tilapia	TIMO
<i>Tilapia aurea</i>	blue tilapia	TIAU
<i>Tilapia</i> sp.	tilapia of unknown species	TIsp.

Appendix B. San Pedro 1997 monitoring data.

Stream-Reach-Station code (1-1-1).

Stream and Reach: San Pedro River, Hereford to Charleston

Station: Hereford Bridge

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species*	Number of Age 0	Number of Age 1+	Total
Backpack Electrofisher	AGCH	0	27	27
	AMME	13	0	13
	AMNA	0	1	1
	GAAF	0	22	22
	LECY	0	3	3
	PACL	21	7	28
	PIPR	0	1	1
Total	7	34	61	95

\* Also captured 6 leopard frogs (*Rana* sp.) (0 age class) while riffle sampling.

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Pool	1,015.7
Riffle	118

Total effort expended by each gear type for each habitat type:

Backpack Electrofisher	
Habitat Type	Total Effort (Seconds)
Pool	2,062
Riffle	226

Appendix B. Continued.

Stream-Reach-Station code (1-1-2).  
 Stream and Reach: San Pedro River, Hereford to Charleston  
 Station: Lewis Springs

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species*	Number of Age 0	Number of Age 1+	Total
Backpack Electrofisher	AGCH	0	9	9
	AMME	1	2	3
	AMNA	0	1	1
	GAAF	0	85	85
	LECY	2	7	9
	PACL	6	1	7
	MISA	0	7	7
Total	7	9	112	121

\* Also captured 11 bullfrogs (*Rana* sp.) of various age classes while riffle/run sampling.

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Pool	944.7
Riffle	272.7
Run	15.8

Total effort expended by each gear type for each habitat type:

Backpack Electrofisher	
Habitat Type	Total Effort (Seconds)
Pool	1,316
Riffle	71
Run	73

Appendix B. Continued.

Stream-Reach-Station code (1-1-3).  
 Stream and Reach: San Pedro River, Hereford to Charleston  
 Station: Charleston

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species*	Number of Age 0	Number of Age 1+	Total
Backpack Electrofisher	AGCH	0	45	45
	AMME	0	1	1
	AMNA	1	0	1
	LECY	9	2	11
	LEMA	1	0	1
	GAAF	0	26	26
	MISA	0	1	1
	PIPR	0	38	38
	PACL	0	1	1
Total	9	11	114	125

\* Also captured various crayfish and tadpoles while riffle/pool sampling.

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Pool	760.6
Riffle	453.3

Total effort expended by each gear type for each habitat type:

Backpack Electrofisher	
Habitat Type	Total Effort (Seconds)
Pool	803
Riffle	1,007

Appendix B. Continued.

Stream-Reach-Station code (1-2-1).  
 Stream and Reach: San Pedro River, Cascabel to Redington  
 Station: Hughes Ranch

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Backpack Electrofisher	AGCH	0	30	30
	AMNA	1	6	7
	GAAF	0	4	4
	PIPR	0	4	4
Total	4	1	44	45

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Pool	200.1
Riffle	161
Run	279.9

Total effort expended by each gear type for each habitat type:

Backpack Electrofisher	
Habitat Type	Total Effort (Seconds)
Pool	283
Riffle	243
Run	284

Appendix B. Continued.

Stream-Reach-Station code (1-2-2).  
 Stream and Reach: San Pedro River, Cascabel to Redington  
 Station: Soza Ranch

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Backpack Electrofisher	AGCH	0	41	41
	GAAF	0	1	1
	LECY	1	0	1
Total	3	1	41	43

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Riffle	337.4
Run	283.4

Total effort expended by each gear type for each habitat type:

Backpack Electrofisher	
Habitat Type	Total Effort (Seconds)
Riffle	360
Run	262

Appendix B. Continued.

Stream-Reach-Station code (1-3-1).  
 Stream and Reach: San Pedro River, Aravaipa Creek to Gila River  
 Station: Confluence with Aravaipa Creek

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Backpack Electrofisher	AGCH	0	1	1
	CYLU	0	1	1
	PIPR	0	1	1
Total	3	0	3	3
Straight Seine	PIPR	0	1	1
Total	3	0	1	1

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Run	600

Total effort expended by each gear type for each habitat type:

Backpack Electrofisher	
Habitat Type	Total Effort (Seconds)
Run	697

Straight Seine	
Habitat Type	Total Effort (m <sup>2</sup> )
Run	3.72

Appendix B. Continued.

Stream-Reach-Station code (1-3-2).  
 Stream and Reach: San Pedro River, Aravaipa Creek to Gila River  
 Station: Swingle Wash (Dudleyville)

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Backpack Electrofisher	AGCH	0	2	2
	CAIN	1	0	1
	CYLU	0	6	6
	GAAF	0	15	15
	LECY	1	0	1
	PIPR	0	2	2
Total	6	2	25	27
Straight Seine	CAIN	3	0	3
	CYLU	0	15	15
	GAAF	0	3	3
Total	3	3	18	21

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Run	1,280

Total effort expended by each gear type for each habitat type:

Backpack Electrofisher	
Habitat Type	Total Effort (Seconds)
Run	1,006

Straight Seine	
Habitat Type	Total Effort (m <sup>2</sup> )
Run	3.72

Appendix B. Continued.

Stream-Reach-Station code (1-3-3).  
 Stream and Reach: San Pedro River, Aravaipa Creek to Gila River  
 Station: ASARCO/Mouth of San Pedro

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species*	Number of Age 0	Number of Age 1+	Total
Backpack Electrofisher	AGCH	0	7	7
	AMNA	2	0	2
	CAIN	5	0	5
	CYLU	0	45	45
	GAAF	0	8	8
	LECY	1	0	1
	PACL	8	0	8
Total	7	16	60	76

\* Also captured various bullfrog tadpoles while riffle/pool sampling.

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Riffle	184.1
Run	1,215.7

Total effort expended by each gear type for each habitat type:

Backpack Electrofisher	
Habitat Type	Total Effort (Seconds)
Riffle	181
Run	1,473

Appendix C. Gila River 1997 monitoring data.

Table C-1. Stream-Reach-Station code (2-1-1).  
 Stream and Reach: Gila River, Coolidge Dam to Needles Eye  
 Station: 0.5 miles downstream of Coolidge Dam

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Backpack Electrofisher	AMNA	0	3	3
	CYLU	0	5	5
	DOPE	0	27	27
	LECY	11	0	11
	ICPU	0	1	1
Total	5	11	36	47
Bag Seine	DOPE	0	1,225	1,225
	GAAF	0	1	1
	LECY	0	1	1
	MISA	2	0	2
Total	4	2	1,227	1,229
Canoe Electrofisher	CYCA	0	25	25
	DOPE	0	107	107
	LECY	1	2	3
	MISA	6	1	7
	MIDO	1	0	1
	PACL	1	0	1
	PYOL	1	0	1
Total	7	10	136	146

Appendix C. Continued.

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Pool	1,096
Riffle	207.3
Run	106.7

Total effort expended by each gear type for each habitat type:

Backpack Electrofisher	
Habitat Type	Total Effort (Seconds)
Pool	521
Riffle	425
Run	84

Bag Seine	
Habitat Type	Total Effort (m <sup>2</sup> )
Pool	33.4

Canoe Electrofisher	
Habitat Type	Total Effort (Seconds)
Pool	696

Appendix C. Continued.

Stream-Reach-Station code (2-1-3).  
 Stream and Reach: Gila River, Coolidge Dam to Needles Eye  
 Station: Hook and Line Ranch

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Backpack Electrofisher	AMNA	2	0	2
	CYLU	0	93	93
	DOPE	0	2	2
	GAAF	0	13	13
	ICPU	5	0	5
	LECY	6	0	6
	PACL	3	3	6
	PYOL	1	0	1
Total	8	17	111	128
Straight Seine	CYCA	2	0	2
	DOPE	0	4	4
	GAAF	0	2	2
	ICPU	1	0	1
	PONI	4	2	6
Total	5	7	8	15
Canoe Electrofisher	AMNA	0	1	1
	CAIN	0	16	16
	DOPE	0	2	2
	CYCA	0	47	47
	LECY	1	2	3
	MISA	5	4	9
	PACL	9	7	16
	PYOL	1	0	1
	PONI	1	0	1
Total	9	17	79	96

Appendix C. Continued.

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Pool	2,952.2
Riffle	236.3

Total effort expended by each gear type for each habitat type:

Backpack Electrofisher	
Habitat Type	Total Effort (Seconds)
Pool	875
Riffle	407

Canoe Electrofisher	
Habitat Type	Total Effort (Seconds)
Pool	1,773

Appendix C. Continued.

Stream-Reach-Station code (2-2-1).  
 Stream and Reach: Gila River, Little Ash Creek to Hayden  
 Station: Mouth of Dripping Springs Wash

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Canoe Electrofisher	AMNA	0	2	2
	CAIN	14	50	64
	CYCA	1	77	78
	ICPU	0	3	3
	LECY	0	3	3
	MISA	6	8	14
	PACL	2	1	3
Total	7	23	144	167
Straight Seine	GAAF	0	96	96
Total	1	0	96	96

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Pool	4,086

Total effort expended by each gear type for each habitat type:

Canoe Electrofisher	
Habitat Type	Total Effort (Seconds)
Pool	2,494

Bag Seine	
Habitat Type	Total Effort (m <sup>2</sup> )
Pool	16.52

Appendix C. Continued.

Stream-Reach-Station code (2-2-2).  
 Stream and Reach: Gila River, Little Ash Creek to Hayden  
 Station: 0.2 miles downstream of Deer Creek

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Canoe Electrofisher	AMNA	4	4	8
	DOPE	0	3	3
	CAIN	12	108	120
	CYLU	0	18	18
	LECY	1	3	4
	MISA	8	3	11
	PACL	7	17	24
	PONI	0	3	3
Total	8	32	159	191
Backpack Electrofisher	PACL	20	1	21
	CYLU	0	56	56
	CAIN	5	0	5
	AGCH	0	1	1
Total	4	35	58	73

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Pool (connected)	1,333
Riffle	179
Run	1,433
Pool (isolated)	159

Appendix C. Continued.

Total effort expended by each gear type for each habitat type:

Canoe Electrofisher	
Habitat Type	Total Effort (Seconds)
Pool (connected)	1,005
Riffle	200
Run	395

Backpack Electrofisher	
Habitat Type	Total Effort (seconds)
Riffle	141
Run	263
Pool (isolated)	321

Appendix C. Continued.

Stream-Reach-Station code (2-2-3).  
 Stream and Reach: Gila River, Little Ash Creek to Hayden  
 Station: 0.5 miles East of Winkelman

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Canoe Electrofisher	AMNA	2	7	9
	CAIN	23	95	118
	CYCA	2	13	15
	CYLU	0	1	1
	ICPU	2	0	2
	LECY	1	5	6
	MISA	3	1	4
	PACL	14	60	74
Total	8	47	182	229
Backpack Electrofisher	AGCH	0	5	5
	AMNA	10	0	10
	CAIN	5	0	5
	CYLU	4	33	37
	GAAF	0	1	1
	LECY	1	0	1
	PACL	21	0	21
Total	7	42	38	80

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Pool	3,282
Riffle	126.5
Run	63.6

Appendix C. Continued.

Total effort expended by each gear type for each habitat type:

Canoe Electrofisher	
Habitat Type	Total Effort (Seconds)
Pool	1,167
Riffle	150
Run	210

Backpack Electrofisher	
Habitat Type	Total Effort (seconds)
Pool	203
Riffle	653

Appendix C. Continued.

Stream-Reach-Station code (2-3-1).  
 Stream and Reach: Gila River, Hayden to Mineral Creek  
 Station: Hayden

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Backpack Electrofisher	AMNA	10	0	10
	AGCH	0	4	4
	CAIN	4	25	29
	CYLU	0	51	51
	CYCA	0	10	10
	GAAF	0	2	2
	ICPU	2	0	2
	PACL	14	16	30
	PIPR	0	2	2
	DOPE	0	2	2
	LECY	6	6	12
Total	11	36	118	154
Trammel Net	ICPU	0	1	1
Total	1	0	1	1

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Run	4,293

Total effort expended by each gear type for each habitat type:

Backpack Electrofisher	
Habitat Type	Total Effort (Seconds)
Run	1,574

Appendix C. Continued.

Stream-Reach-Station code (2-3-2).  
 Stream and Reach: Gila River, Hayden to Mineral Creek  
 Station: Kearney

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Backpack Electrofisher	AMNA	16	3	19
	CAIN	1	5	6
	CYLU	0	26	26
	CYCA	0	6	6
	GAAF	0	6	6
	LECY	2	3	15
	PACL	0	4	4
Total	7	19	53	82

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Run	2,780

Total effort expended by each gear type for each habitat type:

Backpack Electrofisher	
Habitat Type	Total Effort (Seconds)
Run	1,422

Appendix C. Continued.

Stream-Reach-Station code (2-3-3).  
 Stream and Reach: Gila River, Hayden to Mineral Creek  
 Station: Riverside/Kelvin Bridge

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Backpack Electrofisher	AMNA	0	1	1
	CAIN	0	2	2
	CYLU	0	2	2
Total	3	0	5	5
Straight Seine	CYLU	0	2	2
Total	1	0	2	2

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Run	4,940

Total effort expended by each gear type for each habitat type:

Backpack Electrofisher	
Habitat Type	Total Effort (Seconds)
Run	791

Appendix C. Continued.

Stream-Reach-Station code (2-4-1).  
 Stream and Reach: Gila River, Mineral Creek to Ashurst-Hayden Dam  
 Station: 0.5 mi W Diamond A Ranch

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Backpack Electrofisher	AMNA	5	1	6
	CAIN	0	2	2
	CYLU	0	2	2
	CYCA	0	1	1
	GAAF	0	1	1
	ICPU	0	1	1
	PACL	13	26	39
Total	7	18	34	52

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Pool	1,607.6
Riffle	495.7
Run	537.7

Total effort expended by each gear type for each habitat type:

Backpack Electrofisher	
Habitat Type	Total Effort (Seconds)
Pool	654
Riffle	454
Run	723

Appendix C. Continued.

Stream-Reach-Station code (2-4-2).  
 Stream and Reach: Gila River, Mineral Creek to Ashurst-Hayden Dam  
 Station: Cochran

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Backpack Electrofisher	AMNA	23	4	27
	CAIN	2	2	4
	CYLU	0	52	52
	ICPU	0	13	13
	PACL	10	24	34
Total	5	18	95	130

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Riffle	516
Run	1,780.2

Total effort expended by each gear type for each habitat type:

Backpack Electrofisher	
Habitat Type	Total Effort (Seconds)
Riffle	349
Run	873

Appendix C. Continued.

Stream-Reach-Station code (2-4-3).  
 Stream and Reach: Gila River, Mineral Creek to Ashurst-Hayden Dam  
 Station: 0.5 E of confluence with Box-O Wash

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species. Includes species sampled at qualitative sites.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Backpack Electrofisher	AMNA	13	3	16
	CAIN	1	9	10
	CYCA	0	1	1
	CYLU	0	22	22
	GAAF	0	55	55
	LECY	7	0	7
	ICPU	1	0	1
	PACL	1	2	3
Total	8	23	92	115

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Run	3,913.3

Total effort expended by each gear type for each habitat type:

Backpack Electrofisher	
Habitat Type	Total Effort (Seconds)
Run	1,258

Appendix D. Salt River 1997 monitoring data.

Stream-Reach-Station code (3-1-1).

Stream and Reach: Salt River, Stewart Mountain Dam to Granite Reef Dam

Station: 0.75 miles SSW of Stewart Mountain Dam

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Canoe Electrofisher	CAIN	0	29	29
	LECY	1	2	3
	LEMA	0	1	1
	MISA	7	15	22
	PACL	1	23	24
	Tisp.	10	0	10
Total	6	19	70	89
Backpack Electrofisher	GAAF	0	3	3
	LECY	2	0	2
	MISA	18	0	18
	PACL	2	0	2
	Tisp.	2	0	2
Total	5	24	3	27
Gillnet Set while Electrofishing	CAIN	16	0	16
	MISA	1	0	1
	PACL	5	176	181
	Tisp.	2	0	2
Total	4	24	176	200

Appendix D. Continued.

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Pool	15,084.2
Riffle	80.5

Total effort expended by each gear type for each habitat type:

Canoe Electrofisher	
Habitat Type	Total Effort (seconds)
Pool	2,493

Backpack Electrofisher	
Habitat Type	Total Effort (seconds)
Pool	1114
Riffle	200

Gillnet/Electrofished over	
Habitat Type	Total Effort (hours)
Pool	6

Appendix D. Continued.

Stream-Reach-Station code (3-1-2).

Stream and Reach: Salt River, Stewart Mountain Dam to Granite Reef Dam

Station: 1 mile E of the Blue Point Ranger Station

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Canoe Electrofisher	AMNA	0	2	2
	CAIN	0	31	31
	CYCA	0	5	5
	ICPU	0	1	1
	MISA	6	11	17
	PACL	0	51	51
	LECY.	2	2	4
Total	7	8	103	111
Backpack Electrofisher	AMNA	0	1	1
	GAAF	0	124	124
	LECY	1	0	1
	LEMA	5	0	5
	MISA.	30	1	31
Total	5	36	126	162
Trammel Net Set while Electrofishing	CAIN	0	14	14
	PACL	0	1	1
	MISA	0	40	40
Total	3	0	55	55
Gillnet	CAIN	0	1	1
	ICPU	0	19	19
	PACL	0	67	67
Total	3	0	87	87

Appendix D. Continued.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Trammel Net	CAIN	0	3	3
	ICPU	0	1	1
	PACL	0	17	17
Total	3	0	21	21

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Pool (connected)	4,876
Pool (isolated)	259.4

Total effort expended by each gear type for each habitat type:

Canoe Electrofisher	
Habitat Type	Total Effort (seconds)
Pool (connected)	1,958

Backpack Electrofisher	
Habitat Type	Total Effort (seconds)
Pool (isolated)	337

Gillnet	
Habitat Type	Total Effort (hours)
Pool (connected)	3.5

Appendix D. Continued.

Total effort expended by each gear type for each habitat type:

Trammel Net	
Habitat Type	Total Effort (hours)
Pool (connected)	4

Trammel Net-Electrofished over	
Habitat Type	Total Effort (hours)
Pool (connected)	4

Appendix D. Continued.

Stream-Reach-Station code (3-1-3).

Stream and Reach: Salt River, Stewart Mountain Dam to Granite Reef Dam

Station: 1 mile E of Granite Reef Dam

Number of each species captured by each sampling gear and frequency of estimated age-0 and older age classes for each species.

Gear Type	Species	Number of Age 0	Number of Age 1+	Total
Canoe Electrofisher	CAIN	0	9	9
	MISA	10	10	20
	Tisp.	0	1	1
Total	3	10	20	30
Trammel Net	CAIN	0	8	8
	PACL	0	1	1
Total	2	0	9	9
Trammel Net Set while E/F	CAIN	0	1	1
	LEMI	0	1	1
Total	2	0	2	2
Experimental Gillnet	CAIN	0	13	13
	PACL	0	2	2
Total	2	0	15	15
Gillnet set while Electrofishing	CAIN	0	10	10
	MISA	0	1	1
	MOMI	0	2	2
Total	3	0	13	13

Total area of each habitat type available at the sampling station:

Habitat Type	Area (m <sup>2</sup> )
Pool	80,000

Appendix D. Continued.

Total effort expended by each gear type for each habitat type:

Canoe Electrofisher	
Habitat Type	Total Effort (seconds)
Pool	4,694

Trammel Net	
Habitat Type	Total Effort (hours)
Pool	2

Trammel Net set while E/F	
Habitat Type	Total Effort (hours)
Pool	2.5

Experimental Gillnet	
Habitat Type	Total Effort (hours)
Pool	2

Gillnet set while E/F	
Habitat Type	Total Effort (hours)
Pool	1.5

Appendix E. SRP South and Arizona Canal October 1997 and January 1998 monitoring data.

Stream-Reach-Station code (5-1-0).  
 Stream and Reach: SRP South Canal above electrical barrier.

Habitat Type	Gear Type	Species	Total (Rel. Abund. by Hab and Gear Type) [Age-0:Age-1+]
Canal (concrete floor)	Bag seine (75 ft x 5 ft x 0.25 in)  (4 seine hauls)	PACL	322 (26.95%) [11:311]
		ICPU	278 (23.26%) [207:71]
		TIsp.	115 (9.62%) [22:93]
		CAIN	59 (4.94%) [8:51]
		GIRO	18 (1.51%) [0:18]
		MISA	17 (1.42%) [3:14]
		CYCA	16 (1.34%) [0:16]
		STVI	8 (.67%) [7:1]
		LEMA	4 (.33%) [0:4]
		CYLU*	358 (29.96%)
Totals (October 1997)		10 species (3 native; 7 nonnative)	1,195 [258:937]

Appendix E. Continued.

Stream-Reach-Station code (6-1-0).

Stream and Reach: SRP Canal, Arizona Canal, above electrical barrier.

Habitat Type	Gear Type	Species	Total (Rel. Abund. by Hab and Gear Type) [Age-0:Age-1+]
Canal (concrete floor)	Bag seine (75 ft x 5 ft x 0.25 in)  Straight seine (15 ft x 6 ft x 0.25 in) (4 seine hauls)	ICPU	334 (25.44%) [305:29]
		TIsp.	300 (22.85%) [0:300]
		CAIN.	193 (14.7%) [142:51]
		PACL	189(14.4%) [85:104]
		MISA	133 (10.13%) [58:75]
		ONMY	62 (4.7%) [0:62]
		MOMI	37 (2.8%) [0:37]
		STVI	17 (1.3%) [16:1]
		LEMA	14 (1.1%) [0:14]
		CYCA	12 (.91%) [0:12]
		GIRO	10 (.76%) [8:2]
		PYOL	10 (.76%) [6:4]
PONI	2 (.15%) [2:0]		
Totals (January 1998)		13 species (3 native; 10 nonnative)	1,313 [622:691]