LONG TERM MONITORING OF SUB-ADULT AND ADULT LARGE-BODIED FISHES IN THE SAN JUAN RIVER: 2006

Interim Progress Report
(Final)

Submitted By:

Dale W. Ryden
Fish Biologist

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U. S. Fish and Wildlife Service
Colorado River Fishery Project
764 Horizon Drive, Building B
Grand Junction, Colorado 81506

EXECUTIVE SUMMARY

- A total of 11,187 fish were collected during 2006 Adult Monitoring
  - Native fishes accounted for 73.7% of the total catch in 2006

Native Species:

- Colorado pikeminnow
  - No wild Colorado pikeminnow were collected in 2006
  - 323 stocked Colorado pikeminnow were collected in 2006
    - Fifth most abundant species collected
    - The relatively large numbers captured were essentially just a reflection of the large number of fish stocked in 2006 (n = 302,270)
    - Sizes ranged from 116-552 mm TL (age-1 to age-5)
    - Captures ranged from RM 178.0-10.0
      - 51 were collected in Reach 6, 82 in Reach 5, 67 in Reach 4, 82 in Reach 3, 34 in Reach 2, and 7 in Reach 1
    - 287 (88.9%) of these had been in the river < 365 days post-stocking
- Razorback sucker
  - No wild razorback sucker were collected in 2006
  - 144 stocked razorback sucker were collected in 2006
    - Seventh most abundant species collected
    - The relatively large numbers captured were essentially just a reflection of the large number of fish stocked in 2006 (n = 18,793)
    - Sizes ranged from 139-526 mm TL (age-1 through age-6 and age-8)
    - Captures ranged from RM 160.0-10.0
      - 40 were collected in Reach 6, 60 in Reach 5, 13 in Reach 4, 18 in Reach 3, 10 in Reach 2, and 3 in Reach 1
    - 112 (77.8%) of these had been in the river < 365 days post-stocking
- Roundtail chub
  - No roundtail chub were collected in 2006
- Flannelmouth sucker
  - The most abundant species collected in each of the last 11 years
    - Accounted for 39.9% of the total catch (n = 4,470 fish)
    - Collected in 96.5% of all electrofishing samples from RM 180.0-2.9
    - Relatively abundant in Reaches 6-4, becoming less so in Reaches 2 and 1
- Bluehead sucker
  - Among the three most-commonly collected species in each of the last 10 years
  - The third most common species collected in 2006
    - The second most common native species collected in 2006
    - Accounted for 21.8% of the total catch (n = 2,442 fish)
    - Collected in 93.3% of all electrofishing samples from RM 180.0-2.9
  - Most common in Reach 6 with numbers declining steadily in each consecutive downstream river reach
    - Was collected in Reach 1 for only the third time ever in 2006 (n = 1)

Nonnative Species:

- Channel catfish
  - Among the three most commonly-collected species in each of the last 11 years
  - The second most abundant species collected in 2006
    - The most abundant nonnative species collected in 2006
    - Accounted for 23.2% of the total catch (n = 2,590 fish)
    - Collected in 73.6% of all electrofishing samples from RM 180.0-2.9
    - Distribution in 2006 was centered in Reaches 4 and 3 (more specifically from RM 119.2-93.5) with numbers declining steadily proceeding both up- and downstream from that area
- Common carp
  - Percent of total catch accounted for by this species has decreased steadily over the last 10 years (from 13.0% in 1997 to 2.3% in 2006)
    - Was the third most commonly-collected species in 1996
  - The sixth most commonly-collected species in 2006
    - The second most abundant nonnative species collected in 2006
    - Only 254 common carp were collected from RM 180.0-2.9 in 2006
    - Collected in 48.7% of all electrofishing samples from RM 180.0-2.9
    - Most common in Reaches 6 and 5 with numbers declining steadily in consecutive downstream river reaches

TABLE OF CONTENTS

EXECUTIVE SUMMARY i

TABLE OF CONTENTS iii

LIST OF TABLES v

LIST OF FIGURES iv

INTRODUCTION 1
- Objectives 1

METHODS 2
- Field Sampling 2
- Data Analysis 2

RESULTS 3
- Rare Native Fishes 7
  - Colorado Pikeminnow 7
  - Razorback Sucker 11
  - Roundtail Chub 14
- Common Native Fishes 14
  - Flannelmouth Sucker 14
    - Catch Information 14
    - Length Information 20
  - Bluehead Sucker 23
    - Catch Information 23
    - Length Information 23
- Common Nonnative Fishes 31
  - Channel Catfish 31
    - Catch Information 31
    - Length Information 38
  - Common Carp 42
    - Catch Information 42
    - Length Information 42

DISCUSSION 51
- Rare Native Fishes 51
  - Colorado Pikeminnow 51
  - Razorback Sucker 52
  - Roundtail Chub 53

TABLE OF CONTENTS

Common Native Fishes 53
Flannelmouth Sucker 53
Bluehead Sucker. 54
Common Nonnative Fishes. 54
Channel Catfish 54
Common Carp. 55

ACKNOWLEDGEMENTS 55

LITERATURE CITED. 56

APPENDIX A (Tables with details on Colorado pikeminnow and razorback sucker collected on the fall 2006 Adult Monitoring trip)

APPENDIX B (Scaled catch per unit effort for Colorado pikeminnow stocked as age-0 fish {2002-2005} and collected in subsequent years)

LIST OF TABLES

Table		Page
1	Summary of dates, river miles (RM) sampled, and mean flow during Adult Monitoring trips, 1996-2006.	4
2	Scientific and common names, status, and database codes for fish species collected during the 2006 Adult Monitoring trip	5
3	Total number of fish collected during the 2006 Adult Monitoring trip	6
4	General information on stocked Colorado pikeminnow collected in 2006 . .	7

Tables In Appendix A

A-1	Detailed information on Colorado pikeminnow collected during the fall 2006 Adult Monitoring trip
A-2	Detailed information on razorback sucker collected during the fall 2006 Adult Monitoring trip

Tables In Appendix B

B-1	Scaled catch per unit effort values for Colorado pikeminnow stocked as age-0 fish and collected during their age-1 year-class
B-2	Scaled catch per unit effort values for Colorado pikeminnow stocked as age-0 fish and collected during their age-2 year-class
B-3	Scaled catch per unit effort values for Colorado pikeminnow stocked as age-0 fish and collected during their age-3 year-class

LIST OF FIGURES

Figure		Page
1	Colorado pikeminnow catch per unit effort riverwide (RM 180.0-0.0) on fall Adult Monitoring trips.	9
2	Length-frequency histograms for Colorado pikeminnow collected during the fall 1998 and fall 2004-2006 Adult Monitoring trips	10
3	A measure of longevity among stocked razorback sucker collected on the fall 2006 Adult Monitoring trip, expressed as the number of days in the river since stocking versus the percent of total recaptures represented by recaptured fish.	12
4	Razorback sucker catch per unit effort riverwide (RM 180.0-0.0) on fall Adult Monitoring trips.	13
5	A summary of flannelmouth sucker relative abundance in riverwide Adult Monitoring collections, 1996-2006.	15
6	Flannelmouth sucker catch per unit effort riverwide (RM 180.0-0.0) on fall Adult Monitoring trips.	16
7	Flannelmouth sucker catch per unit effort in Reaches 6 and 5 on fall Adult Monitoring trips.	17
8	Flannelmouth sucker catch per unit effort in Reaches 4 and 3 on fall Adult Monitoring trips.	18
9	Flannelmouth sucker catch per unit effort in Reaches 2 and 1 on fall Adult Monitoring trips.	19
10	Length-frequency histograms showing the riverwide (RM 180.0-0.0) size-class distribution of flannelmouth sucker on Adult Monitoring trips, 1996-2001	21
11	Length-frequency histograms showing the riverwide (RM 180.0-0.0) size-class distribution of flannelmouth sucker on Adult Monitoring trips, 2002-2006	22
12	A summary of bluehead sucker relative abundance in riverwide Adult Monitoring collections, 1996-2006.	24

LIST OF FIGURES

Figure		Page
13	Bluehead sucker catch per unit effort riverwide (RM 180.0-0.0) on fall Adult Monitoring trips.	25
14	Bluehead sucker catch per unit effort in Reaches 6 and 5 on fall Adult Monitoring trips.	26
15	Bluehead sucker catch per unit effort in Reaches 4 and 3 on fall Adult Monitoring trips.	27
16	Bluehead sucker catch per unit effort in Reaches 2 and 1 on fall Adult Monitoring trips.	28
17	Length-frequency histograms showing the riverwide (RM 180.0-0.0) size-class distribution of bluehead sucker on Adult Monitoring trips, 1996-2001.	29
18	Length-frequency histograms showing the riverwide (RM 180.0-0.0) size-class distribution of bluehead sucker on Adult Monitoring trips, 1996-2001.	30
19	A summary of channel catfish relative abundance in riverwide Adult Monitoring collections, 1996-2006.	32
20	Channel catfish catch per unit effort riverwide (RM 180.0-0.0) on fall Adult Monitoring trips.	33
21	Channel catfish catch per unit effort in Reaches 6 and 5 on fall Adult Monitoring trips.	34
22	Channel catfish catch per unit effort in Reaches 4 and 3 on fall Adult Monitoring trips.	35
23	Channel catfish catch per unit effort in Reaches 2 and 1 on fall Adult Monitoring trips.	36
24	Channel catfish total catch per unit effort in workable river sections, 2001 versus 2006. This graph details minimum and maximum catch per unit effort values and number of fish > 300 mm TL caught in each river section	37

LIST OF FIGURES

Figure		Page
25	Channel catfish total catch per unit effort in workable river sections, 2001 versus 2006. This graph details mean total catch per unit effort values in each river section and where significant differences between years occur . . .	39
26	Length-frequency histograms showing the riverwide (RM 180.0-0.0) size-class distribution of channel catfish on Adult Monitoring trips, 1996-2001.	40
27	Length-frequency histograms showing the riverwide (RM 180.0-0.0) size-class distribution of channel catfish on Adult Monitoring trips, 2002-2006.	41
28	A summary of common carp relative abundance in riverwide Adult Monitoring collections, 1996-2006.	43
29	Common carp catch per unit effort riverwide (RM 180.0-0.0) on fall Adult Monitoring trips.	44
30	Common carp catch per unit effort in Reaches 6 and 5 on fall Adult Monitoring trips.	45
31	Common carp catch per unit effort in Reaches 4 and 3 on fall Adult Monitoring trips.	46
32	Common carp catch per unit effort in Reaches 2 and 1 on fall Adult Monitoring trips.	47
33	Length-frequency histograms showing the riverwide (RM 180.0-0.0) size-class distribution of common carp on Adult Monitoring trips, 1996-2001. . .	48
34	Length-frequency histograms showing the riverwide (RM 180.0-0.0) size-class distribution of common carp on Adult Monitoring trips, 1996-2006. . .	49
35	The relative proportion of juvenile (< 250 mm TL) common carp collected and measured, 1996-2006	50

LIST OF FIGURES

Figures In Appendix B

B-1 Scaled catch per unit effort at age among groups of Colorado pikeminnow stocked as age-0 fish in the fall (2001-2005) and collected in subsequent years

INTRODUCTION

Research performed from 1991-1997 led to the initiation of several major management actions by the San Juan River Recovery Implementation Program (SJRIP) that are intended to have long-term positive impacts on the native fish community. These included development of flow recommendations for the reoperation of Navajo Reservoir, instituting the mechanical removal of nonnative fishes, modification or removal of three instream water diversion structures to provide fish passage and minimize entrainment, and augmentation efforts for both federally-listed endangered fish species (Colorado pikeminnow, Ptychocheilus lucius and razorback sucker, Xyrauchen texanus). To assess the effects of management actions over the duration of the SJRIP, a long-term monitoring program (Propst et al. 2000) was initiated. Standardized data collection following long-term monitoring protocols began in 1999 and is scheduled to continue throughout the SJRIP.

One component of long-term monitoring, ***Sub-Adult And Adult Large-Bodied Fish Community Monitoring*** (referred to hereafter as "Adult Monitoring"), is the primary responsibility of the U. S. Fish and Wildlife Service's (USFWS) Colorado River Fishery Project (CRFP) office in Grand Junction, CO. However, other state and federal agencies supply manpower, equipment, and logistical support.

The objectives of Adult Monitoring (as stated in the FY-2006 workplan) are:

1) Monitor the San Juan River's fish community, specifically the large-bodied fish species, to identify shifts in fish community structure, species relative abundance and distribution, and length/weight frequencies that are occurring over time. Determine whether these shifts in fish community parameters correspond to management actions that are being implemented by the SJRIP. These include (but may not be limited to) the following:
    a) Reoperation of water releases from Navajo Reservoir
    b) Mechanical removal of nonnative fishes
    c) Modification or removal of instream water diversion structures
    d) Augmentation efforts for both federally-listed endangered fish species – Colorado pikeminnow and razorback sucker

2) Monitor population trends (e.g., distribution and abundance, habitat use, spawning and staging areas, growth rates, recruitment) of the rare San Juan River fish species -- Colorado pikeminnow, razorback sucker, and roundtail chub (both wild and stocked fish).

3) Remove nonnative fish species which prey upon and may potentially compete with native fish species in the San Juan River.

The study area for Adult Monitoring begins just downstream of the Animas River confluence (at river mile {RM} 180.0) and continues downstream to Clay Hills boat landing (RM 2.9) just upstream of Lake Powell. This study area encompasses six of eight major geomorphic reaches identified in the San Juan River between Navajo Reservoir and Lake Powell (Bliesner and Lamarra 2000). The six geomorphic reaches in our study area are: Reach 6 (RM 180.0-155.0); Reach 5 (RM 155.0-131.0); Reach 4 (RM 131.0-106.0); Reach 3 (RM 106.0-68.0); Reach 2 (RM 68.0-17.0); and Reach 1 (RM 17.0-0.0). Although our study area ends 2.9 RM short of the end of Reach 1, it is assumed herein that the data collected from RM 17.0-2.9 are representative of the entirety of Reach 1.

METHODS

Field Sampling

Sampling conducted in 2006 followed the protocols for long-term monitoring set forth in Propst et al. (2000).

Data Analysis

Descriptions of analyses that follow apply to Colorado pikeminnow and razorback sucker as well as to the four most common large-bodied, non-endangered fish species collected during Adult Monitoring. The four common species are flannelmouth sucker (Catostomus latipinnis), bluehead sucker (Catostomus discobolus), channel catfish (Ictalurus punctatus), and common carp (Cyprinus carpio). These six were the only large-bodied fish species present in the San Juan River in large enough numbers to yield sufficient sample sizes from which statistically valid conclusions could be drawn (on both a riverwide {i.e., Reaches 6-1 -- RM 180.0-0.0} and by-reach basis) annually and across several consecutive years.

Electrofishing data were pooled for all rafts to obtain total catch numbers, by species, for the entire sampling trip. Total catch numbers for each species were then divided by the number of seconds (converted to hours) fished by all rafts combined to obtain riverwide combined) catch per unit effort (CPUE) values for juvenile and adult life stages and for all life stages combined (i.e., juvenile + adult; referred to hereafter as "total CPUE"). CPUE values for each of the six large-bodied fish species were then partitioned by whole geomorphic reach and compared to 1991-2005 electrofishing data to evaluate long-term trends. Analysis of variance (ANOVA), utilizing post hoc Bonferroni tests, were used to determine whether significant differences in CPUE values occurred between years. Since CPUE data represented a random sample of a population and not a known number (i.e., population parameter), significance was determined at $p < 0.10$ (following Ryden 2000a).

Length data obtained from fish measured at designated miles (DMs) were used to develop riverwide length frequency histograms for the six large-bodied fish species, from 1996-2006. Ages provided for fish were either determined using PIT tag information for known-age fish or were an educated guess based on length frequency histograms and observed between-year growth rates.

Adult Monitoring from 1991-1998 followed protocols (detailed in Ryden 2000a) very similar to those in Propst et al. (2000). The differences between these two sampling protocols were: 1) from 1991-1998, electrofishing was done every RM (instead of two of every three RM); and 2) DMs were done every fifth sampled RM (instead of every fourth sampled RM). Also, from 1991-1998 Adult Monitoring did not always sample the entire study area in a given year. It was only from 1996 on that the entire study area was sampled during similar time-frames and flow conditions to allow for valid riverwide comparisons of data sets among years. Therefore, data collected prior to 1996 were only included in comparative analyses for this report if it encompassed an entire geomorphic reach. Thus, appropriate comparative data sets were available for Reach 6 from 1996-2005, for Reaches 5-3 from 1991-2005, and for Reaches 2-1 from 1993 and 1995-2005.

Additionally, it was not until 1994 that fish collected in non-DM samples were characterized by life stage. Before this, fish collected in non-DM samples were enumerated only by total numbers collected per species. Therefore, no juvenile or adult CPUE data are presented for Reaches 5-3 from 1991-1993 or for Reaches 2 or 1 in 1993, but total CPUE data are presented for these reaches in those years.

RESULTS

Mean river flows (at the Shiprock USGS gage #09368000) for the 2006 Adult Monitoring trip were the highest recorded since riverwide sampling began in 1996. However, up until 7 October 2006, daily flows had been well within the range of flows observed over the last 8 years (Table 1). Sampling flows for the first 10 days of electrofishing ranged from 659-1,770 CFS and the mean sampling flow was 971 CFS. However, from 7-9 October 2006, the San Juan River experienced a monsoonal storm spike, which peaked at 8,310 CFS. This storm spike caused high turbidity, lower water temperatures, and caused sampling crews (who were at that time just entering the canyon-bound reaches of the San Juan River) to sample at a much higher rate of speed than during the previous days of this sampling trip. In fact, sampling proceeded so quickly from 7-9 October that sampling crews were almost two days ahead of schedule when they entered Reach 1 and they were unable to find a camp site. Because of this, sampling was terminated at RM 10.0 on 9 October 2006 so the sampling crew could row out to Clay Hills (RM 2.9) before dark that night.

Seventeen fish species and hybrid forms were collected during the 2006 Adult Monitoring trip (Table 2). This included five native species and two native sucker X native sucker hybrids, as well as eight nonnative species and two native sucker X nonnative sucker hybrids (Tables 2 and 3). Eight species (flannelmouth sucker, channel catfish, bluehead sucker, speckled dace, Colorado pikeminnow, common carp, razorback sucker, and red shiner) accounted for 99.3% (11,111 fish) of the total catch during the 2006 Adult Monitoring trip. The other five species and four hybrids contributed only 0.7% (77 fish) to the total catch in 2006 (Table 3). Native fishes dominated the total catch in 2006 (Table 3). For the third consecutive year common carp were not among the four most commonly-collected fish species.

Table 1. Summary of dates, river miles sampled, and mean flow during riverwide Adult Monitoring trips in the San Juan River in New Mexico, Colorado, and Utah, 1999-2006.

Beginning Date Of Sampling	Ending Date Of Sampling	River Miles Sampled	Mean Trip Flow At The Shiprock, NM USGS Gage (#09368000) In CFS And (Cubic Meters/Second)
20 September 1999	7 October 1999	RM 180.0-2.9	2,177 CFS (61.6 m^3/sec)
18 September 2000	10 October 2000	RM 180.0-2.9	657 CFS (18.6 m^3/sec)
25 September 2001	19 October 2001	RM 180.0-2.9	611 CFS (17.3 m^3/sec)
20 September 2002	7 October 2002	RM 180.0-2.9	458 CFS (12.9 m^3/sec)
22 September 2003	14 October 2003	RM 180.0-2.9	450 CFS (12.7 m^3/sec)
20 September 2004	13 October 2004	RM 180.0-2.9	1,432 CFS (40.5 m^3/sec)
19 September 2005	12 October 2005	RM 180.0-2.9	1,072 CFS (30.3 m^3/sec)
18 September 2006	9 October 2006	RM 180.0-2.9	2,479 CFS (70.1m^3/sec)

Table 2. Scientific and common names (following Nelson et al. 2004), status, and database codes for fish species collected from the San Juan River during the 2006 Adult Monitoring trip.

Scientific Name	Common Name	Status	Database Code
Order Cypriniformes: Family Catostomidae – suckers			
Catostomus discobolus	bluehead sucker	Native	Catdis
Catostomus commersoni	white sucker	Introduced	Catcom
C.commersoni X C.discobolus	hybrid	Introduced	comXdis
C.commersoni X C.latipinnis	hybrid	Introduced	comXlat
Catostomus latipinnis	flannelmouth sucker	Native	Catlat
C.latipinnis X C.discobolus	hybrid	Native	latXdis
Xyrauchen texanus	razorback sucker	Native	Xyrtex
X.texanus X C.latipinnis	hybrid	Native	texXlat
Order Cypriniformes: Family Cyprinidae - carps and minnows			
Cyprinella lutrensis	red shiner	Introduced	Cyplut
Cyprinus carpio	common carp	Introduced	Cypcar
Pimephales promelas	fathead minnow	Introduced	Pimpro
Ptychocheilus lucius	Colorado pikeminnow	Native	Ptyluc
Rhinichthys osculus	speckled dace	Native	Rhiosc
Order Perciformes: Family Centrarchidae – sunfishes			
Micropterus salmoides	largemouth bass	Introduced	Micsal
Order Salmoniformes: Family Salmonidae – trouts			
Salmo trutta	brown trout	Introduced	Saltru
Order Siluriformes: Family Ictaluridae - bullhead catfishes			
Ameiurus melas	black bullhead	Introduced	Amemel
Ictalurus punctatus	channel catfish	Introduced	Ictpun

Table 3. Total number of fish collected during the 2006 Adult Monitoring trip.

Species (Status)[a]	Number Collected	Percent of total[b]	Frequency Of Occurrence
flannelmouth sucker (N)	4,470	39.95	190
channel catfish (I)	2,590	23.15	145
bluehead sucker (N)	2,442	21.83	185
speckled dace (N)	817	7.30	99
Colorado pikeminnow (N)	323	2.89	128
common carp (I)	254	2.27	96
razorback sucker (N)	144	1.30	60
red shiner (I)	71	0.63	30
bluehead sucker X flannelmouth sucker (H, N)	42	0.38	30
Black bullhead (I)	17	0.15	15
razorback sucker X flannelmouth sucker (H, N)	6	-----	6
white sucker X bluehead sucker (H, I)	3	-----	3
fathead minnow (I)	2	-----	2
white sucker (I)	2	-----	2
white sucker X flannelmouth sucker (H, I)	2	-----	2
brown trout (I)	1	-----	1
largemouth bass (I)	1	-----	1
GRAND TOTAL	11,187		
Total Electrofishing Collections In 2006 = 197 Total Electrofishing Effort In 2006 = 77.80 Hours			
2006 Native Fishes = 8,244 (73.69% Of The Total Catch) 2006 Introduced Fishes = 2,943 (26.31% Of The Total Catch) 2006 Native To Introduced Fishes Ratio = 2.80:1			
a: (N) = Native species; (I) = Introduced species; (H, N) = A hybrid of two species, considered to be a native fish; (H, I) = A hybrid of two species, considered to be an introduced fish b: ---- = less than 0.1%			

Rare Native Fishes

Colorado Pikeminnow

No wild adult Colorado pikeminnow were collected in 2006.

A total of 323 stocked Colorado pikeminnow were collected (Table A-1 in Appendix A). This marked the fourth time that > 100 Colorado pikeminnow were collected during an Adult Monitoring trip (1998 = 104; 2004 = 159; 2005 = 127).

Colorado pikeminnow captures ranged from RM 178.0-10.0 (Table 4). The majority (n = 282; 87.3%) occurred upstream of the canyon-bound reaches (RM 68.0-0.0) of the river. In addition, 38 (11.8%) of these collections occurred upstream of the Hogback Diversion (RM 158.6). Fifty-one Colorado pikeminnow were collected in Reach 6, 82 in Reach 5, 67 in Reach 4, 82 in Reach 3, 34 in Reach 2, and 7 in Reach 1.

Most (n = 287; 88.9%) of the Colorado pikeminnow collected in 2006 were in the river < 365 days post-stocking (Table 4). Only 31 (9.6%) were in the river > 365 days post-stocking (Table 4). Of that 31 fish, 30 were stocked as age-0 fish (Table 4). Likewise, all of the Colorado pikeminnow collected in 2006 that were in the river > 730 days had been stocked as age-0 fish.

Table 4. General information on stocked Colorado pikeminnow collected in 2006.

Age And (Number) At Capture	Size Range At Capture (TL in mm)	Range of Capture RM's	Days In River Post-Stocking	Stocking Date(s)	Age At Stocking	Source[a]
Age-1 (170)	116-235	178.0-10.0	319-340	10/20/2005 & 11/03/2005	Age-0	Dexter
Age-1 (2)	159 & 180	10.0	6	10/03/2006	Age-1	Dexter
Age-2 (26)	247-348	172.0-14.3	690-711	10/21/2004 & 10/28/2004	Age-0	Dexter
Age-2 (1)	393	68.0	456	07/07/2005	Age-1	Dexter
Age-2 (26)	186-255	175.0-30.0	60-85	07/13/2006 & 07/20/2006	Age-2	Mumma
Age-3 (3)	383-402	145.0-64.0	1,048-1,065	11/06/2003	Age-0	Dexter
Age-4 (1)	408	27.0	1,445	10/24/2002	Age-0	Dexter
Age-5 (89)	339-552	146.0-11.0	13-67	08/03/2006 & 09/06/2006	Age-5	Bubbling Ponds
Undetermined Age (5)	176, 355, 388, 395, 433	Unknown				

a: Dexter = U.S. Fish and Wildlife Service, Dexter National Fish Hatchery and Technology Center, Dexter NM; Mumma = Colorado Division of Wildlife, Mumma Native Species Hatchery, Alamosa, CO; Bubbling Ponds = Arizona Game and Fish Department, Bubbling Ponds hatchery facility, Sedona, AZ.

Riverwide, the 2006 Colorado pikeminnow total CPUE value was the highest ever observed (3.99 fish/hr of electrofishing; Figure 1). However, this CPUE number is mostly reflective of recently-stocked fish.

Five different age-classes of Colorado pikeminnow were collected in 2006 (Table 4). The 2006 length-frequency histogram for Colorado pikeminnow showed a much wider size range of fish than had been observed during any previous Adult Monitoring trip (Figure 2).

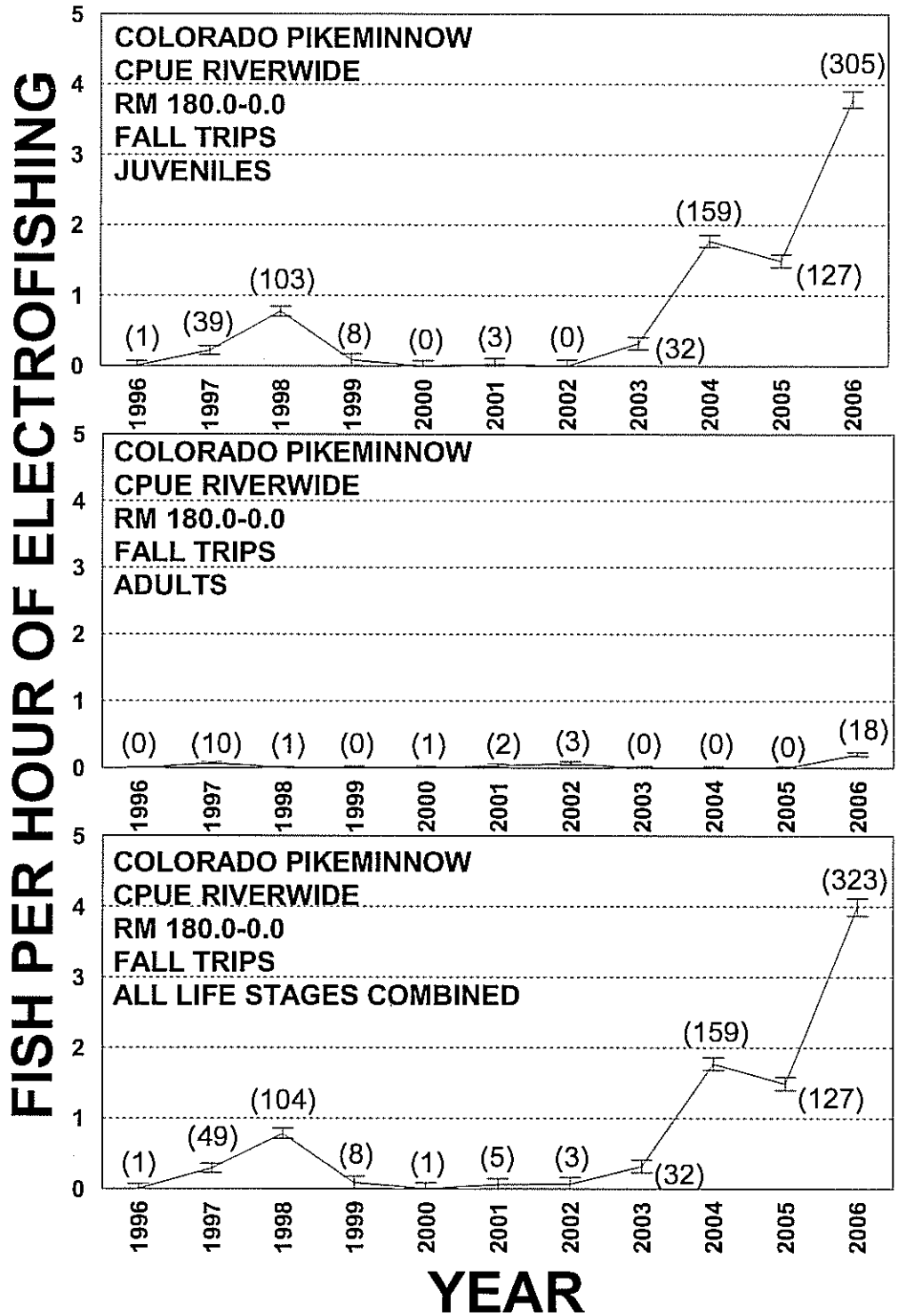

Figure 1. Colorado pikeminnow catch per unit effort (CPUE) riverwide (RM 180.0-0.0) on fall Adult Monitoring trips, for juvenile fish (< 450 mm TL; top), adult fish (≥ 450 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error. Numbers in parentheses above or beside the error bars indicate the sample size.

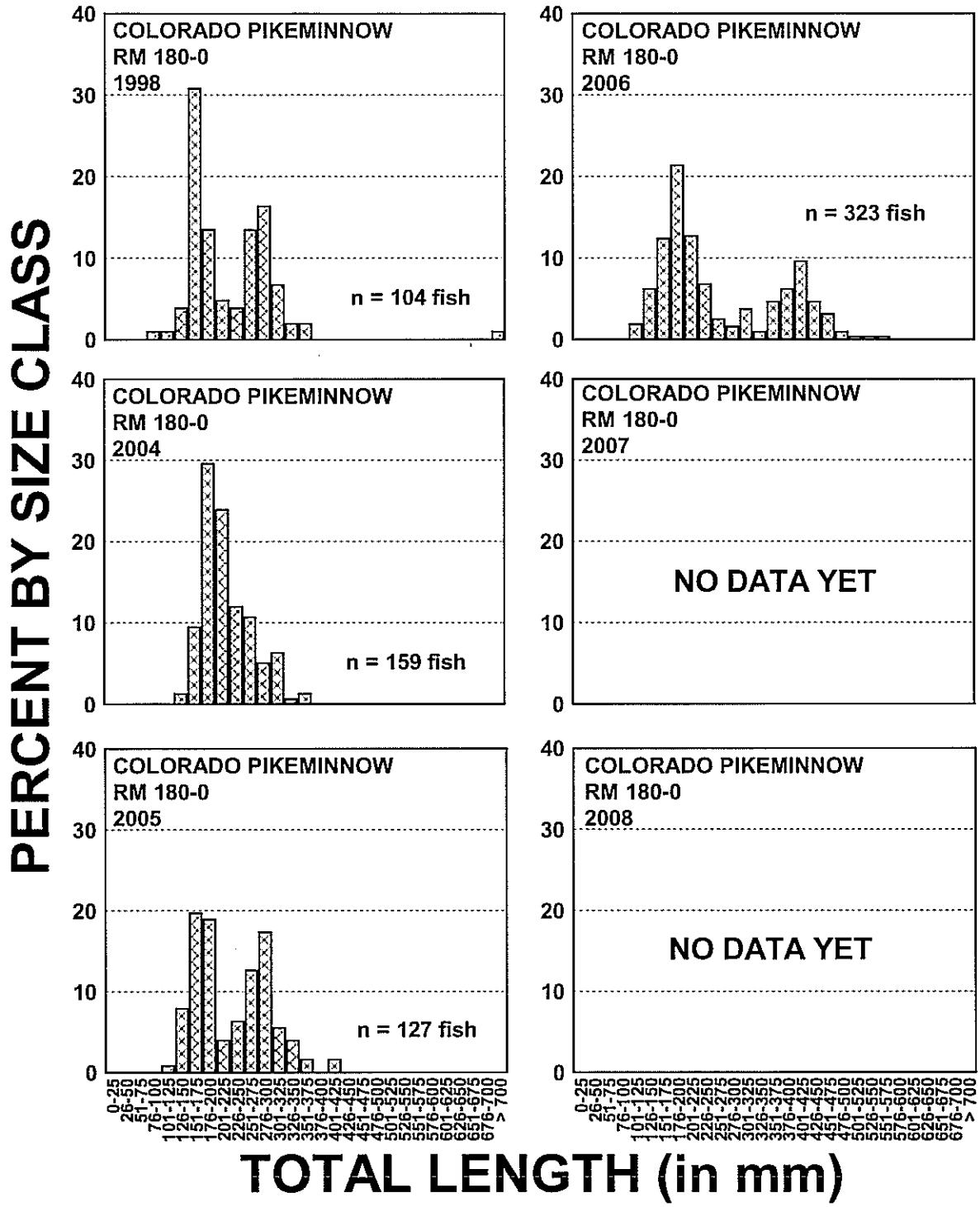

Figure 2. Length-frequency histograms for Colorado pikeminnow collected during the fall 1998 and fall 2004-2006 Adult Monitoring trips. These are the only four Adult Monitoring trips during which > 100 Colorado pikeminnow were recaptured.

Razorback Sucker

No wild razorback sucker were collected in 2006.

A total of 144 razorback sucker were collected in 2006 (Table A-2 in Appendix A). This marked the third consecutive year during which > 50 razorback sucker (2005 = 52; 2004 = 117) were collected during an Adult Monitoring trip.

Razorback sucker captures ranged from RM 160.0-10.0 (Table A-2 in Appendix A). The majority (n = 131; 91.0%) occurred upstream of the canyon-bound reaches (RM 68.0-0.0) of the river. Only one (0.7%) of these collections occurred upstream of the Hogback Diversion however. Forty razorback sucker were collected in Reach 6, 60 in Reach 5, 13 in Reach 4, 18 in Reach 3, 10 in Reach 2, and 3 in Reach 1.

Most (n = 112; 77.8%) of the 144 razorback sucker collected in 2006 were in the river < 365 days post-stocking (Figure 3). The other 32 (22.2%) were in the river > 365 days post-stocking (Figure 3). Sixteen of that 32 were in the river from 731-1,095 days (2-3 years) post-stocking (Figure 3). Only three of the 144 razorback sucker collected in 2006 were in the river > 1,095 days post-stocking (Figure 3). Stocking date could not be determined for nine fish.

The 2006 riverwide razorback sucker total CPUE value (1.89 fish/hr of electrofishing) appears to be the highest ever observed (Figure 4). However, while the 2006 total CPUE value is significantly higher than that in nine of the ten previous years ($p < 0.000$), it is not significantly different than that for 2004. Both the 2004 and 2006 total CPUE values are mostly reflective of collections of recently-stocked fish.

Stocking information was found for 136 of the 144 razorback sucker that were captured in 2006. Of those, 1 was stocked in 1998, 1 in 2001, 1 in 2002, 16 in 2004, 4 in 2005, and 113 in 2006. Age could be determined for 55 of those fish. Those individuals represented 7 age-classes (age-1 through age-6 and age-8). The overall size-range of razorback sucker collected in 2006 (139-526 mm TL) was much wider than had been observed previously. This wide distribution primarily reflected recently-stocked fish.

Of the total captured, 19 were males (5 were ripe), 1 was female (neither gravid nor ripe), and sex could not be determined for the remaining 124 fish.

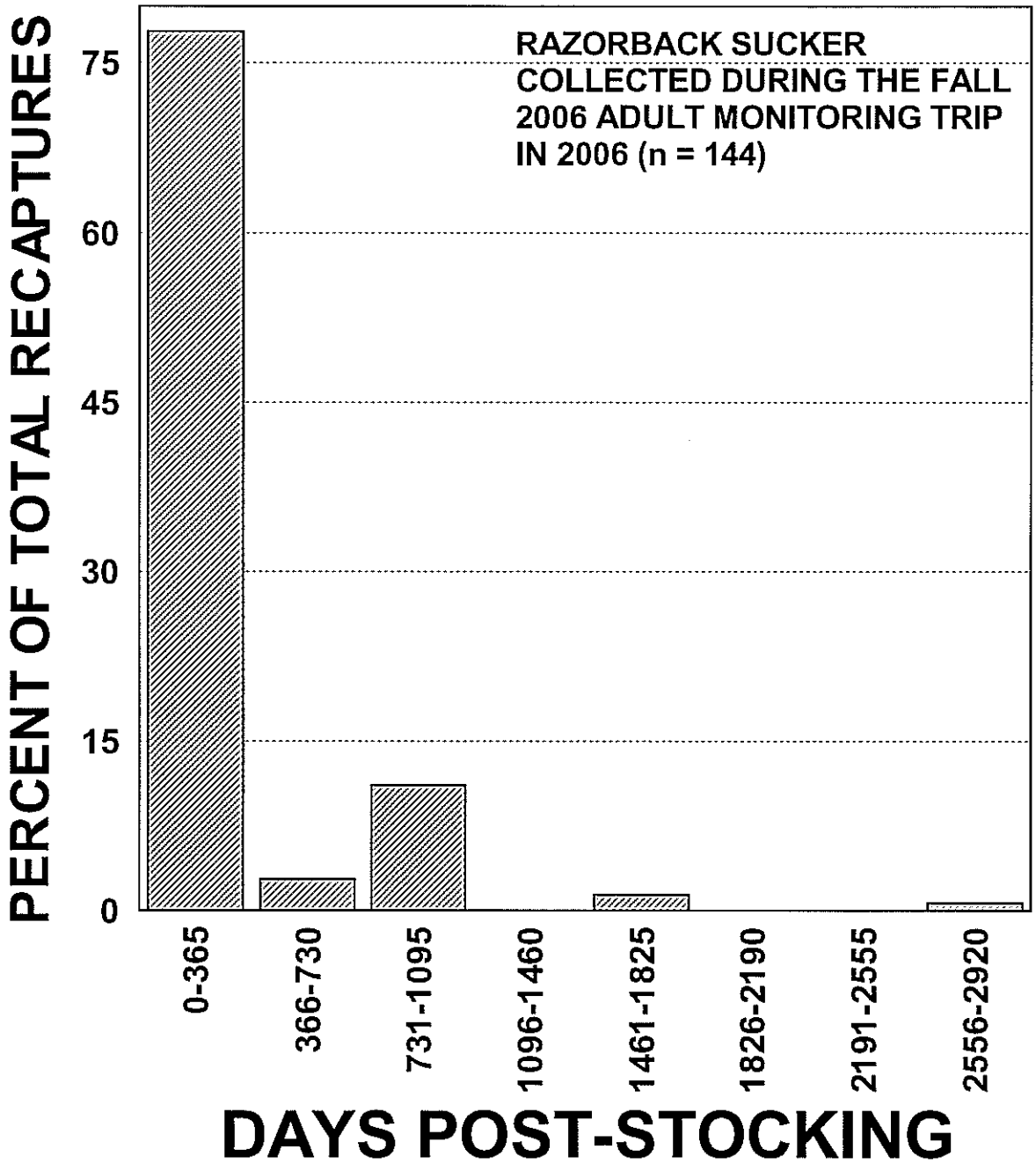

Figure 3. A measure of longevity among stocked razorback sucker that were collected on the fall 2006 Adult Monitoring trip, expressed as the number of days in the river since stocking versus the percent of total recaptures represented by recaptured fish. Values on the X-Axis are given in progressive one-year (365-day) increments. Leap years (i.e., years containing 366 days) are not accounted for in this graph. Some recaptures could not be used in this analysis due to lack of a detectable PIT tag at the time of recapture.

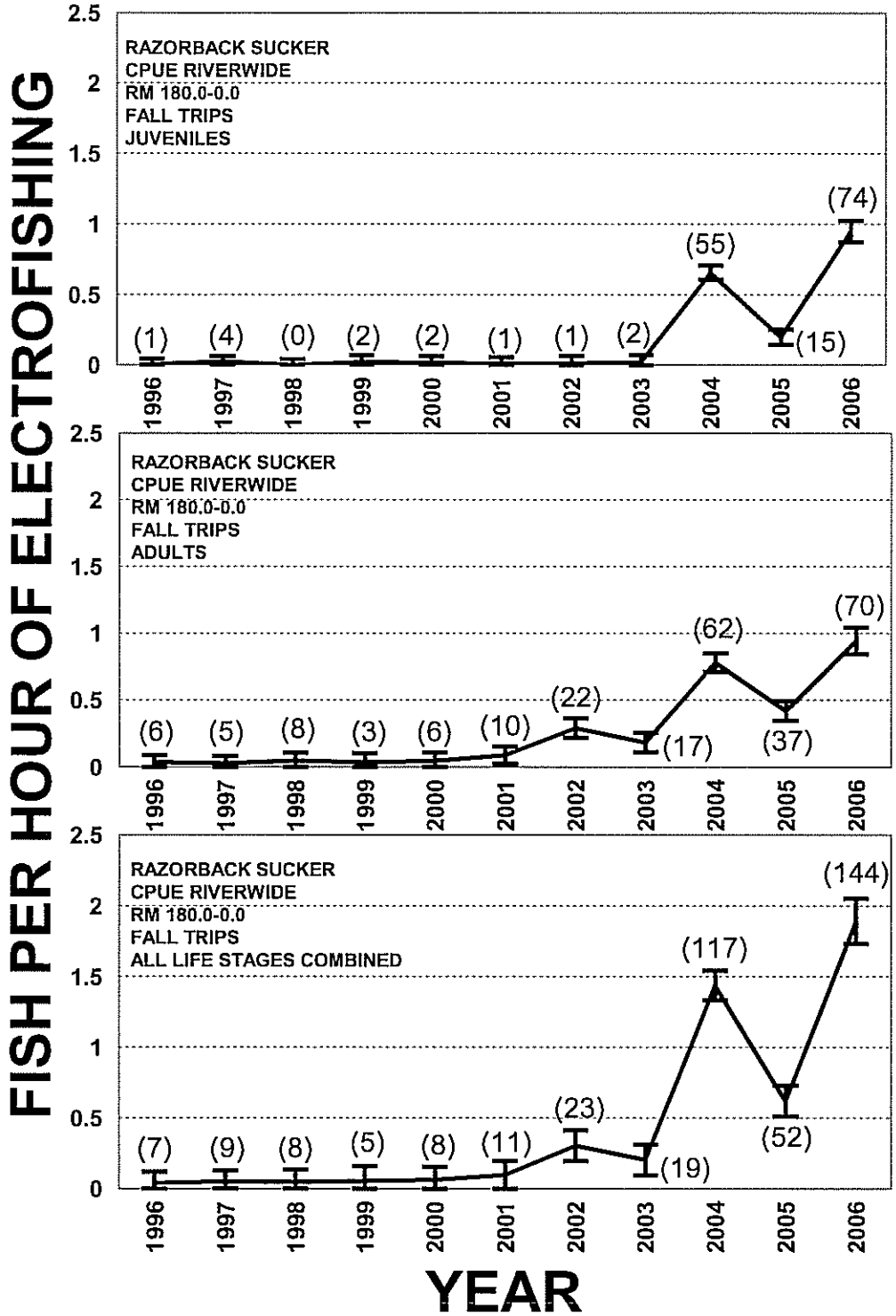

Figure 4. Razorback sucker catch per unit effort (CPUE) riverwide (RM 180.0-0.0) on fall Adult Monitoring trips, for juvenile fish (< 400 mm TL; top), adult fish (≥ 400 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error. Numbers in parentheses above or beside the error bars indicate the sample size.

Roundtail Chub

No roundtail chub were collected in 2006.

Common Native Fishes

Flannelmouth Sucker

Catch Information

Flannelmouth sucker continue to be the most common large-bodied fish collected riverwide during Adult Monitoring trips (Table 3, Figure 5; Ryden 2000a, 2001, 2003, 2004, 2005, 2006). Flannelmouth sucker have remained numerically dominant in both overall numbers of specimens collected and in frequency of occurrence in electrofishing samples.

Riverwide flannelmouth sucker juvenile CPUE has shown much more variation than has CPUE for adult flannelmouth sucker, especially over the last seven years (Figure 6). The result is that the graph for total CPUE among flannelmouth sucker riverwide is heavily affected by swings in juvenile fish. However, the general trend for total CPUE over the last 11 years is essentially flat (Figure 6).

Finding meaningful trends in flannelmouth sucker CPUE becomes difficult when data are partitioned to the geomorphic reach level. However, two pieces of information are evident. First, flannelmouth sucker are relatively abundant in Reaches 6-4, then CPUE values drop in steadily in Reaches 2 and 1 (Figures 7-9). Few flannelmouth sucker were collected in Reach 1 over the last 14 years (Figures 9). Second, flannelmouth sucker CPUE values from reaches that were sampled in their entirety from 1991-2004 (i.e., Reaches 5-3) seem to indicate that riverwide CPUE values were generally higher from 1991-1993 than they have been over the last 13 years (Figures 7-9). Numbers of flannelmouth sucker have been relatively stable riverwide since 1996 (Figure 6).

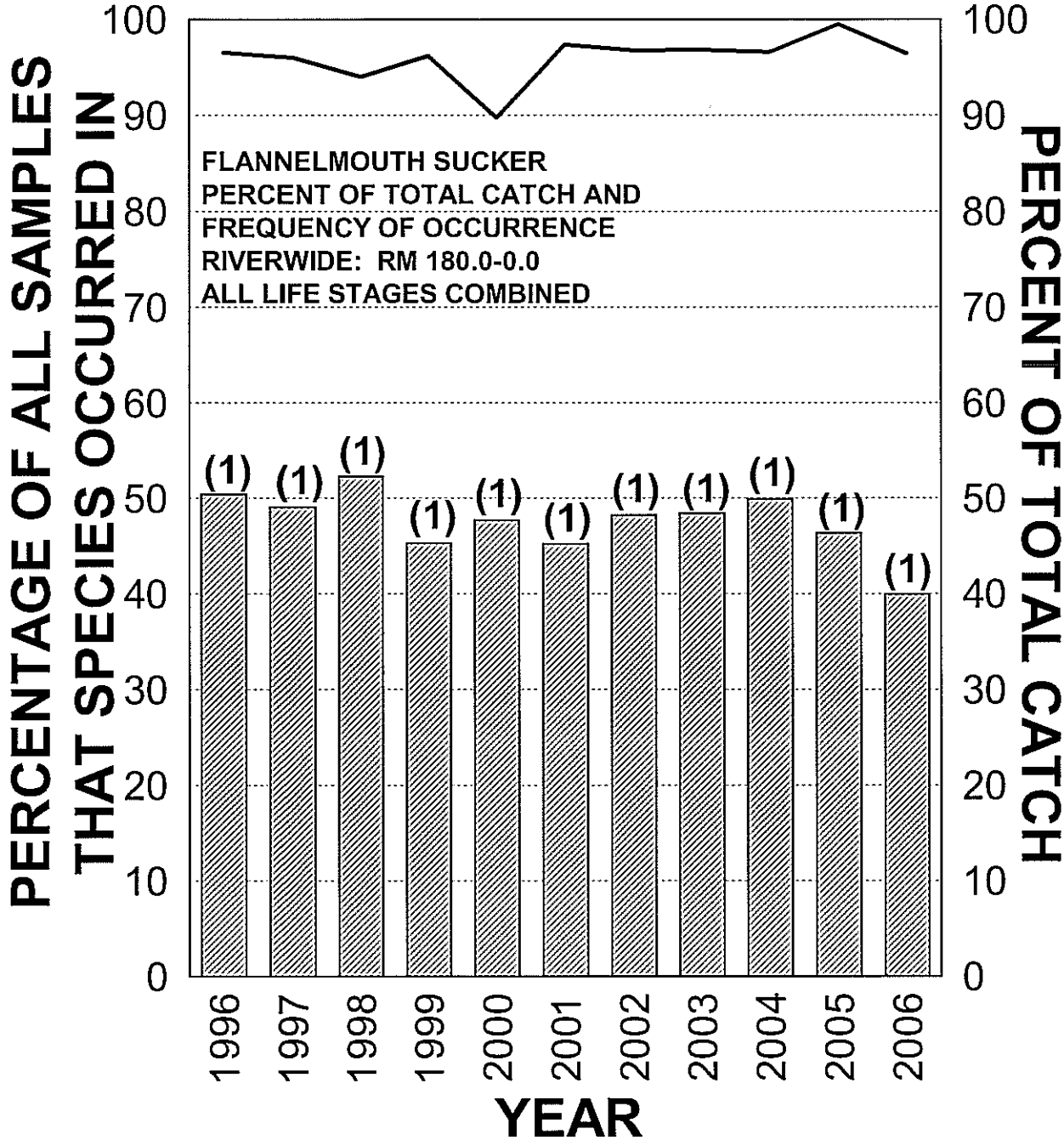

Figure 5. A summary of flannelmouth sucker relative abundance in riverwide Adult Monitoring collections, 1996-2006. The solid black line represents the percentage of all electrofishing samples on a given Adult Monitoring trip in which this species occurred (i.e., frequency of occurrence). The shaded bars represent the percent of the total catch that this species composed in a given year. Numbers in parentheses indicate the numeric rank for this species in a given year relative to all other fish species collected.

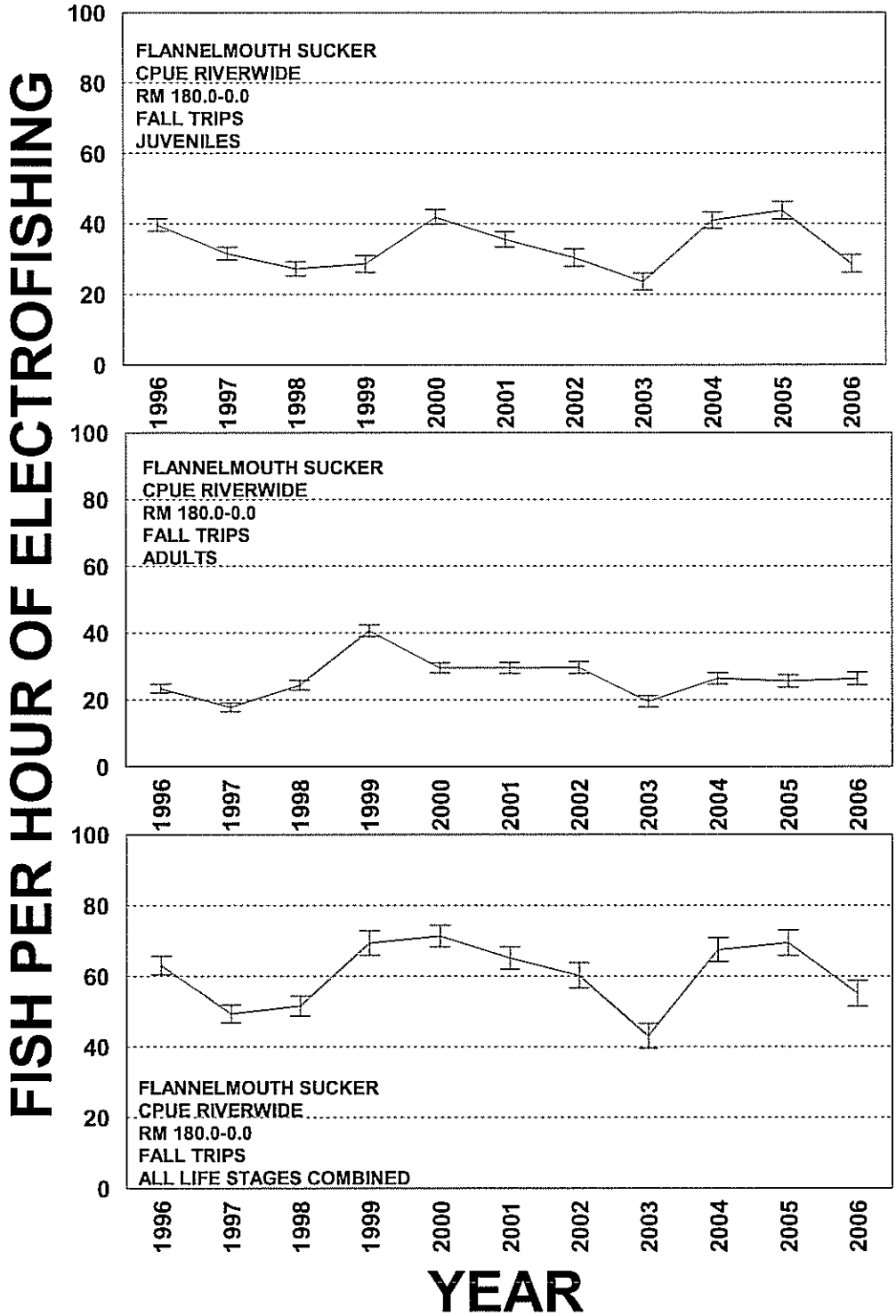

Figure 6. Flannelmouth sucker catch per unit effort (CPUE) riverwide (RM 180.0-0.0) on fall Adult Monitoring trips, for juvenile fish (< 410 mm TL; top), adult fish (≥ 410 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error.

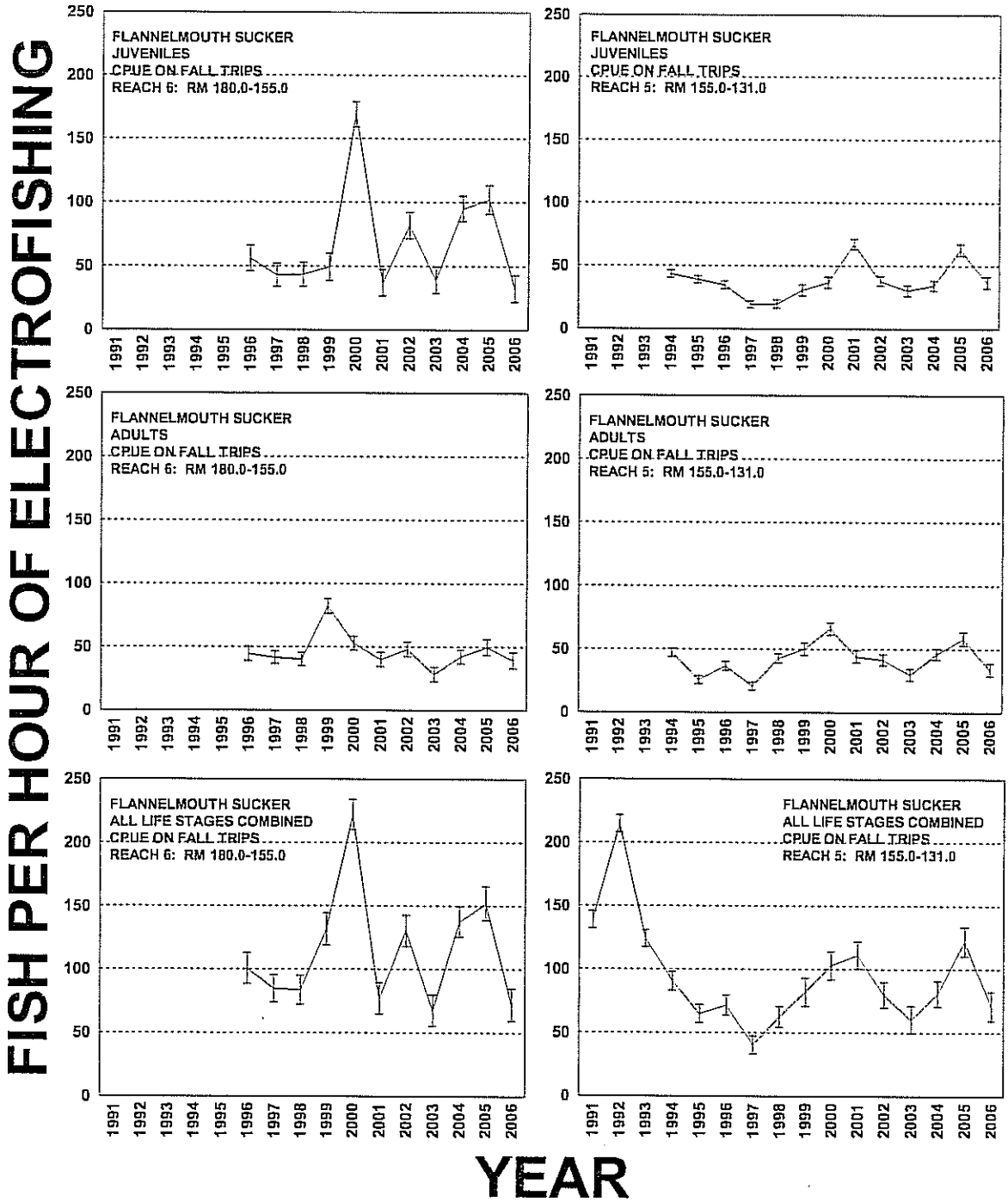

Figure 7. Flannelmouth sucker catch per unit effort (CPUE) in Reach 6 and Reach 5 on fall Adult Monitoring trips for juvenile fish (< 410 mm TL; top), adult fish (≥ 410 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error.

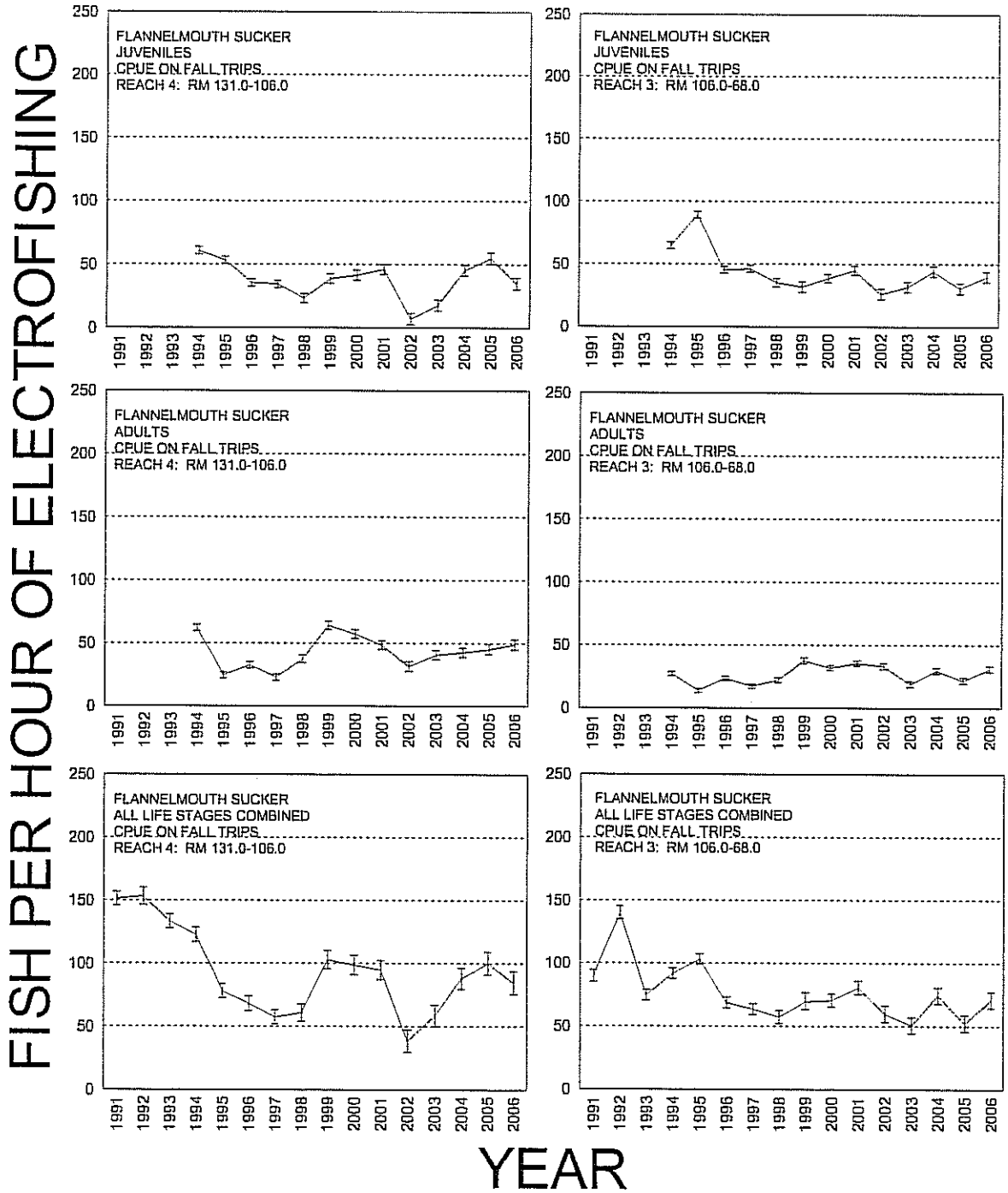

Figure 8. Flannelmouth sucker catch per unit effort (CPUE) in Reach 4 and Reach 3 on fall Adult Monitoring trips for juvenile fish (< 410 mm TL; top), adult fish (≥ 410 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error.

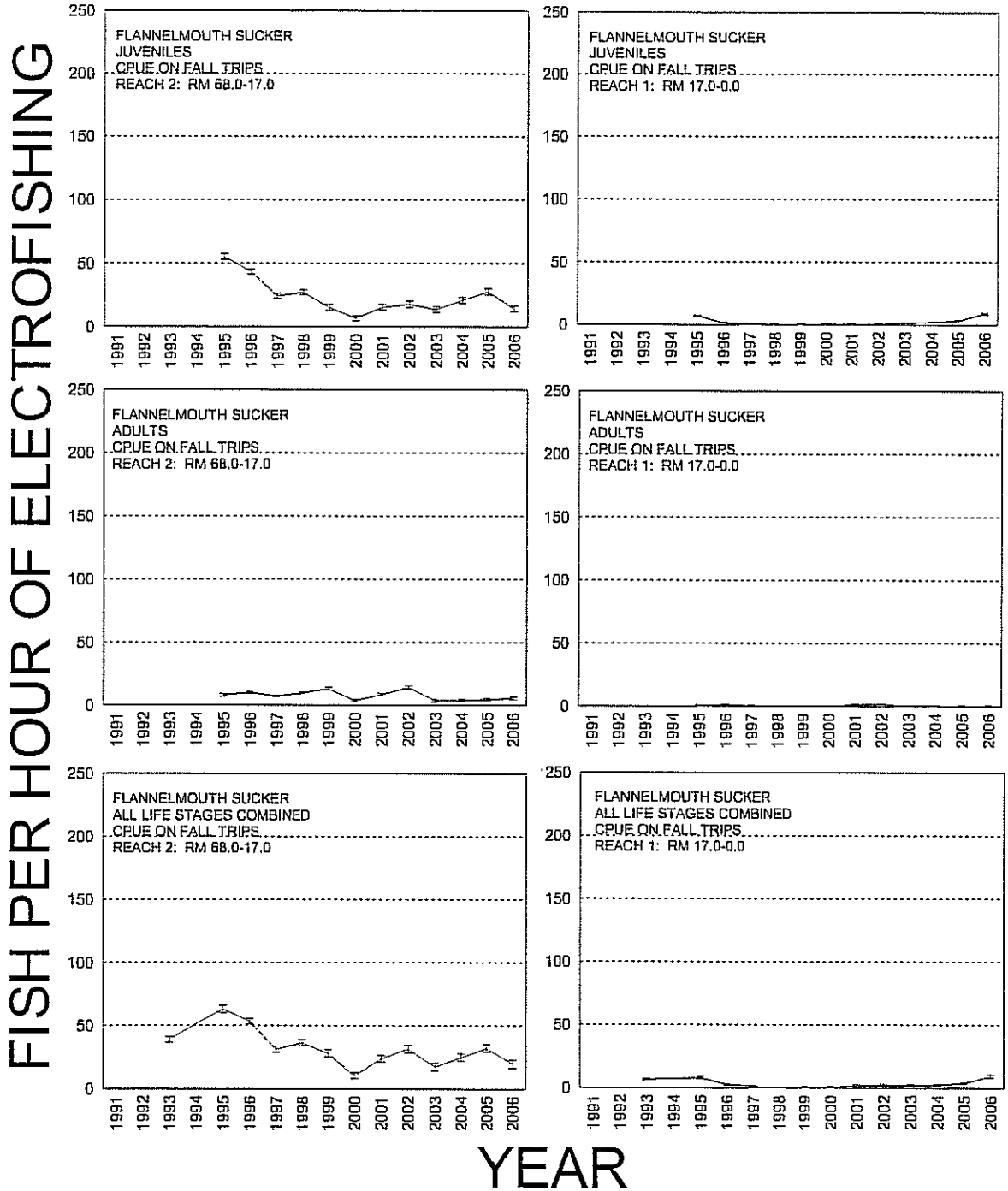

Figure 9. Flannelmouth sucker catch per unit effort (CPUE) in Reach 2 and Reach 1 on fall Adult Monitoring trips for juvenile fish (< 410 mm TL; top), adult fish (≥ 410 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error.

Length Information

Flannelmouth sucker ranging from 65-560 mm TL (mean TL = 382 mm) were collected during 2006 Adult Monitoring.

The riverwide length-frequency histogram for flannelmouth sucker in 2006 was bimodal, but not as strongly bimodal as in some previous (e.g., 2000 and 2002), when very strong cohorts of young fish were very evident in the riverwide length-frequency histograms (Figures 10 and 11). In 2006, one mode of the flannelmouth sucker length-frequency histogram was centered around 326-350 mm TL subadult fish (likely spawned in 2003-2004) and the second, larger mode was centered around young adult fish between 426-450 mm TL (Figure 11). The 2006 length-frequency histogram for flannelmouth sucker was very reminiscent of that seen in 2002 (Figure 11). During 2006 Adult Monitoring collections, very few age-0 flannelmouth sucker ($\leq$ 125 mm TL) were collected (Figure 11).

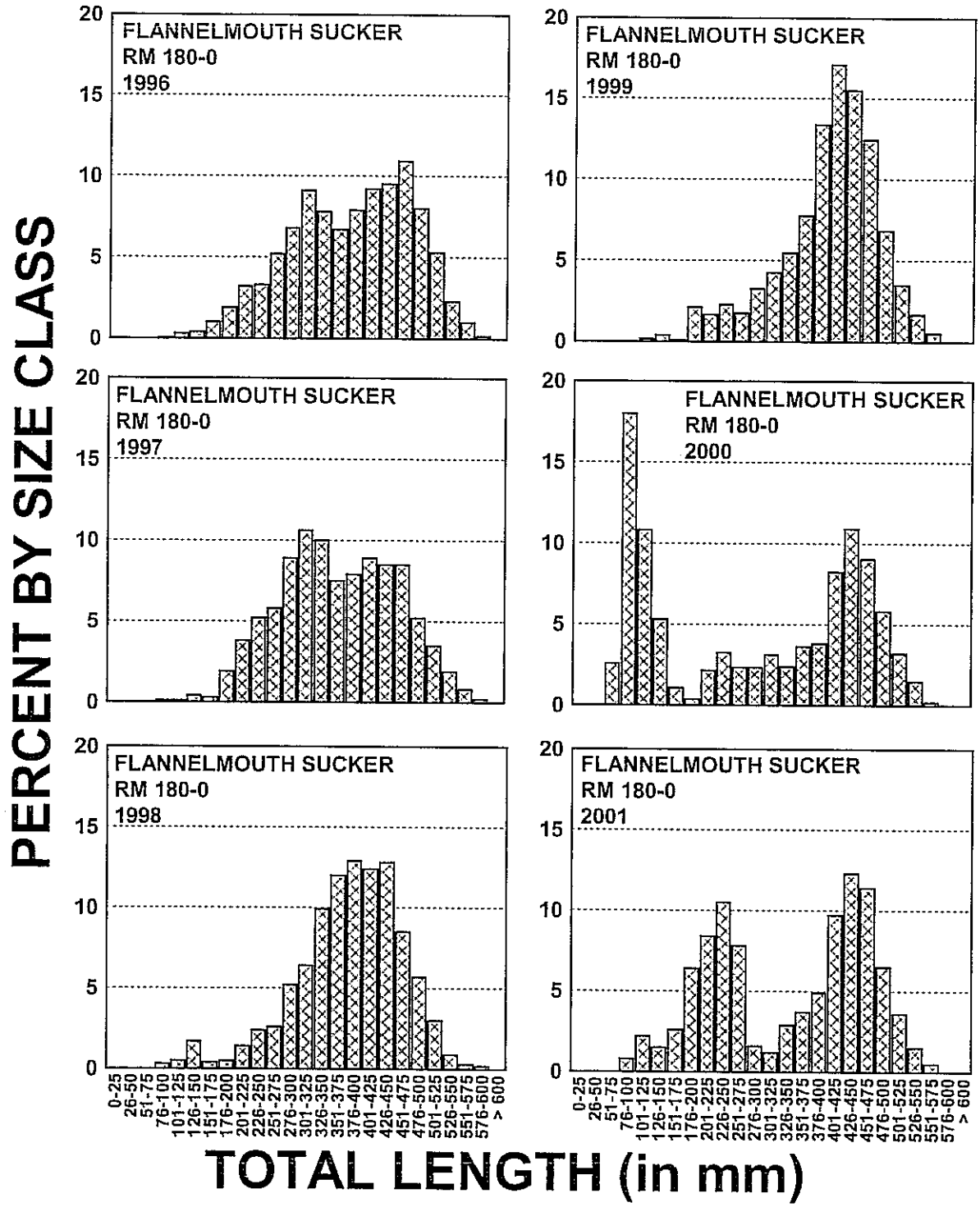

Figure 10. Length-frequency histograms showing the riverwide (RM 180.0-0.0) size-class distribution of flannelmouth sucker on fall Adult Monitoring trips in the San Juan River, 1996-2001.

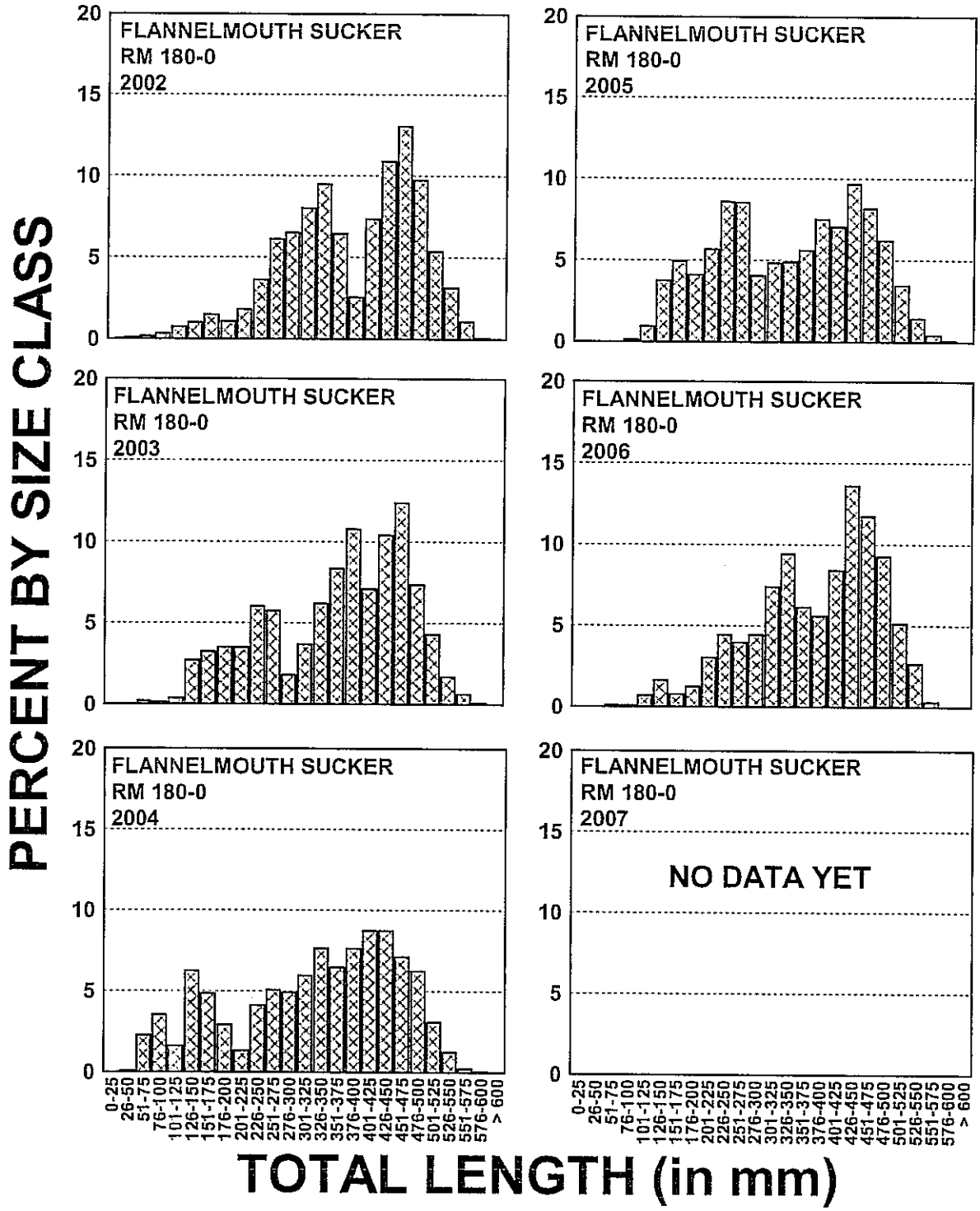

Figure 11. Length-frequency histograms showing the riverwide (RM 180.0-0.0) size-class distribution of flannelmouth sucker on fall Adult Monitoring trips in the San Juan River, 2002-2006.

Bluehead Sucker

Catch Information

Bluehead sucker were among the three most commonly-collected large-bodied fish species during Adult Monitoring, from 1997-2006, being the second most commonly-collected species from 2002-2005 (Table 3, Figure 12). Between 1996 and 2001, bluehead sucker never accounted for $\geq$ 17% of the total catch (Figure 12). However, in four of the last five years bluehead sucker have accounted for $\geq$ 22% (Figure 12). Bluehead sucker have also become noticeably more widely distributed throughout the San Juan River since 2001 (Figure 12, pers. obs.), occurring in > 80% of all electrofishing samples riverwide in each of the last six years and in > 90% in four of those years (Figure 12). Prior to 2003, bluehead sucker were never collected in Reach 1, adjacent to Lake Powell. However, they have been collected in Reach in three of the last four years.

Both juvenile and total CPUE values increased significantly riverwide from 1996-2006 ($p < 0.000$ in both cases; Figure 13). Adult CPUE riverwide did not change significantly during this period.

The San Juan River bluehead sucker population, within our study area, is largely centered in Reach 6 (Figure 14-16). In Reach 6, bluehead sucker are often the most common large-bodied fish species collected, however year-to-year total CPUE for bluehead sucker in Reach 6 is unpredictable, demonstrating large swings between years in both juvenile and adult CPUE. Bluehead sucker CPUE declines noticeably in each contiguous downstream river reach, with the exception of Reach 2 (Figures 14-16). In Reach 2 bluehead sucker CPUE has actually been increasing steadily since 2000 (Figure 16).

Length Information

Bluehead sucker ranging from 83-440 mm TL (mean TL = 281 mm) were collected during 2006 Adult Monitoring.

Few age-0 or age-1 bluehead sucker were collected in 2006 (Figure 18). However, length-frequency histograms show that in four of the last seven years (2000, 2002, 2003 and 2004), there have been noticeable influxes of young fish into the San Juan River bluehead sucker population (Figures 17 and 18). Smaller cohorts of young fish spawned in 1996 and 1997 appeared in the 1997 length-frequency histogram (Figure 17).

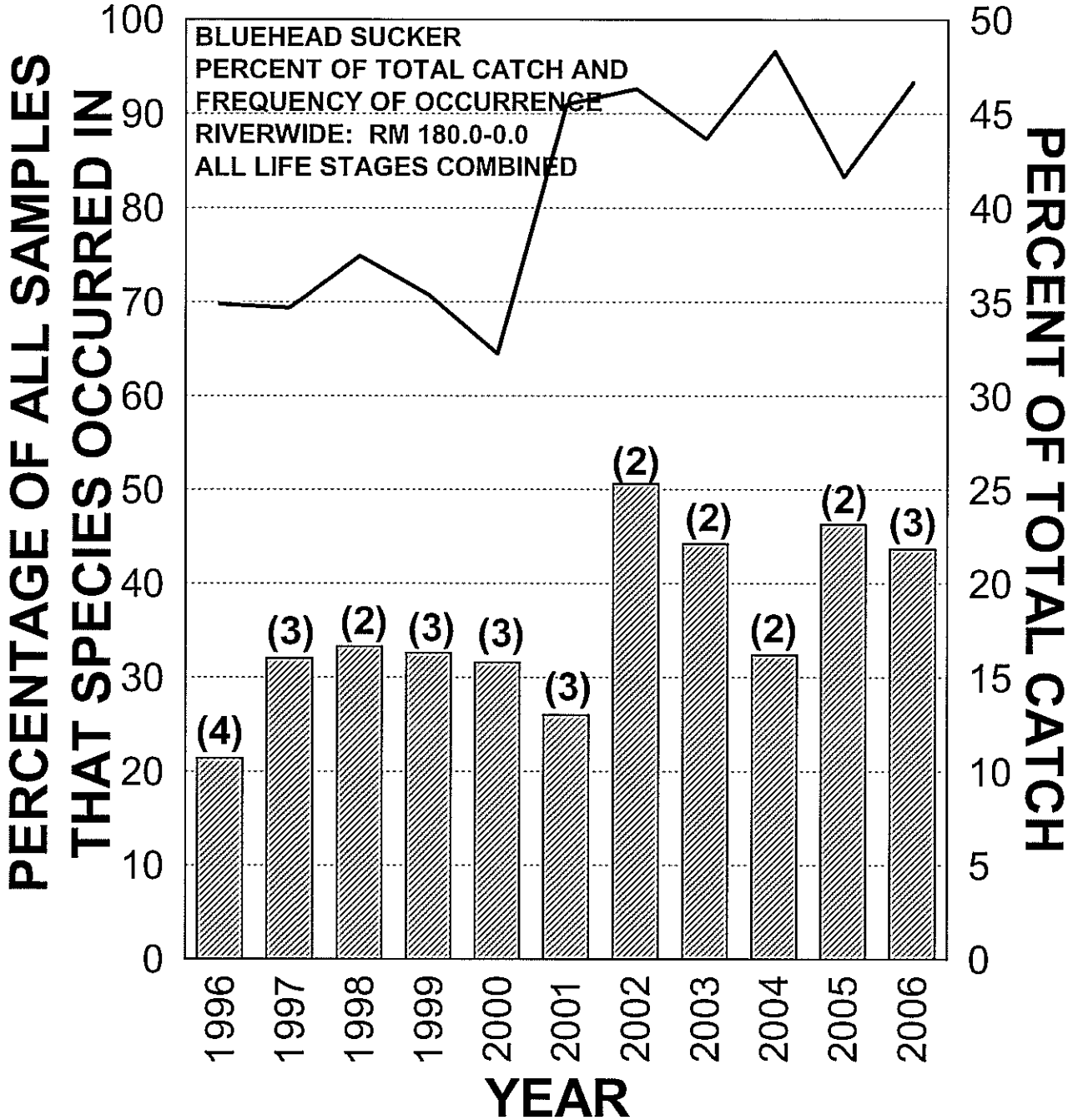

Figure 12. A summary of bluehead sucker relative abundance in riverwide Adult Monitoring collections, 1996-2006. The solid black line represents the percentage of all electrofishing samples on a given Adult Monitoring trip in which this species occurred (i.e., frequency of occurrence). The shaded bars represent the percent of the total catch that this species composed in a given year. Numbers in parentheses indicate the numeric rank for this species in a given year relative to all other fish species collected.

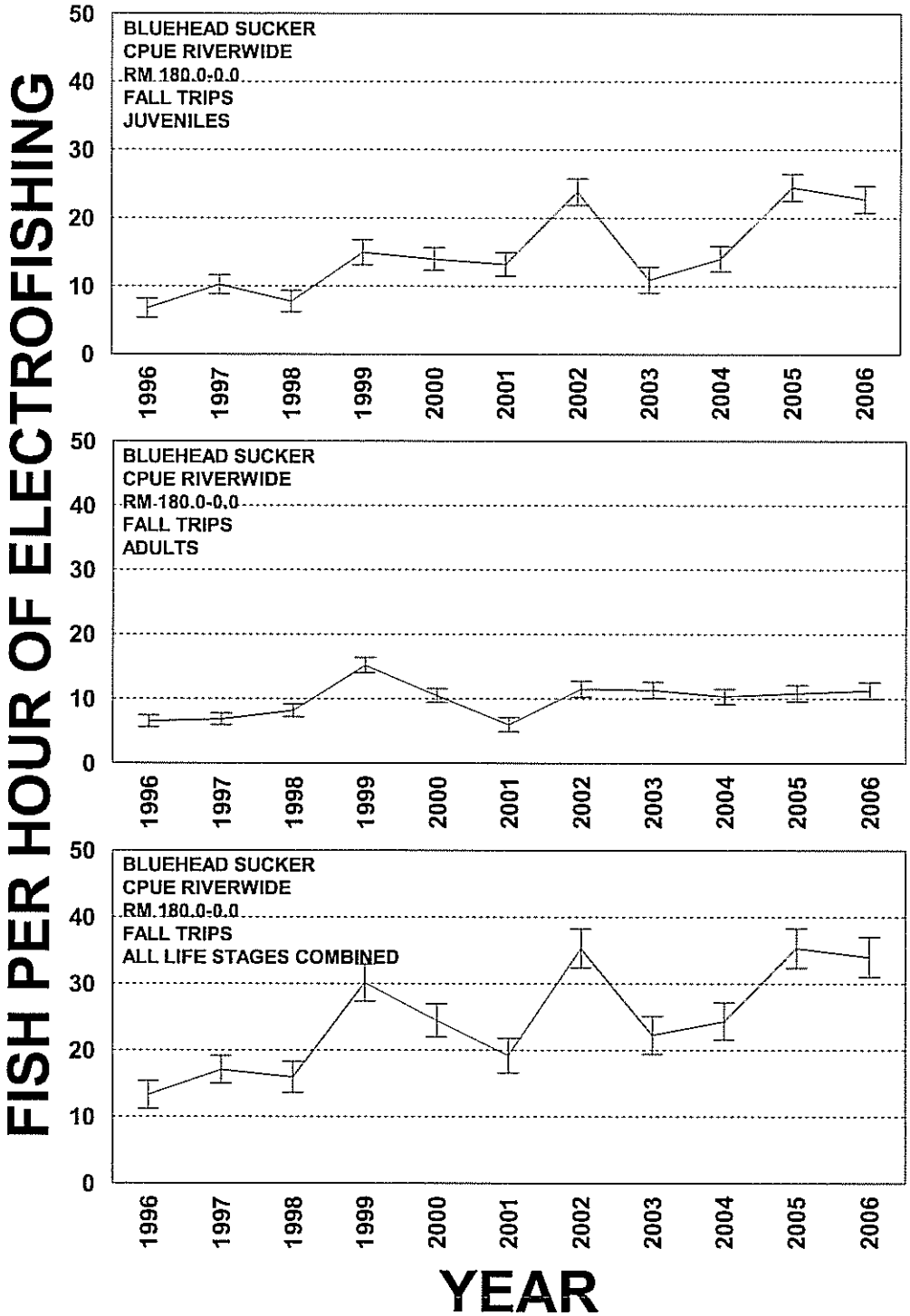

Figure 13. Bluehead sucker catch per unit effort (CPUE) riverwide (RM 180.0-0.0) on fall Adult Monitoring trips, for juvenile fish (< 300 mm TL; top), adult fish (≥ 300 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error.

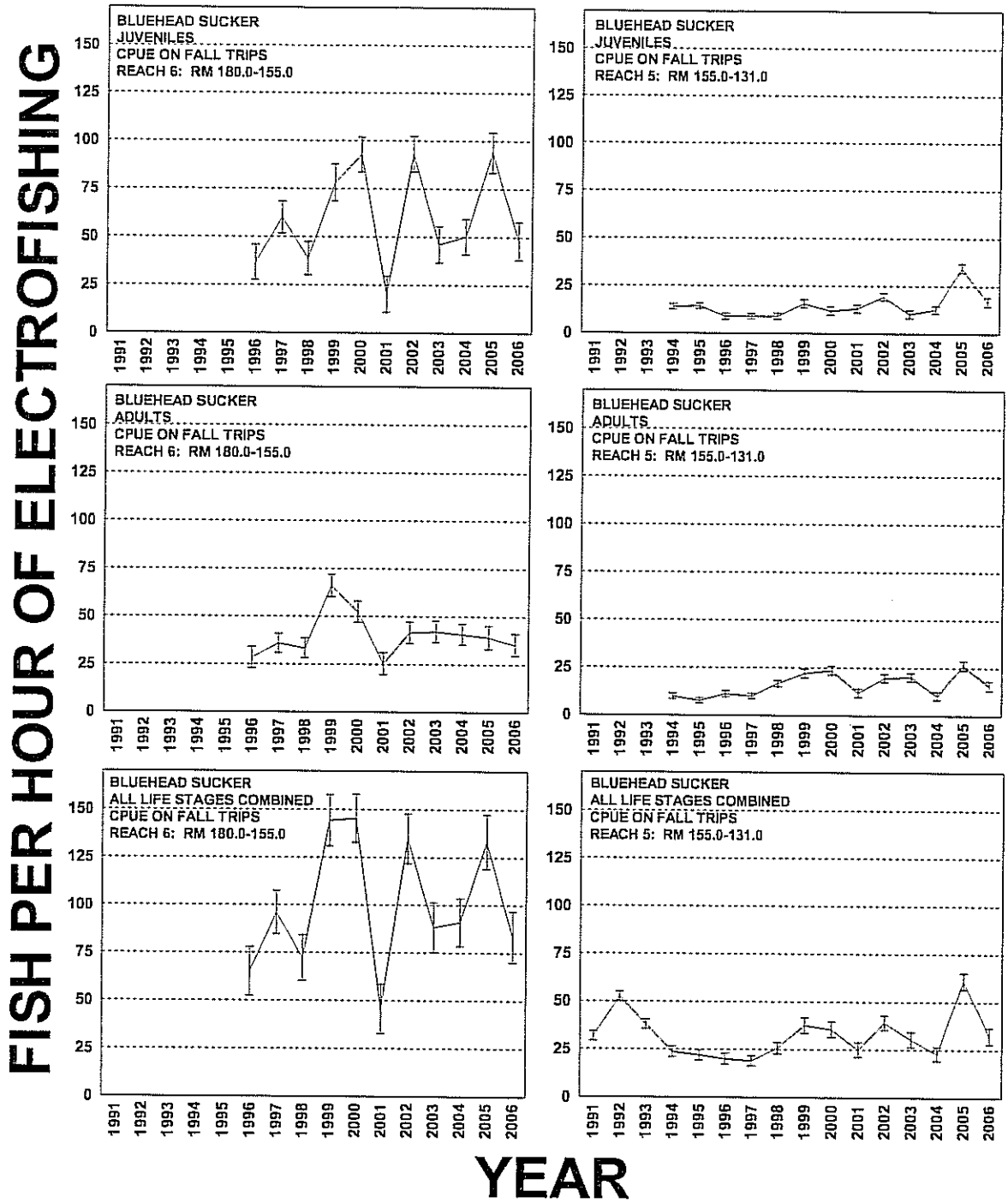

Figure 14. Bluehead sucker catch per unit effort (CPUE) in Reach 6 and Reach 5 on fall Adult Monitoring trips for juvenile fish (< 300 mm TL; top), adult fish (≥ 300 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error.

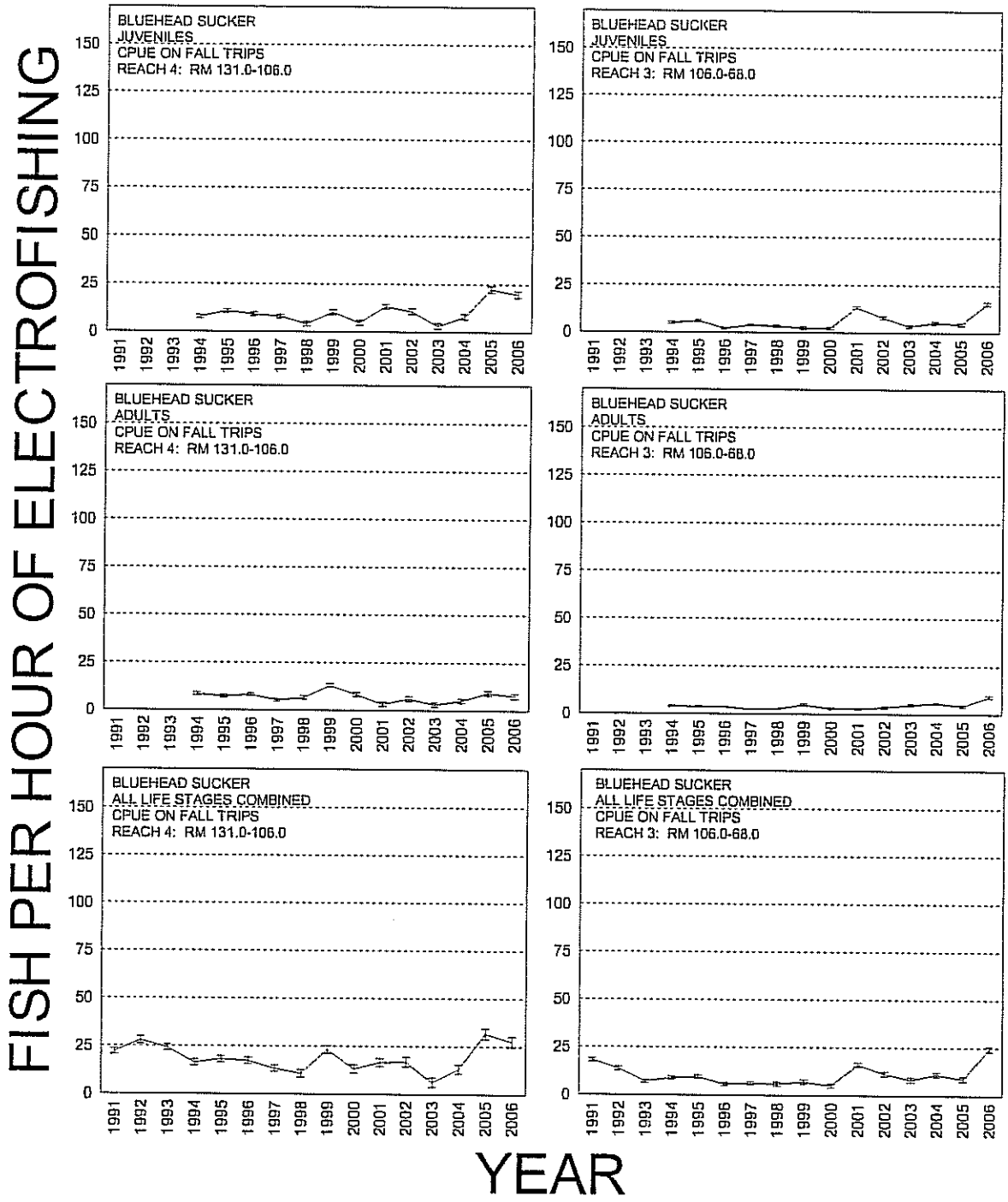

Figure 15. Bluehead sucker catch per unit effort (CPUE) in Reach 4 and Reach 3 on fall Adult Monitoring trips for juvenile fish (< 300 mm TL; top), adult fish (≥ 300 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error.

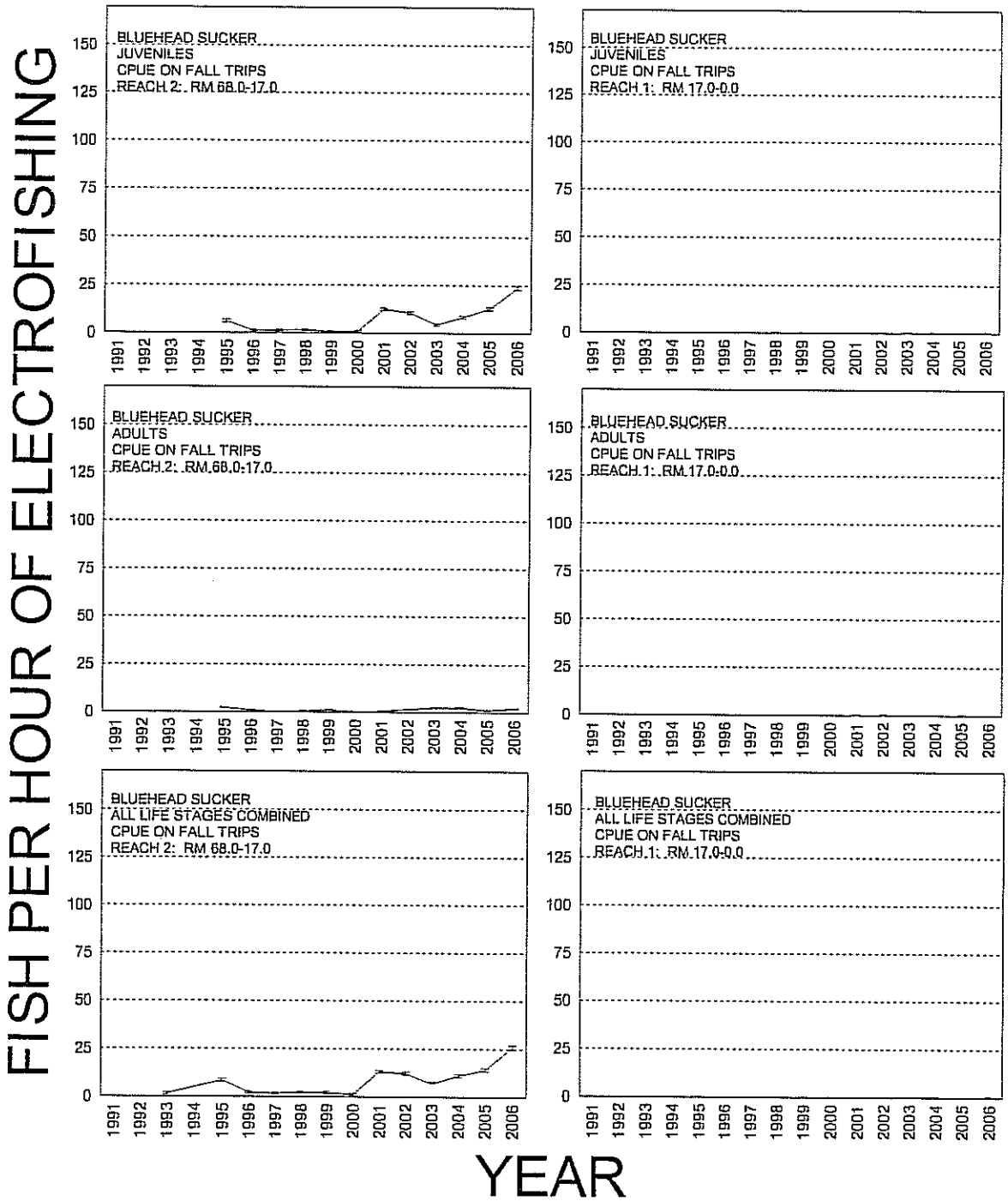

Figure 16. Bluehead sucker catch per unit effort (CPUE) in Reach 2 and Reach 1 on fall Adult Monitoring trips for juvenile fish (< 300 mm TL; top), adult fish (≥ 300 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error.

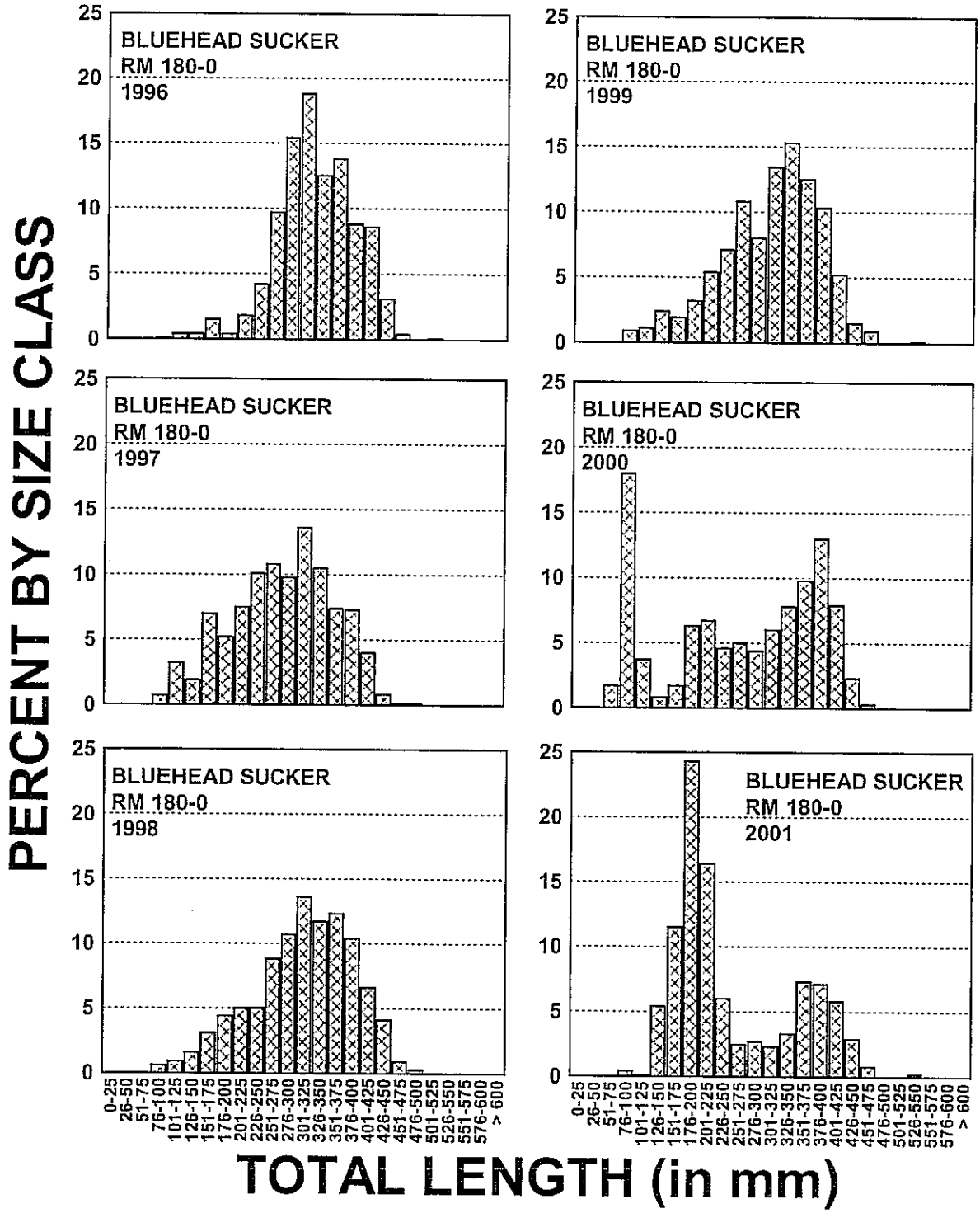

Figure 17. Length-frequency histograms showing the riverwide (RM 180.0-0.0) size-class distribution of bluehead sucker on fall Adult Monitoring trips in the San Juan River, 1996-2001.

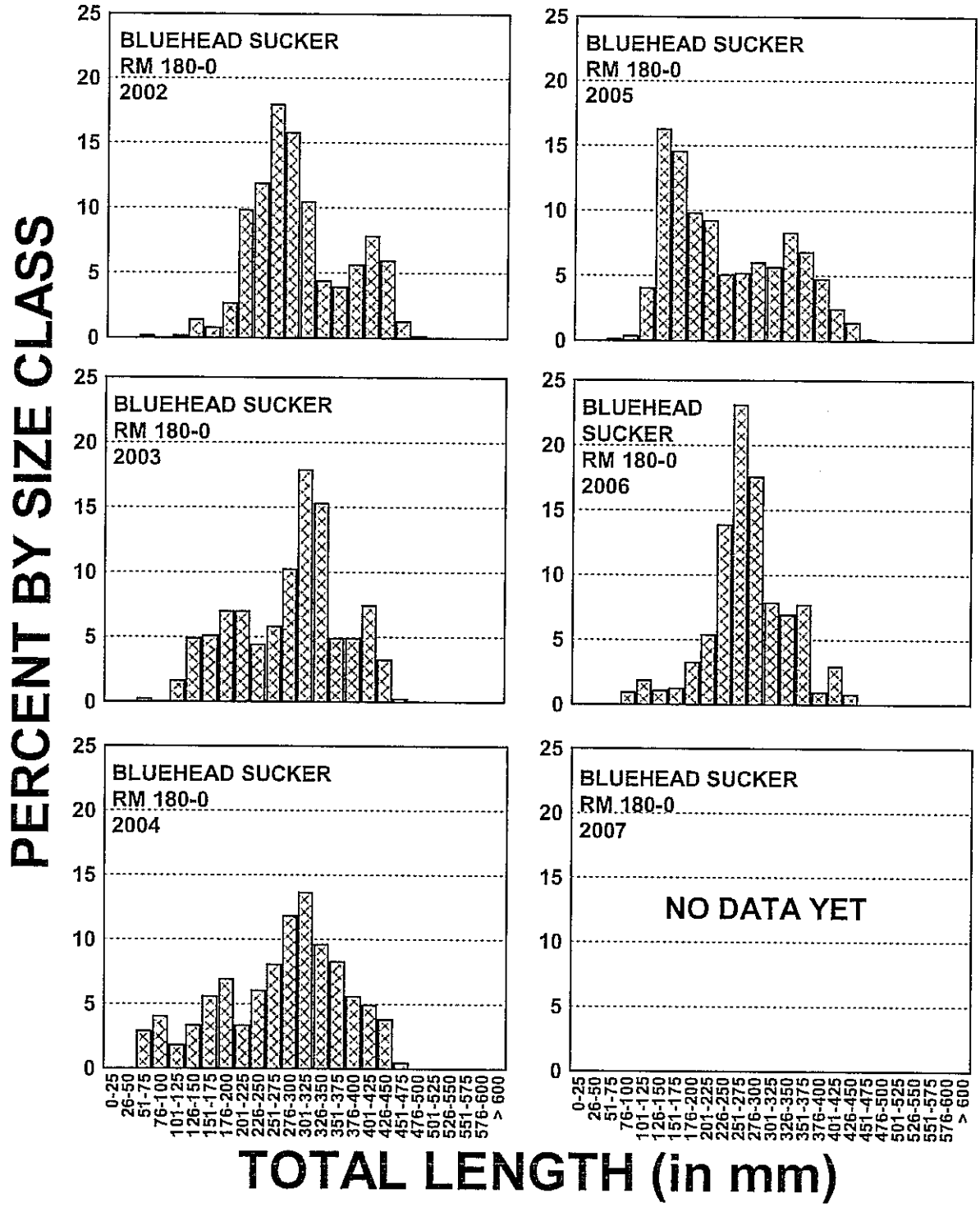

Figure 18. Length-frequency histograms showing the riverwide (RM 180.0-0.0) size-class distribution of bluehead sucker on fall Adult Monitoring trips in the San Juan River, 2002-2006.

Channel Catfish

Catch Information

Channel catfish are the most common nonnative fish collected during Adult Monitoring (Table 3) and have remained among the three most commonly-collected fish species in each of the last 11 years (Figure 19). In reaches where they are common, channel catfish are ubiquitous, being collected in a myriad of habitat types (pers. obs.) and are occasionally (as in 2000) collected in more electrofishing samples than are flannelmouth sucker (Figures 5 and 19; Ryden 2003). In 2006, channel catfish were the second most commonly-collected fish species, accounting for 23.2% of the total catch (Figure 19). Despite their overall numbers, channel catfish occurred in only 73.6% of all electrofishing samples, the lowest value ever observed (Figure 19).

Riverwide CPUE values for channel catfish are heavily affected by large fluctuations in juvenile CPUE. Despite these fluctuations, the general long-term trend among channel catfish total CPUE over the last 11 years has been flat (Figure 20). Despite removal efforts, which have been ongoing in some form since 1996, there was no difference between the beginning and ending values for channel catfish total CPUE riverwide ($p = 1.000$; Figure 20).

Trends in channel catfish CPUE among individual river reaches have been, at best, hard to discern. However, a few trends can be determined. First, in Reach 6 the channel catfish population has typically been dominated by adult fish, whereas in Reaches 5-2, juvenile channel catfish become increasingly numerically dominant in each contiguous downstream river reach (Figures 21-23). Second, the riverwide increase in channel catfish total CPUE from 2003-2006 was due not only to increasing numbers of large juvenile fish, but to fish that were just beginning to recruit into the adult population as well (Figures 20 and 26). Third, the large majority of the San Juan River's channel catfish population now resides in Reaches 5-2 (Figures 21-23) -- more specifically, between RM 166.6 and RM 52.9 (Figure 24). Last, in areas of the river where nonnative fish removal has been ongoing since 2001, channel catfish total CPUE was visibly lower during 2006 Adult Monitoring than it was in 2001 (Figure 24).

Intensive nonnative fish removal appears to be effective in the limited river sections where it has been implemented. Three river sections in or adjacent to the upper removal section that had "hot spots" where > 200 channel catfish per hour of electrofishing were collected in 2001 showed greatly reduced maximum total CPUE values in 2006 (Figure 24). Likewise, the lower removal section also showed a greatly reduced maximum total CPUE value in 2006 versus 2001 (Figure 24). Additionally, in 2001, 6 of 8 river sections examined yielded > 100 adult channel catfish. In 2006, this number fell to just 3 of 8 river sections (Figure 24).

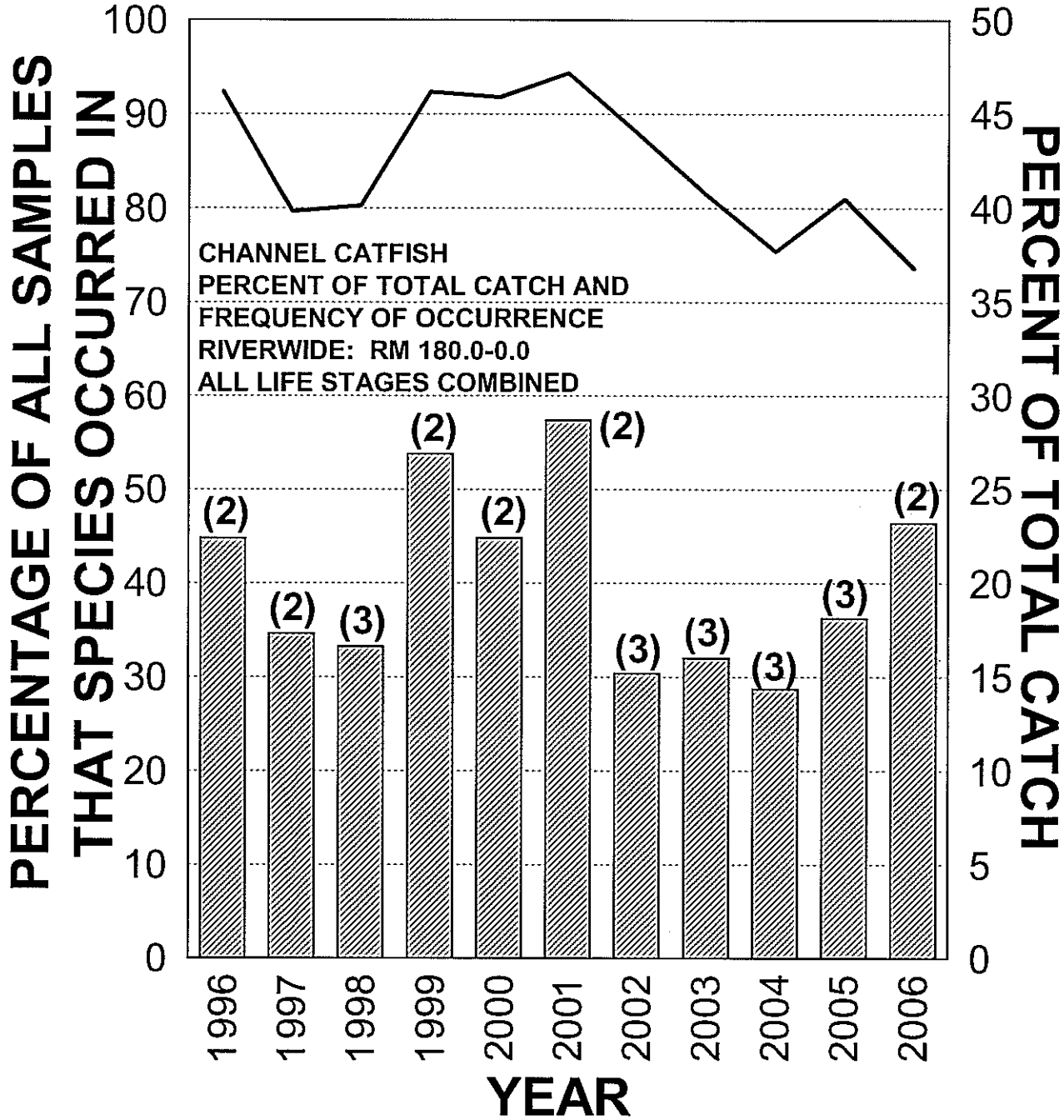

Figure 19. A summary of channel catfish relative abundance in riverwide Adult Monitoring collections, 1996-2006. The solid black line represents the percentage of all electrofishing samples on a given Adult Monitoring trip in which this species occurred (i.e., frequency of occurrence). The shaded bars represent the percent of the total catch that this species composed in a given year. Numbers in parentheses indicate the numeric rank for this species in a given year relative to all other fish species collected.

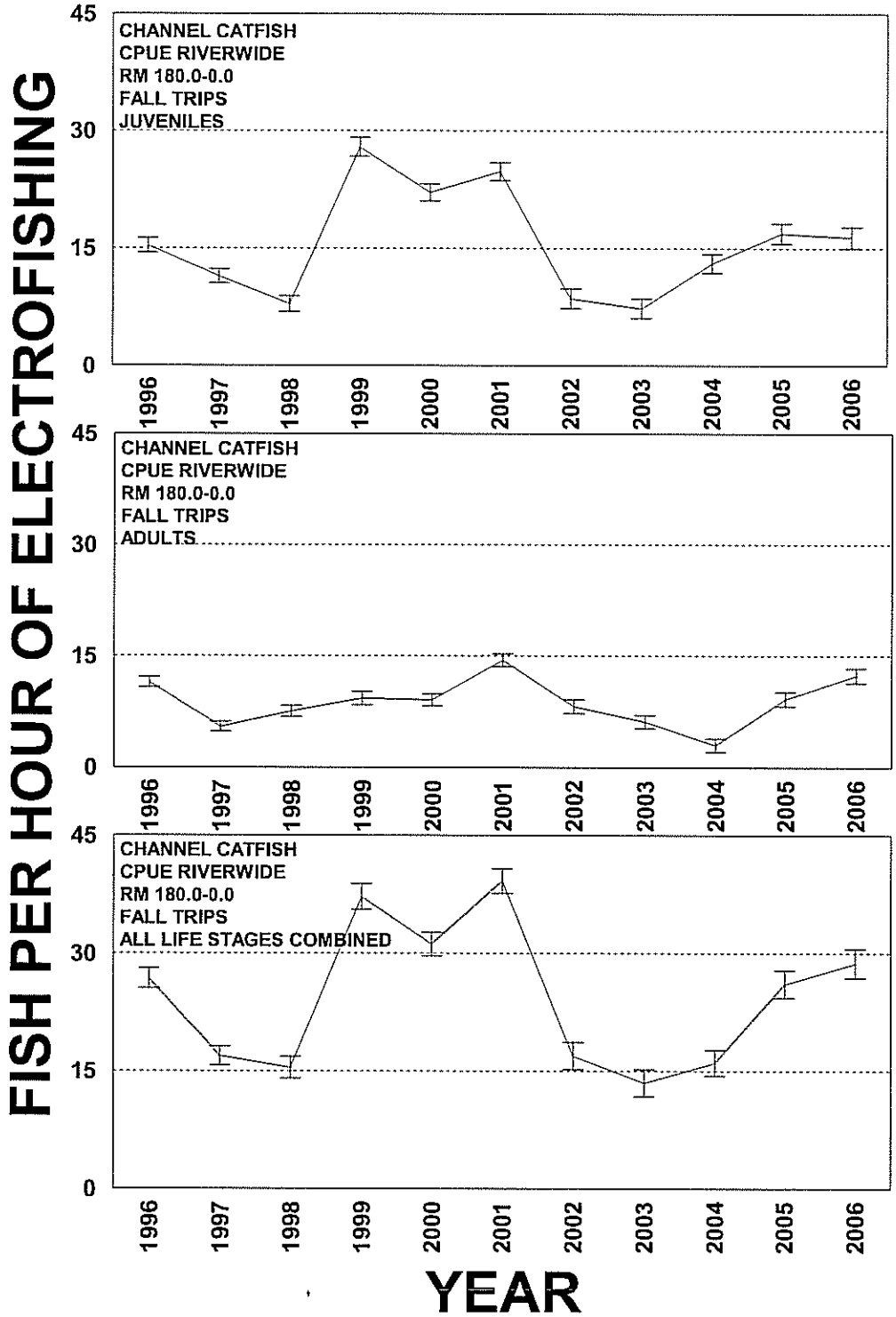

Figure 20. Channel catfish catch per unit effort (CPUE) riverwide (RM 180.0-0.0) on fall Adult Monitoring trips, for juvenile fish (< 300 mm TL; top), adult fish (≥ 300 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error.

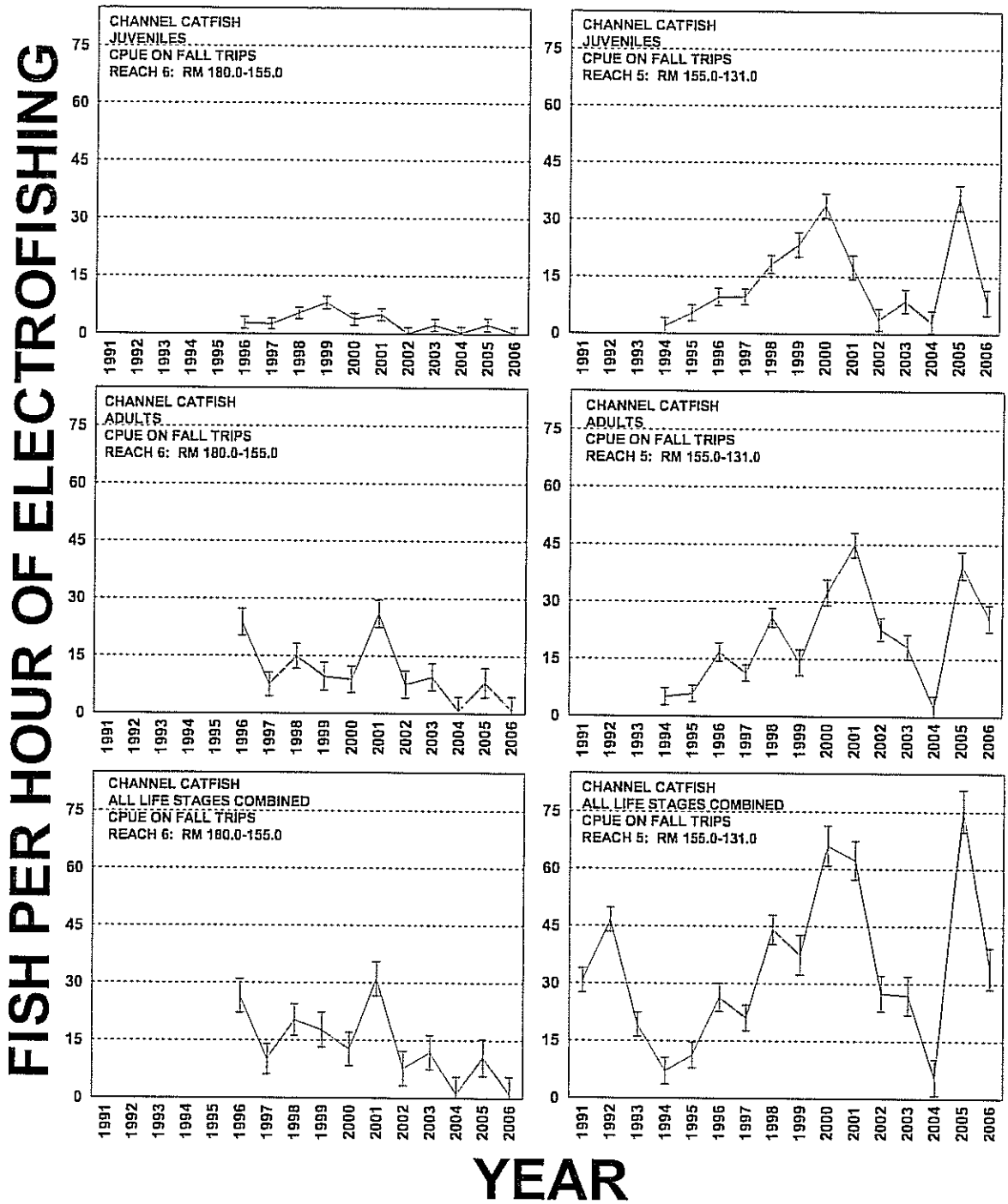

Figure 21. Channel catfish catch per unit effort (CPUE) in Reach 6 and Reach 5 on fall Adult Monitoring trips for juvenile fish (< 300 mm TL; top), adult fish (≥ 300 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error.

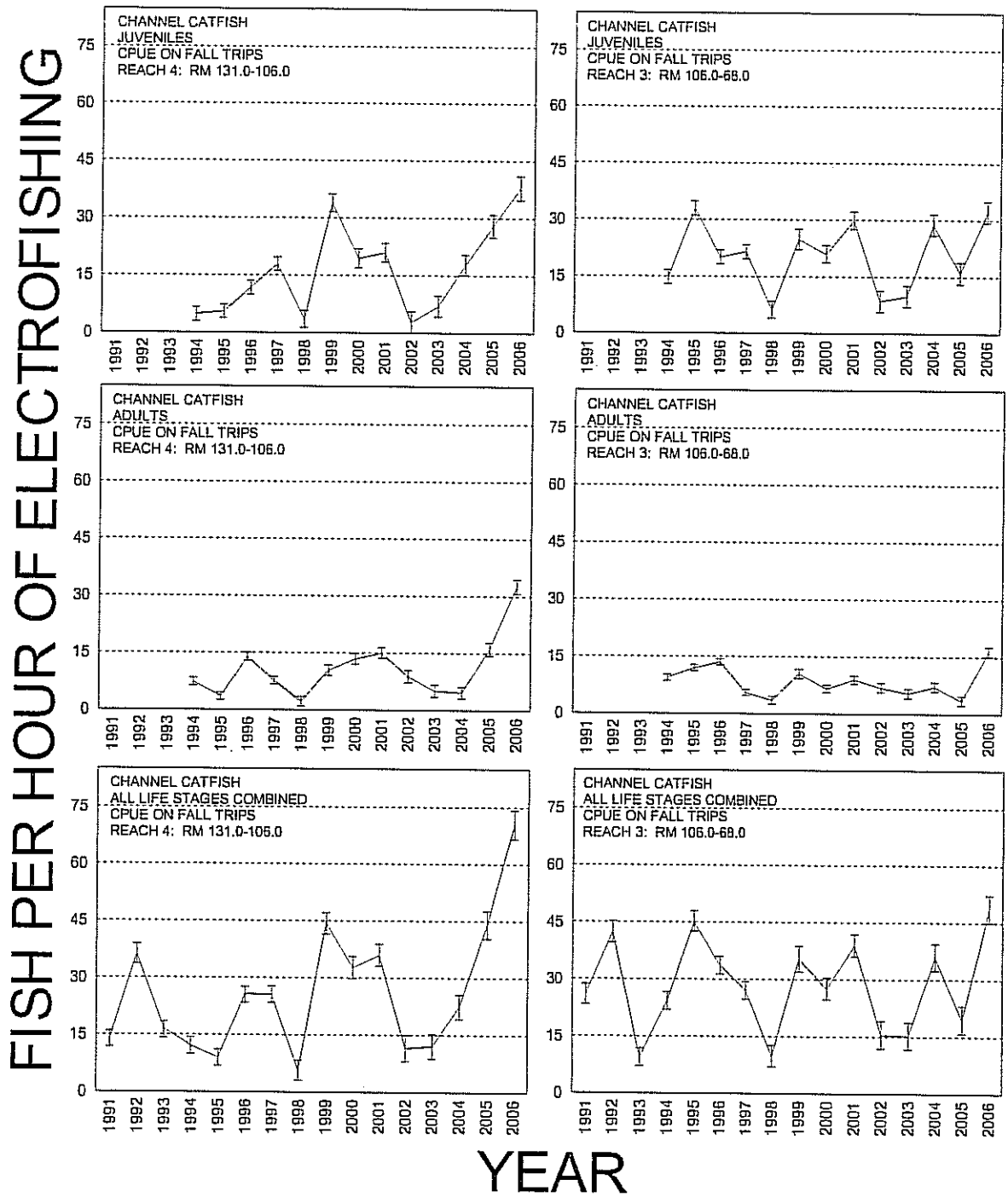

Figure 22. Channel catfish catch per unit effort (CPUE) in Reach 4 and Reach 3 on fall Adult Monitoring trips for juvenile fish (< 300 mm TL; top), adult fish (≥ 300 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error.

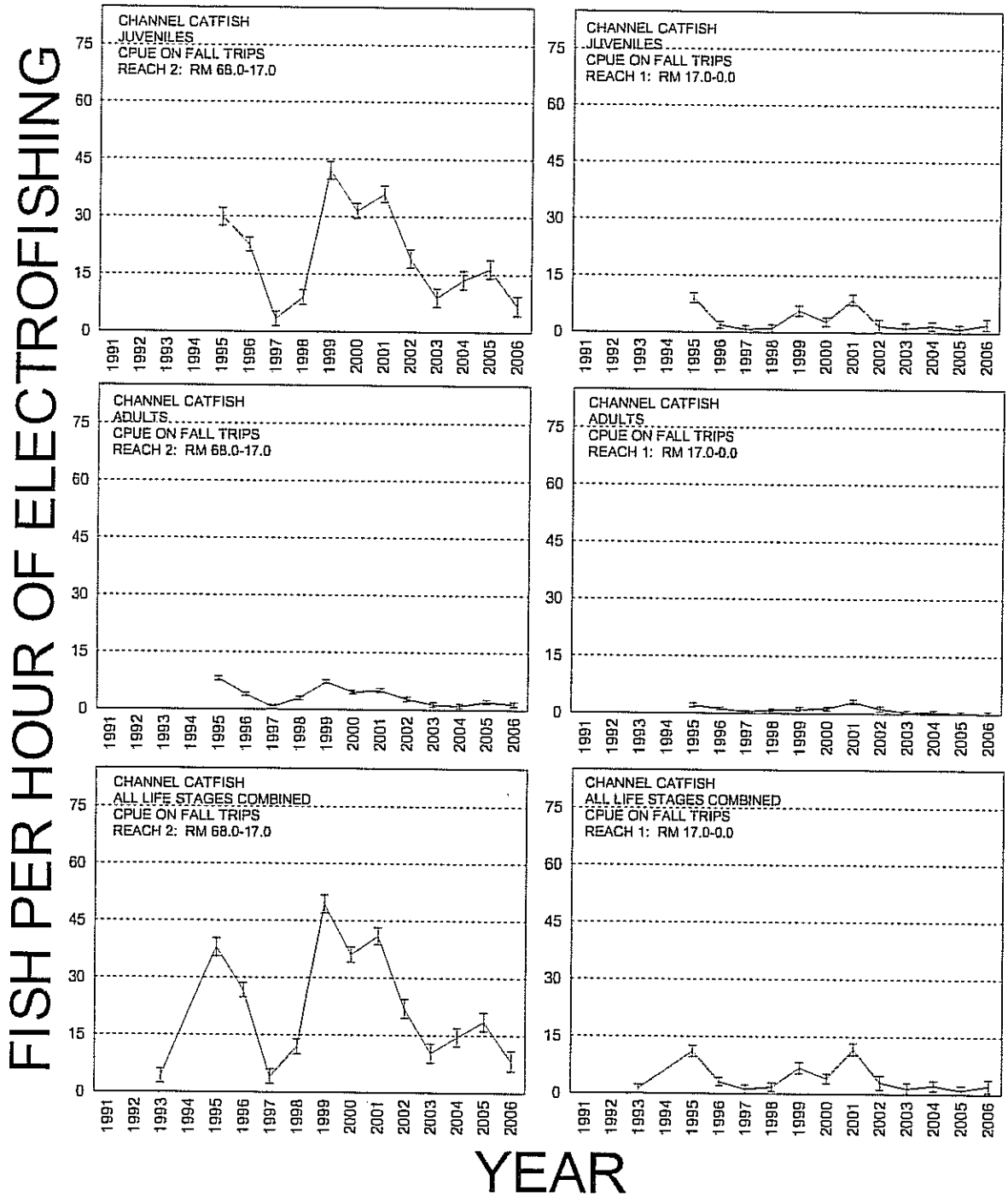

Figure 23. Channel catfish catch per unit effort (CPUE) in Reach 2 and Reach 1 on fall Adult Monitoring trips for juvenile fish (< 300 mm TL; top), adult fish (≥ 300 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error.

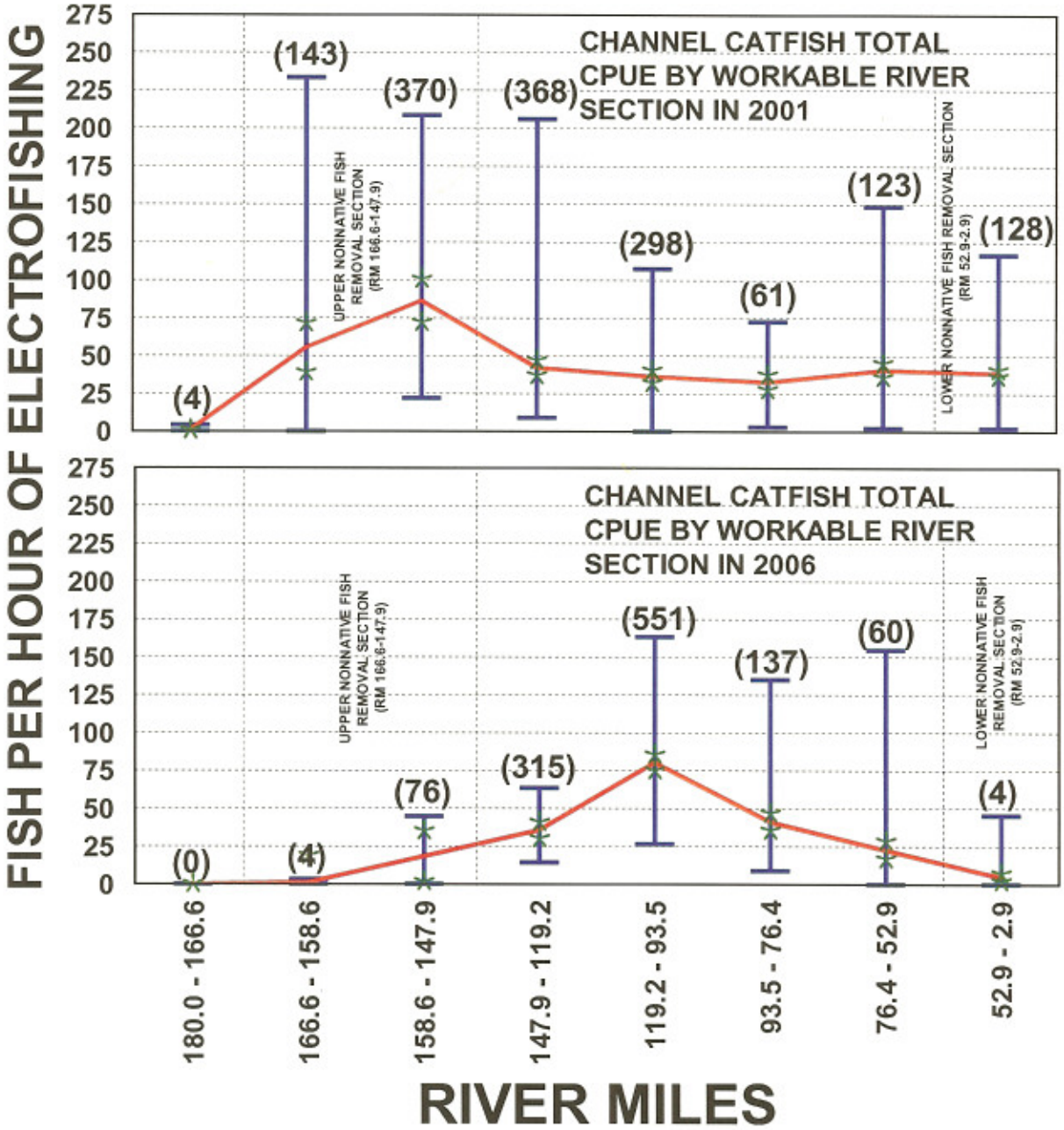

Figure 24. Channel catfish total CPUE in workable sections of the San Juan River (i.e., areas between boat launches) in 2001 and 2006. The red sloping horizontal lines represent the mean total CPUE. The blue error bars represent the minimum and maximum observed total CPUE values for each river section. The green asterisks represent one standard error. Numbers in parentheses represent the number of adult channel catfish (i.e., fish ≥ 300 mm TL) collected in each river section.

Channel catfish total CPUE declined significantly in the three most upstream workable river sections between 2001 and 2006: RM 180.0-166.6 ($p = 0.034$); RM 166.6-158.6 ($p = 0.035$); RM 158.6-147.9 ($p = 0.005$; Figure 25). Channel catfish total CPUE also declined significantly in the two most downstream workable river sections between 2001 and 2006: RM 76.4-52.9 ($p = 0.020$); RM 52.9-2.9 ($p < 0.000$; Figure 25). All five of these river sections either had repetitive, intensive nonnative fish removal efforts ongoing in them (RM 166.6-147.9 = 2001-2006; RM 52.9 and 2.9 = 2002-2006), or were adjacent to intensive removal sections.

In the middle workable sections of the San Juan River, where only sporadic nonnative removal efforts had occurred, channel catfish total CPUE either remained unchanged or increased significantly from 2001-2006: RM 147.9-119.2 ($p = 0.402$); RM 119.2-93.5 ($p < 0.000$); RM 93.5-76.4 ($p = 0.020$; Figure 25).

Length Information

Channel catfish ranging from 48-762 mm TL (mean TL = 296 mm) were collected during 2006 Adult Monitoring.

In the 2006 length-frequency histogram, the largest group of channel catfish were age-1 fish centered around 126-150 mm TL (Figure 27). A group of smaller, age-0 fish, centered around 51-75 mm TL, were also discernible (Figure 27). The large numbers of older subadult and young adult fish observed in the 2005 length-frequency histogram (centered around 276-325 mm TL) were still in evidence in 2006, but they had grown and were now centered around 326-375 mm TL (Figure 27). In addition, the strong cohort of age-1 channel catfish centered around 126-150 mm TL in the 2005 length-frequency histogram, continued to grow and were centered around 201-276 mm TL in the 2006 length-frequency histogram (Figure 27).

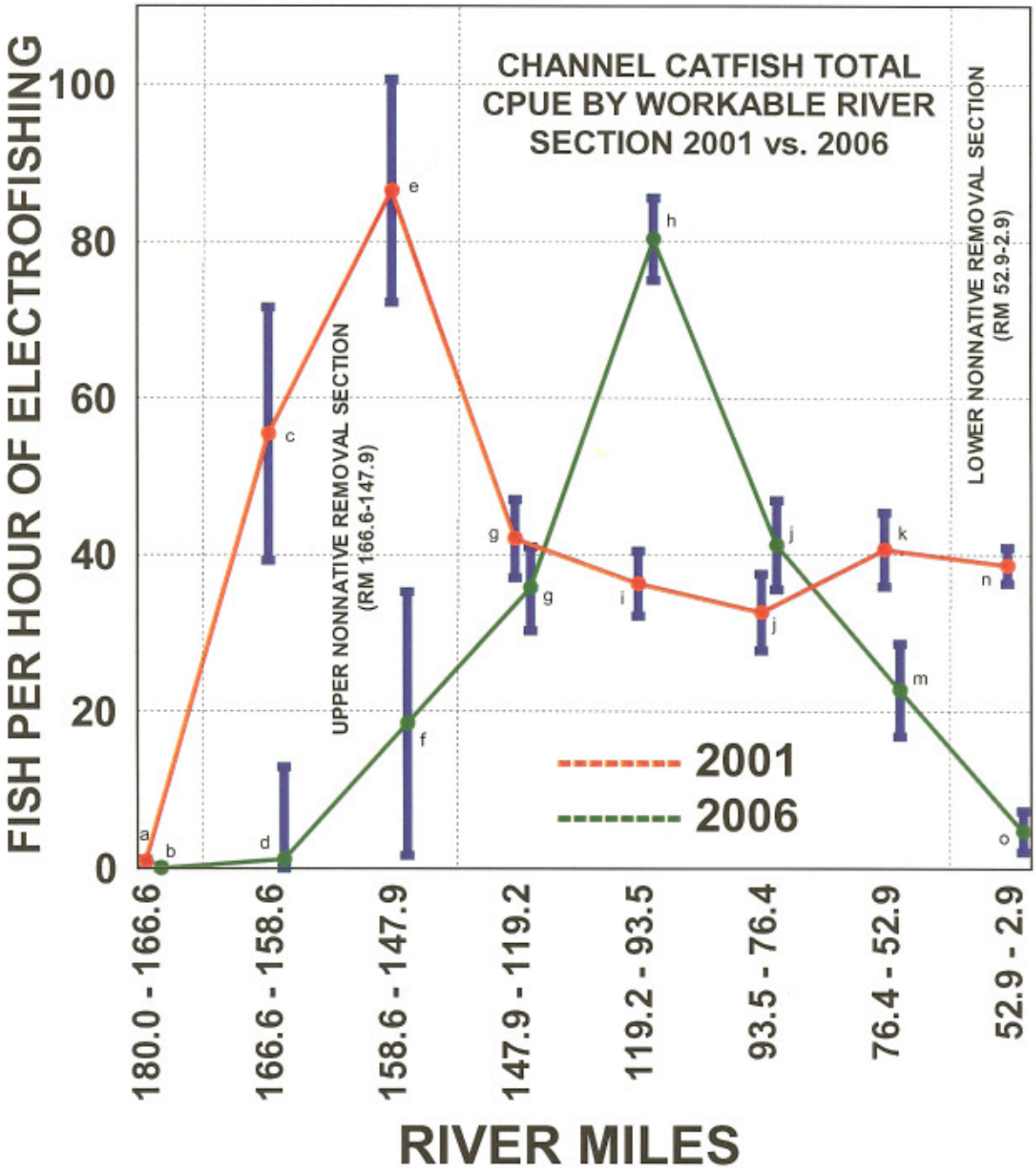

Figure 25. Channel catfish total CPUE in workable sections of the San Juan River (i.e., areas between boat launches) in 2001 and 2006. The red and green sloping horizontal lines represent the mean total CPUE. The blue error bars represent one standard error. Letters by the mean CPUE values represent ANOVA comparisons within workable sections, between years. Where letters differ, total CPUE values were significantly different. Where letters are alike, there was no difference in total CPUE.

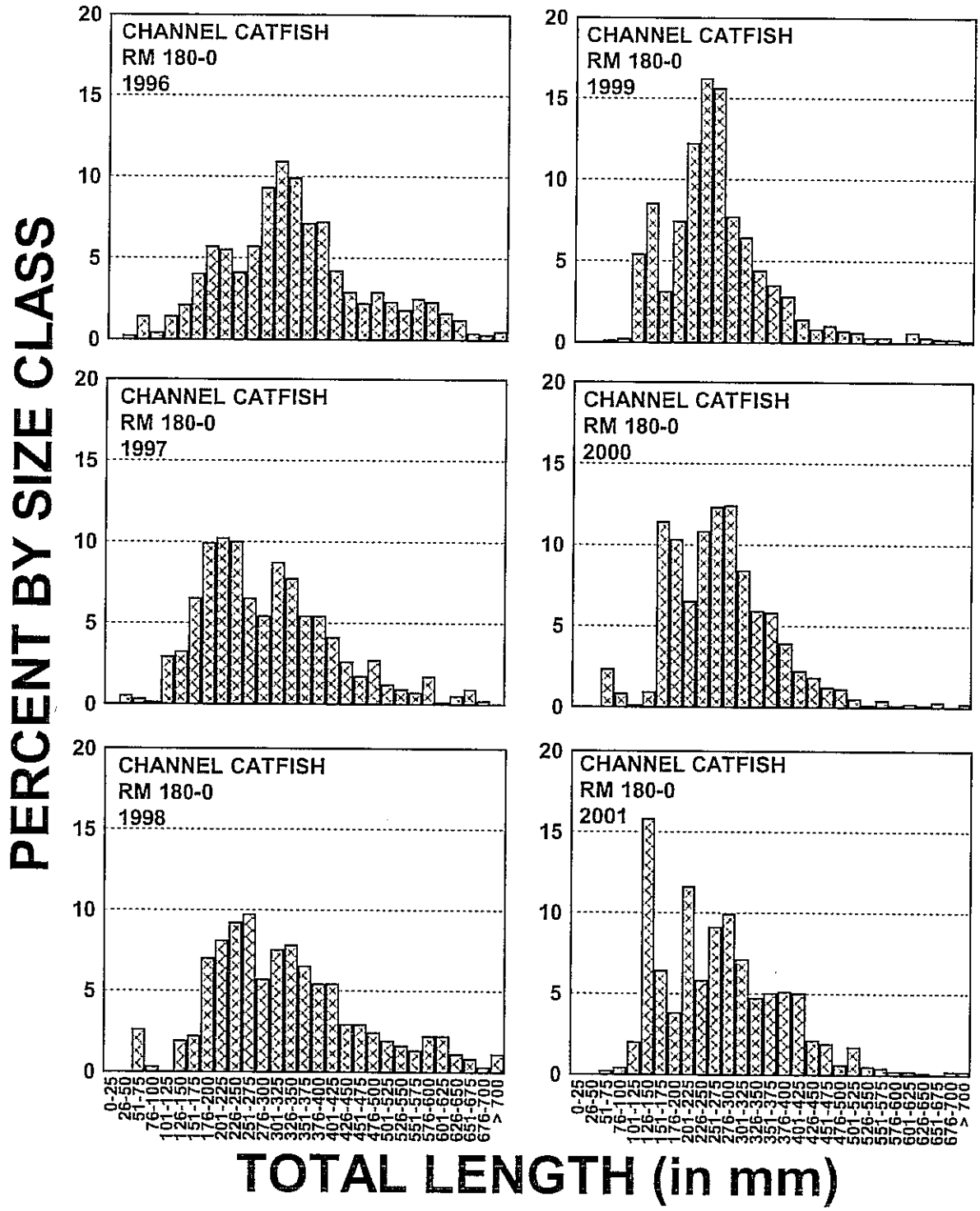

Figure 26. Length-frequency histograms showing the riverwide (RM 180.0-0.0) size-class distribution of channel catfish on fall Adult Monitoring trips in the San Juan River, 1996-2001.

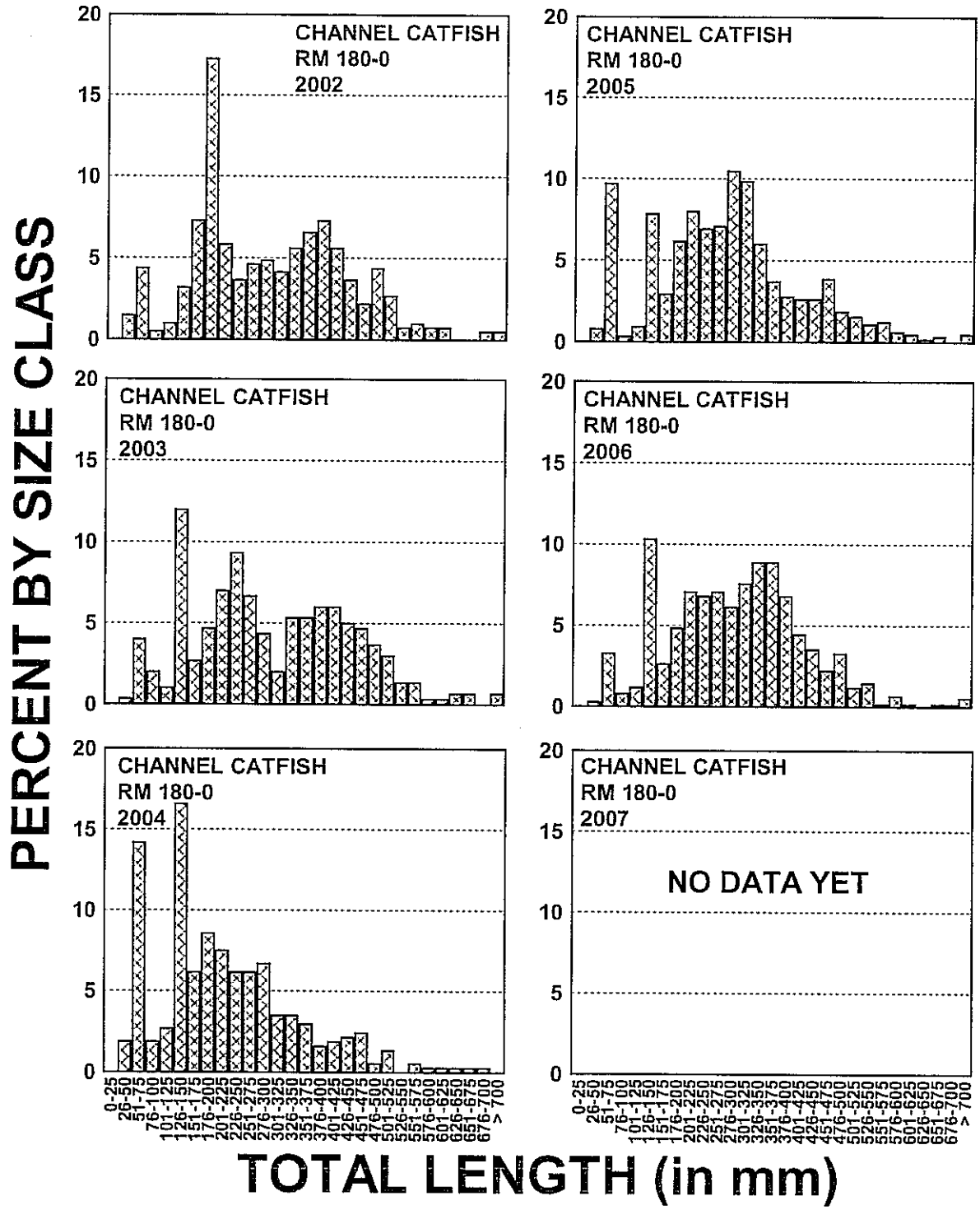

Figure 27. Length-frequency histograms showing the riverwide (RM 180.0-0.0) size-class distribution of channel catfish on fall Adult Monitoring trips in the San Juan River, 2002-2006.

Common Carp

Catch Information

Common carp were the sixth most commonly-collected fish during 2006 Adult Monitoring (Table 3, Figure 28). This marks the third consecutive year that common carp have not been among the four most commonly-collected fish species during Adult Monitoring (Figure 28). Only 254 total common carp were collected riverwide in 2006 (Table 3).

Common carp have composed less of the total catch in each consecutive year since 1997, dropping to a low of 2.27% of the total catch in 2006 (Table 3; Figure 28). Common carp were collected in only 48.73% of all electrofishing collections in 2006, compared to being collected in 82.99%-89.14% of all electrofishing collections riverwide between 1996 and 2002 (Figure 28).

The decline in common carp abundance riverwide was reflected in a significant decline ($p < 0.000$) in adult common carp CPUE riverwide from 1996-2006 (Figure 29). During this same period, CPUE among juvenile common carp riverwide increased noticeably in 2000, 2002, and 2004 (Figure 29). However, these pulses of juvenile fish did not last more than one year and have not led to a comeback in numbers of adult fish, suggesting that most of the juvenile common carp seen in these large pulses are not recruiting into the adult population.

The declining trend in adult common carp CPUE over the last eleven years has been the most pronounced in Reach 6 (Figure 30). However, adult common carp CPUE has generally declined in all six river reaches since about 2001 (Figures 30-32). The spikes in juvenile common carp CPUE observed in 200, 2002, and 2004 occurred mostly in Reaches 6-4 (Figures 30-32).

Length Information

Common carp ranging from 157-652 mm TL (mean TL = 512 mm) were collected during 2006 Adult Monitoring.

The 2006 length-frequency histogram for common carp was dominated by large, adult fish (Figure 34). While past years' length-frequency histograms were also dominated by large, adult fish, those observed in 2006 were noticeably larger than those being collected just a few years ago (Figures 33 and 34). In fact, with one exception (i.e. 2000), the dominant size-class of common carp being collected during Adult Monitoring has increased fairly steadily from 1999-2006 (Figure 35).

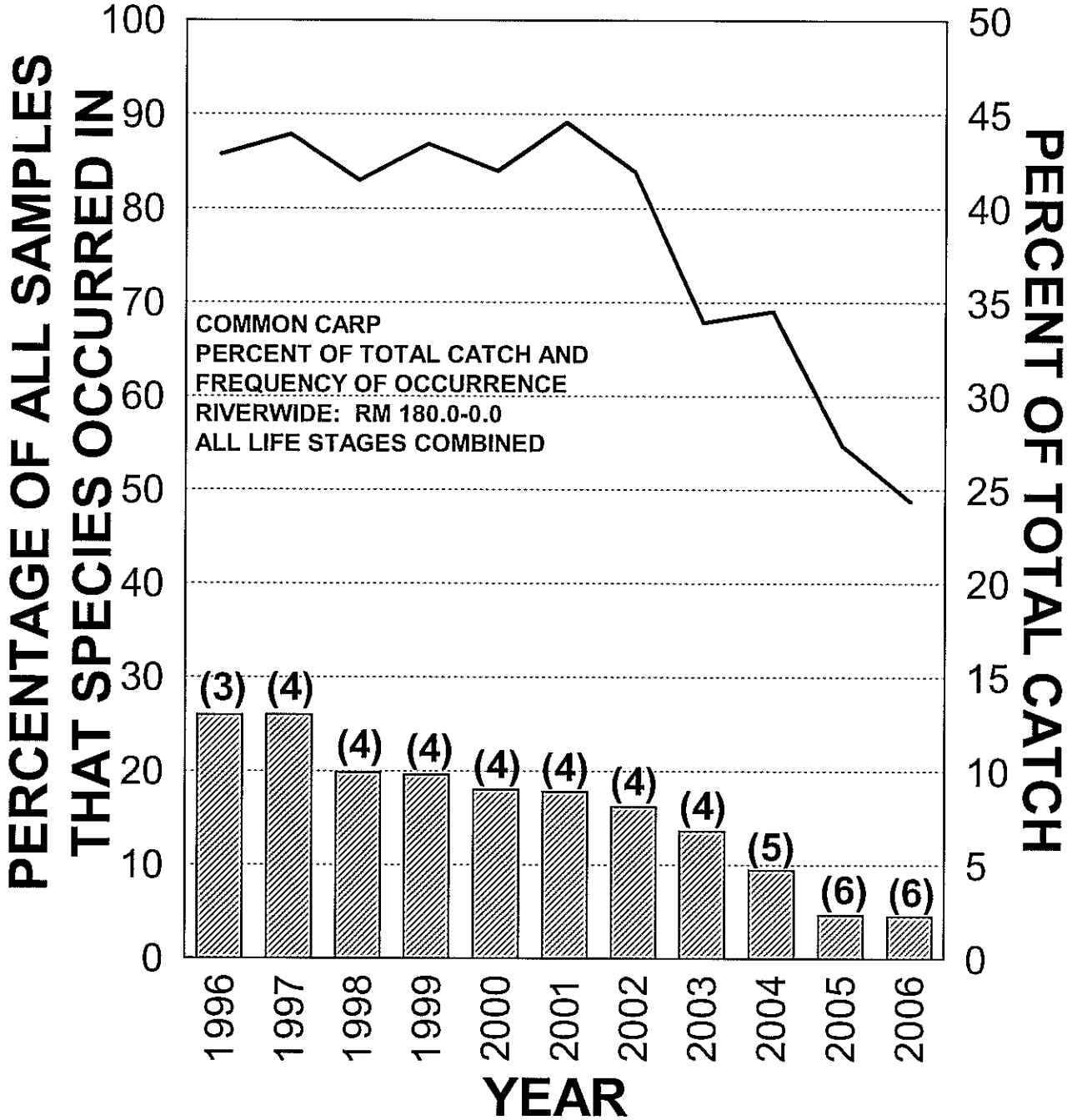

Figure 28. A summary of common carp relative abundance in riverwide Adult Monitoring collections, 1996-2006. The solid black line represents the percentage of all electrofishing samples on a given Adult Monitoring trip in which this species occurred (i.e., frequency of occurrence). The shaded bars represent the percent of the total catch that this species composed in a given year. Numbers in parentheses indicate the numeric rank for this species in a given year relative to all other fish species collected.

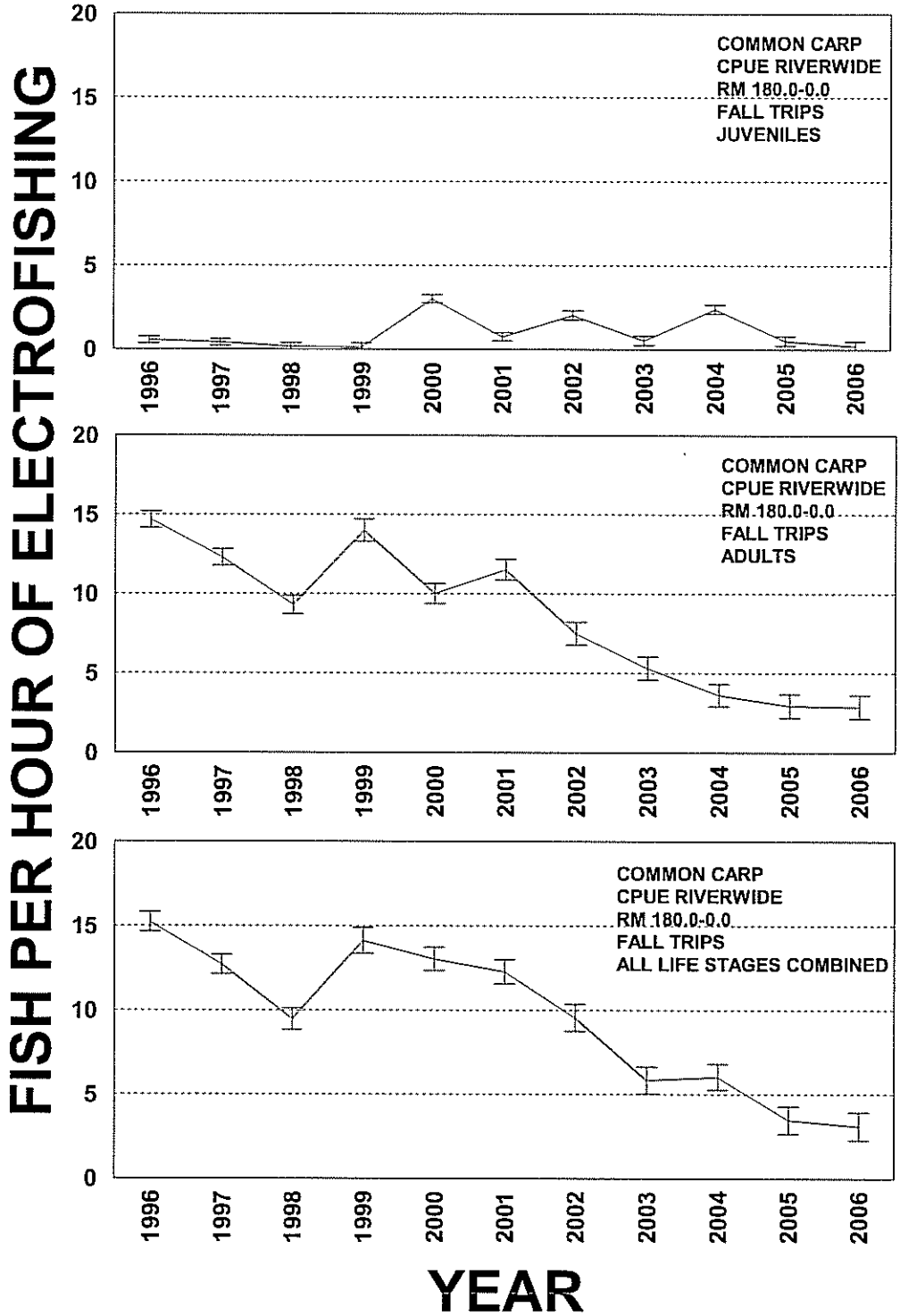

Figure 29. Common carp catch per unit effort (CPUE) riverwide (RM 180.0-0.0) on fall Adult Monitoring trips, for juvenile fish (< 250 mm TL; top), adult fish (≥ 250 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error.

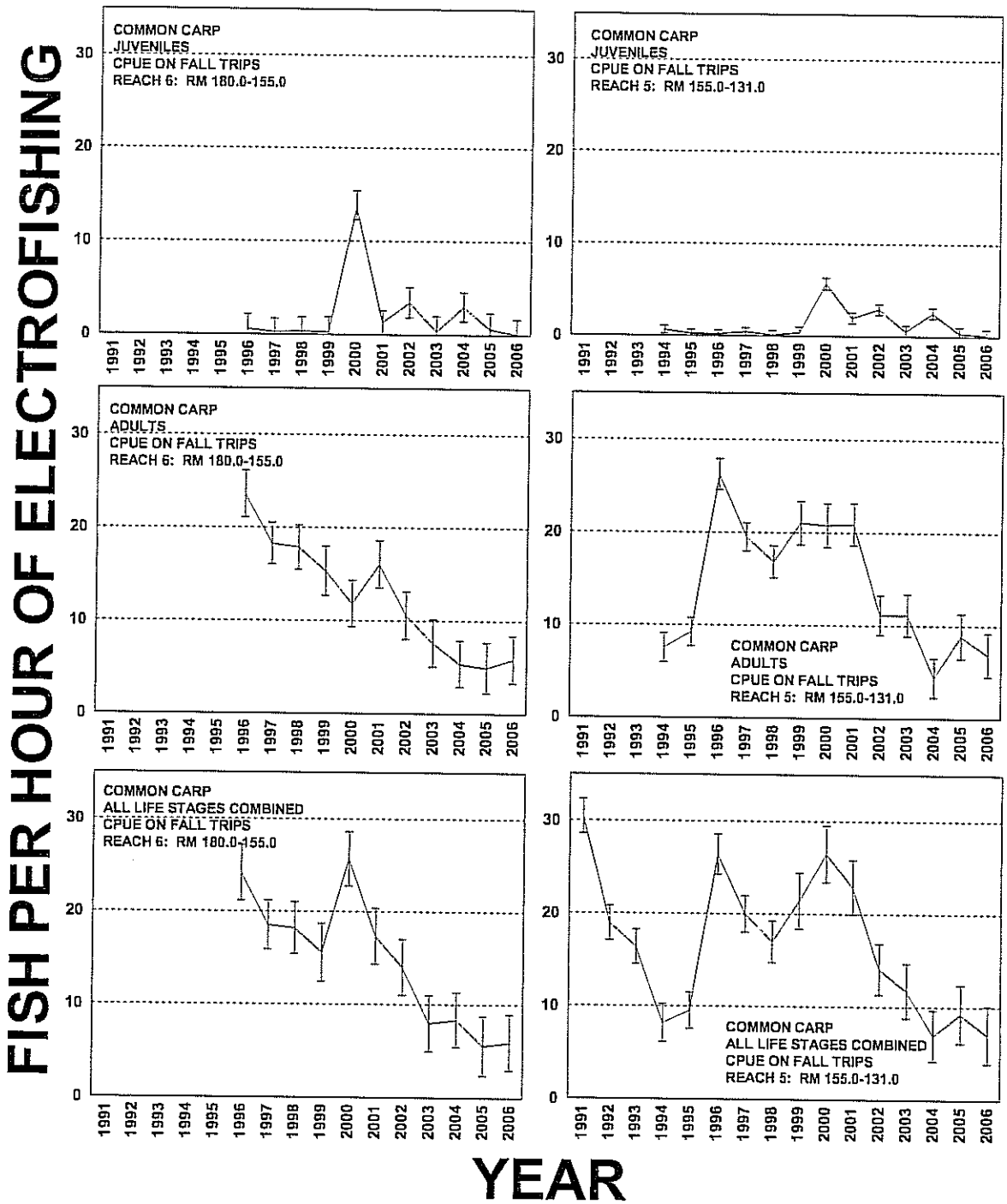

Figure 30. Common carp catch per unit effort (CPUE) in Reach 6 and Reach 5 on fall Adult Monitoring trips for juvenile fish (< 250 mm TL; top), adult fish (≥ 250 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error.

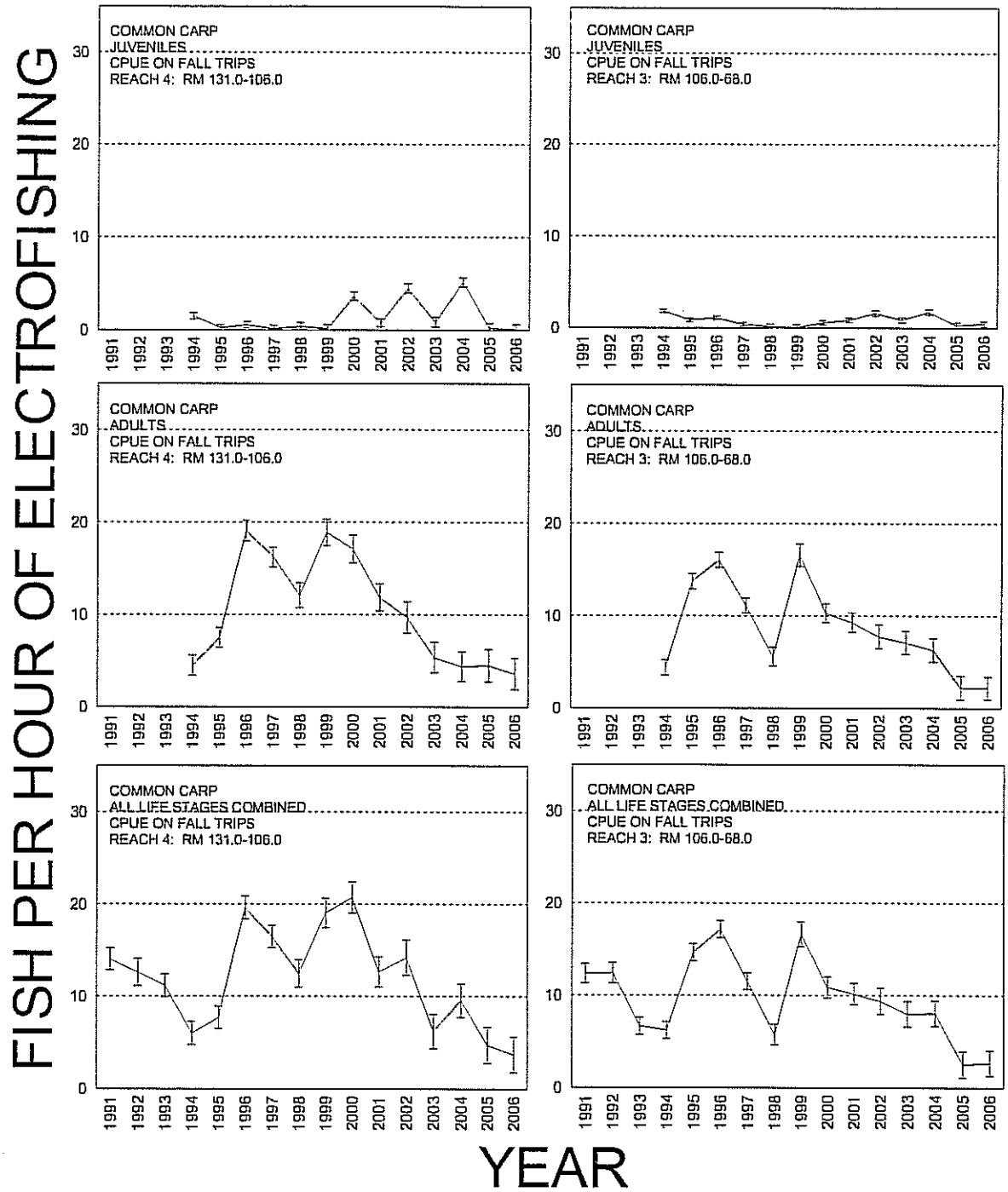

Figure 31. Common carp catch per unit effort (CPUE) in Reach 4 and Reach 3 on fall Adult Monitoring trips for juvenile fish (< 250 mm TL; top), adult fish (≥ 250 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error.

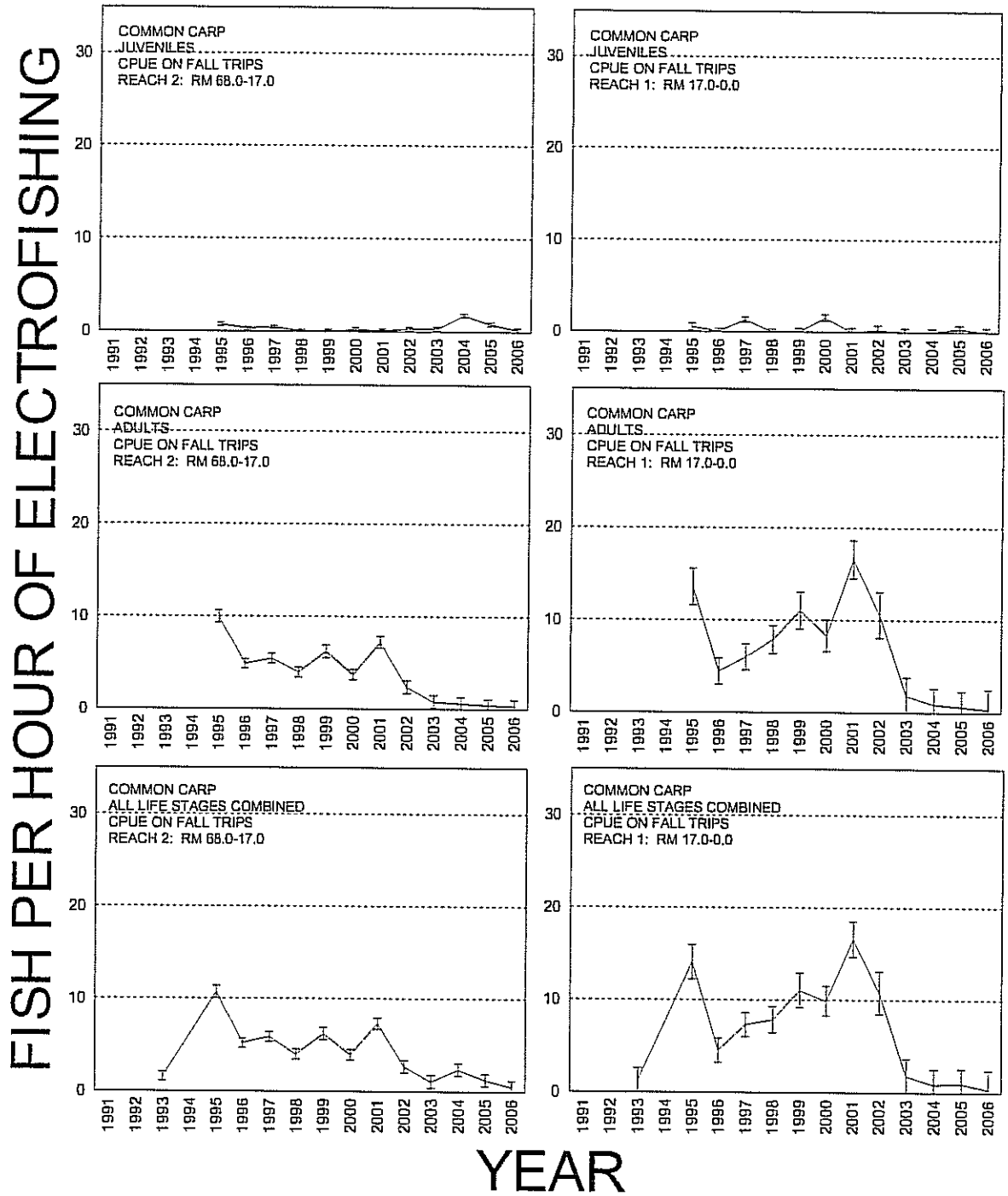

Figure 32. Common carp catch per unit effort (CPUE) in Reach 2 and Reach 1 on fall Adult Monitoring trips for juvenile fish (< 250 mm TL; top), adult fish (≥ 250 mm TL; middle), and for all life stages combined (juveniles + adults; bottom). Error bars represent one standard error.

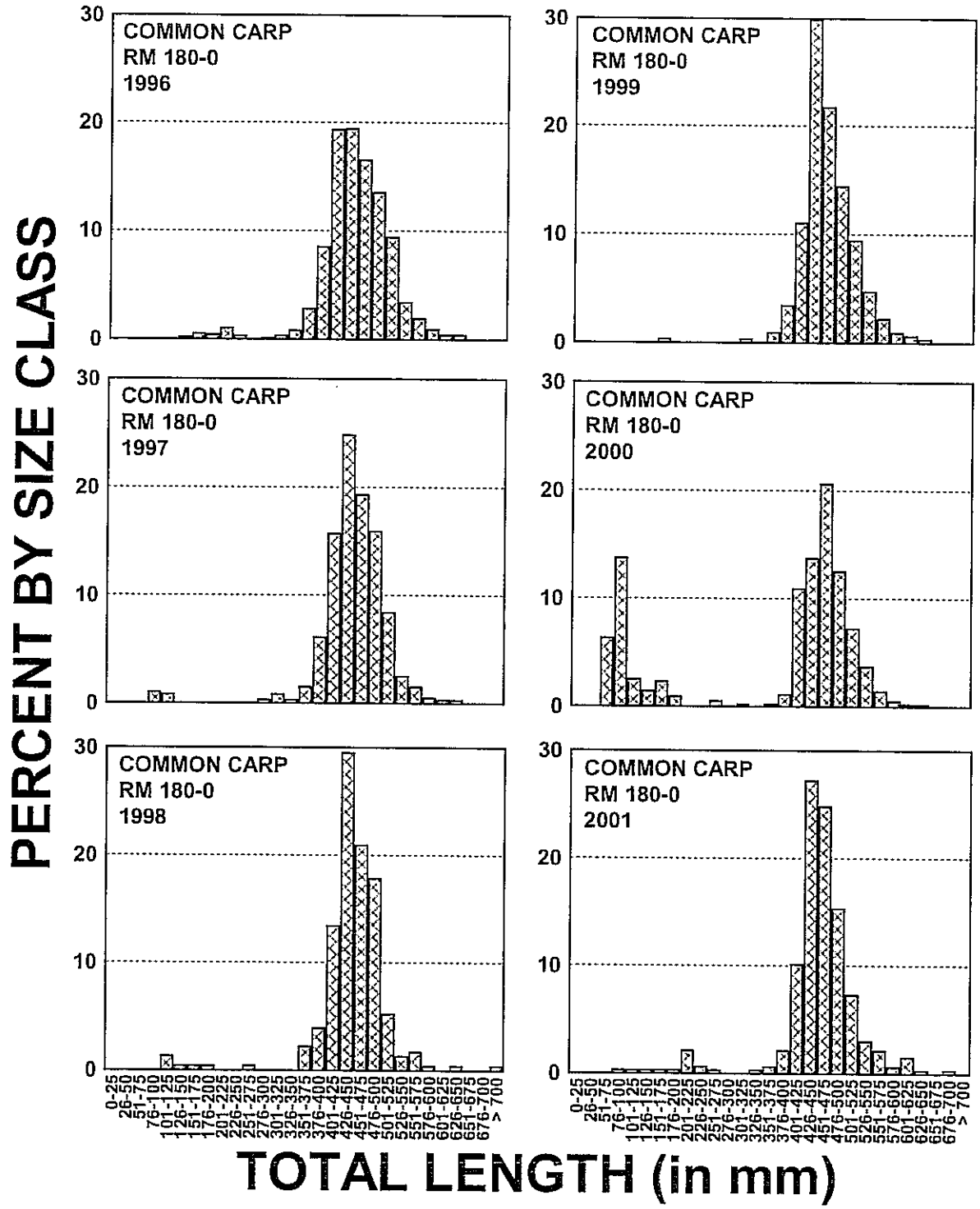

Figure 33. Length-frequency histograms showing the riverwide (RM 180.0-0.0) size-class distribution of common carp on fall Adult Monitoring trips in the San Juan River, 1996-2001.

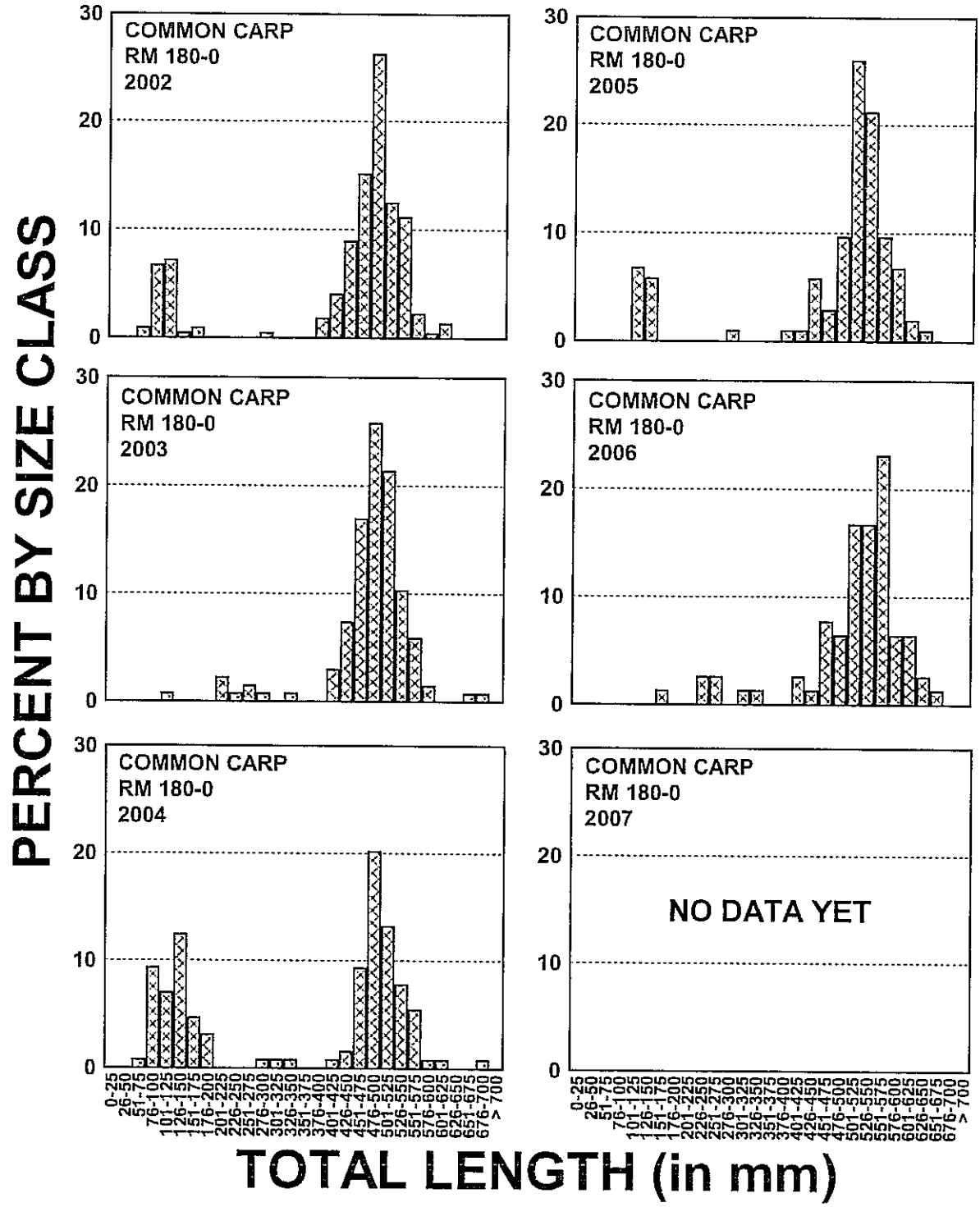

Figure 34. Length-frequency histograms showing the riverwide (RM 180.0-0.0) size-class distribution of common carp on fall Adult Monitoring trips in the San Juan River, 2002-2006.

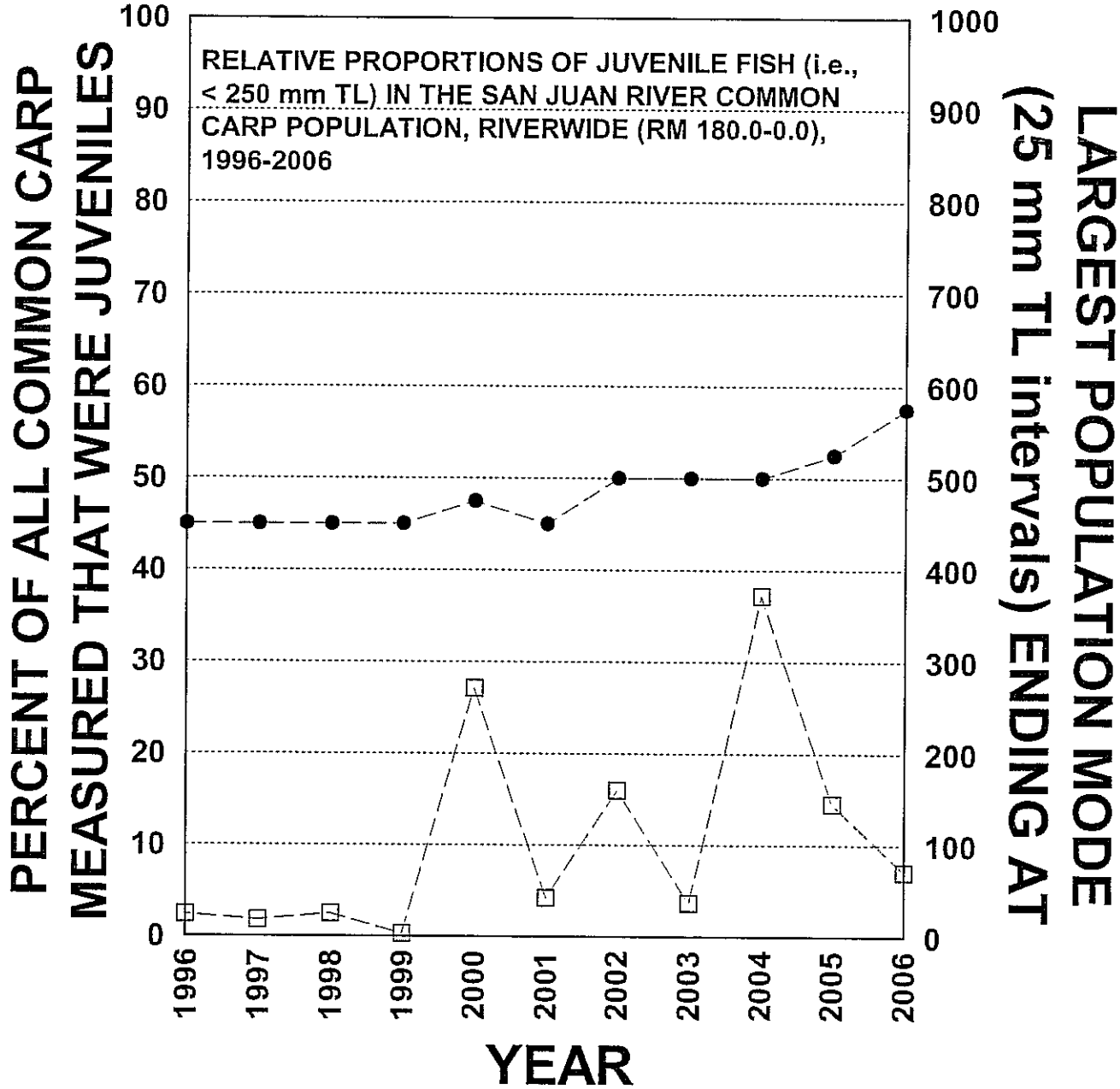

Figure 35. The relative proportion of juvenile fish (< 250 mm TL) observed among common carp collected and measured from the San Juan River, 1996-2006. The bottom dashed line (with open squares) represents the percent of all measured common carp in a given year's samples that were juveniles. The top dashed line (with solid circles) represents the TL at which the largest population mode (from Figures 39 and 40), ended at. Therefore, the 2002-2004 values represent 476-500 mm TL, the 1996-1999 values represent 426-450 mm TL, and so on.

DISCUSSION

Rare Native Fishes

Colorado Pikeminnow

Wild Colorado pikeminnow continue to be absent from Adult Monitoring collections.

The 323 stocked Colorado pikeminnow collected during 2006 Adult Monitoring was the largest number ever collected during one of these trips. However, care must be taken when interpreting that result. The large numbers of Colorado pikeminnow collections in 2006 were essentially just a reflection of the large number (n = 302,270) of fish that were stocked that year. Colorado pikeminnow of more various age- and size-classes were stocked in 2006 than in any previous year (Ryden 2007a). In addition, almost 2,000 fish were stocked barely a month prior to the 2006 Adult Monitoring trip (Ryden 2007a). These facts, combined with the fact that relatively few fish were captured that had been in the river for longer than a year post-stocking, mean that the Colorado pikeminnow population that is currently inhabiting the river is basically behaving like a put-and-take fishery.

Colorado pikeminnow were collected in all six geomorphic reaches in 2006, including Reach 6 upstream of Hogback Diversion. Range expansion of Colorado pikeminnow upstream of this structure was identified as being an important recovery factor for this species (USBR 2001). However, this range expansion has been accomplished by stocking hatchery-reared fish directly into this area of the river, as opposed to colonizing upstream areas of the river on their own. Whether or not recently-stocked fish will survive and remain resident in the river upstream of Hogback Diversion is unknown.

In 2006, there were more different age- and size-classes of Colorado pikeminnow in the river than during any previous year during which Adult Monitoring occurred. If fish from across the range of stocked age- and size-classes of 2006 stockings could retain and survive, it would go a long way towards helping establish a multiple year-class population. Additionally, the stocking of many large subadult and adult Colorado pikeminnow in the summer of 2006 (Ryden 2007a) placed a large group of fish in the river that could potentially begin spawning in 2007, if they survive.

Scaled CPUE comparisons among Colorado pikeminnow that had been stocked as age-0 fish (Appendix B) showed that CPUE varied quite a bit among age-1 fish. For example, scaled CPUE for age-1 fish collected in 2004 was 4.9 times higher than that for age-1 fish collected in 2003 (Table B-1, Figure B-1). However, by the time these fish reached age-2, scaled CPUE values were much more comparable (Table B-2, Figure B-1). At age-3 the scaled CPUE for

these two year-classes of fish were virtually identical (Table B-2, Figure B-1). Scaled CPUE comparisons haven't been done for older stocked fish yet. These comparisons will be included in next year's report. Comparisons of this type over the next several years may help answer such questions as whether or not there is really a long-term advantage to stocking 300,000 + age-0 fish annually, as opposed to stocking 175,000 age-0 fish, as well as whether or not it is more effective to stock age-0 Colorado pikeminnow as opposed to stocking older age-classes.

Razorback Sucker

No wild razorback sucker were collected in 2006.

Numerically, more razorback sucker were collected during 2006 Adult Monitoring than any previous year. However, over 75% of razorback sucker captures during 2006 were fish that had been in the river < 365 days post-stocking.

Far more razorback sucker were stocked in 2006 (18,793) than in any previous year (Ryden 2007b). Yet, the 2006 and 2004 CPUE values were not statistically different from one another, despite the fact that almost 6.3 times as many razorback sucker were stocked in 2006 as in 2004 (n = 2,988; Ryden 2007b). One possible explanation for 2006 stockings not resulting in a higher associated CPUE value during Adult Monitoring could be that many of the razorback sucker stocked in 2006 (n = 7,599; 40.4%) were salvaged from two grow-out ponds as they were being drained. Since the draining and salvage process tends to be very stressful on fish, an unknown number of them may have succumbed to either delayed mortality or extended downstream drift (possibly into Lake Powell) after stocking. Additionally, 80.5% of all razorback sucker stocked during 2006 were < 300 mm TL when stocked (Ryden 2007b). It has long been known that razorback sucker stocked at < 300 mm TL tend to be captured much less frequently post-stocking than do razorback sucker stocked at larger sizes (Ryden 2000b). The exact reasons are unknown at this point. However, if it does become apparent that fish collected during pond draining and salvage are being lost due to stress-related factors, it may be necessary to acclimate these fish, as has been done with age-0 Colorado pikeminnow, in order to increase post-stocking survival.

Razorback sucker were collected from all six geomorphic reaches in 2006. Yet, despite the large number of fish being stocked just downstream of the Hogback Diversion and the presence of a fish passage on that structure, only one razorback sucker was collected upstream of it during 2006 Adult Monitoring. Likewise, few razorback sucker (n = 4) were collected in the PNM Weir at RM 166.6 in 2006 (A. Lapahie, pers. comm.). In contrast, 49.3% (n = 71) of all razorback sucker collected during 2006 Adult Monitoring were collected between the Hogback stocking site and the town of Shiprock (RM 147.9). It does not appear as if large number of this species are making their way through the Hogback fish ladder into upstream section of the river.

Roundtail Chub

No roundtail chub were collected during 2006 Adult Monitoring.

Roundtail chub, a state-listed endangered species in both New Mexico and Utah, continue to be the most rarely-collected of the three rare fish species in the San Juan River. Collections of roundtail chub in the San Juan River, when they do occur, tend to be concentrated mostly in areas downstream of the LaPlata and Mancos river confluences (Ryden 2004). These two small rivers, along with the Animas River, are the only three tributaries of the San Juan River that are known to have resident populations of roundtail chub (Miller and Rees 2000). The large majority of the roundtail chub collections between 1987 and 2003 consisted of subadult fish (Ryden 2004).

Between 1991 and 2003, a total of 25 roundtail chub (TL range = 116-414 mm) were implanted with PIT tags (SJRIP Integrated Database). Of these 25, only three individuals were recaptured a second time after their initial capture and release (Ryden 2004).

The dearth of adult roundtail chub in the San Juan River, combined with a lack of recaptures among PIT-tagged fish over time, and the fact that most roundtail chub captures in the mainstem San Juan River occur downstream of major tributaries known to have resident populations of roundtail chub, would seem to suggest that the roundtail chub being collected in the mainstem San Juan are only transient members of the mainstem river's fish community. It seems very plausible that roundtail chub collected in the mainstem San Juan River get flushed out of tributaries during high flow events and either perish or move up- or downstream out of the mainstem river fairly quickly after entering it.

Common Native Fishes

Flannelmouth Sucker

Flannelmouth sucker are still the most abundantly-collected large-bodied fish species in the San Juan River. This species is consistently collected in > 90% of all electrofishing riverwide each year. Flannelmouth sucker are found throughout all six river reaches in the Adult Monitoring study area and are ubiquitous, occupying a multitude of habitat types. In addition, flannelmouth sucker of all life stages continue to be collected with regularity, showing that reproduction and recruitment are still occurring. Long-term trend lines show that despite year-to-year fluctuations observed in riverwide CPUE, the flannelmouth sucker population has remained relatively stable over the last eleven years.

CPUE values in Reaches 5-3 collected from 1991-1993 would seem to indicate that while the San Juan River flannelmouth sucker population appears to be relatively stable over the last eleven years (1996-2006), its overall abundance is less than what it likely was, riverwide, in the early 1990's. Conversely, 1991-1993 may have been anomalous years. If the CPUE values for those three years were removed from the data set, then there would be no trend toward lower CPUE values from 1996-2006 on (M. Warren pers. comm.).

Bluehead Sucker

Bluehead sucker continue to be among the three most commonly large-bodied fish species collected during Adult Monitoring. Bluehead sucker are collected in Reaches 6-2 in most years, but rarely in Reach 1 adjacent to Lake Powell. Within our study area, bluehead sucker are heavily concentrated in upstream reaches of the river, specifically in Reach 6 and to a lesser degree in Reach 5. Given this concentration in the most upstream reach of our study area and the marked fluctuations in bluehead sucker CPUE observed in Reach 6 over the last eleven years, it seems likely that these fish are interacting (e.g., via immigration, emigration, reproduction) with bluehead sucker that are known to be common in adjacent upstream sections of the San Juan and Animas rivers (e.g. Zimmerman 2005).

Over the last five years, juvenile bluehead sucker have become more widely distributed, longitudinally, throughout the San Juan River. The reason for this is unknown. The last four years corresponds nicely to the time that intensive nonnative fish removal efforts have been in place in both the upper (RM 166.6-147.9; 2001-present) and lower (RM 52.9-2.9; 2002-present) San Juan River. However, whether the increased distribution and number of juvenile bluehead sucker riverwide is actually tied to nonnative fish removal efforts, or whether these two things are purely coincidental is unknown.

Common Nonnative Fishes

Channel Catfish

Channel catfish are the most commonly-collected nonnative fish during Adult monitoring. They continue to be collected in all six geomorphic reaches, although their numbers in reaches encompassed by nonnative fish removal efforts have been visibly reduced. Riverwide, CPUE values for channel catfish are essentially the same as they were in 1996, however, the longitudinal distribution of this species has changed. The majority of channel catfish were residing between RM 147.9 and 52.9 during the 2006 Adult monitoring trip. The center of this population was distributed in the river section between Four Corners bridge and Montezuma Creek, UT (RM 119.2-93.5). The exact causes of the longitudinal shift in channel catfish

distribution between 2001 and 2006 are unknown. However, it is my belief that nonnative fish removal has been a heavily contributing factor. This species is now much more heavily concentrated in areas of the river where there are no repetitive, intensive removal efforts currently underway.

Common Carp

Common carp were the sixth most commonly-collected species during 2006 Adult Monitoring. Common carp were collected in all six geomorphic reaches in 2006, although just a single individual was collected in Reach 1 adjacent to Lake Powell. In the last 3-4 years, common carp numbers have become much reduced. While the exact causes of the large-scale decline of common carp are unknown, it is my belief that nonnative fish removal has been a heavily contributing factor. Common carp were numerically less "common" than were endangered Colorado pikeminnow in 2006 collections. Common carp accounted for barely 2% of the total catch and were collected in less than half of all electrofishing samples riverwide in 2006. Only 254 common carp were collected during 2006 Adult Monitoring. In comparison, during 1998 Adult Monitoring, 77 common carp were collected in just one electrofishing sample (RM 163-162). During 2006 Adult Monitoring, less than four times that number were collected in 197 electrofishing samples.

Large, adult common carp has always been the dominant life stage collected during Adult Monitoring trips. However, as overall numbers of common carp become have declined, the remaining adults have become noticeably larger, in terms of TL.

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APPENDIX A

Tables With Details On Colorado Pikeminnow And Razorback Sucker Collected On The Fall 2006 Adult Monitoring Trip

Table A-1. Colorado pikeminnow collected from the San Juan River on the fall 2006 Adult Monitoring trip (n = 323).

Species	Date Of Capture	Old PIT Tag Number	New PIT Tag Number	Total Length (in mm)	Weight (in g)	Capture River Mile	Sex
Colorado pikeminnow	9/18/2006	NONE	NONE	128	13	158	I
Colorado pikeminnow	9/18/2006	NONE	NONE	134	23	158	I
Colorado pikeminnow	9/18/2006	NONE	NONE	116	10	158	I
Colorado pikeminnow	9/18/2006	NONE	NONE	121	13	157	I
Colorado pikeminnow	9/18/2006	NONE	NONE	140	14	157	I
Colorado pikeminnow	9/18/2006	NONE	NONE	122	10	157	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C691DBB	163	32	157	I
Colorado pikeminnow	9/18/2006	NONE	3D91BF18E3945	165	27	157	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C69CAFA	141	17	157	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C699BDD	130	12	157	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C6BB080	142	15	157	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C6BBE64	146	19	157	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C69BFF0	145	18	157	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C69CF42	141	16	154.3	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C69D0D7	171	30	154.3	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C69C3FA	137	15	154.3	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C6B9521	171	31	154.3	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C69AB83	207	62	154.3	I
Colorado pikeminnow	9/18/2006	NONE	3D91BF1D85CCF	194	43	154.3	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C69C9A3	165	29	154.3	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C69EBF6	163	25	154.3	I
Colorado pikeminnow	9/18/2006	NONE	3D91BF1D8C274	182	28	154.3	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C6B8894	136	18	154.3	I
Colorado pikeminnow	9/18/2006	NONE	UNKNOWN	185	24	154.3	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C6BA56E	278	150	151	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C69D729	148	20	151	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C69CECD	177	36	151	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C6BA125	173	35	151	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C69CE75	147	22	151	I

Sex: I = Indeterminate; F = Female; M = Male

Table A-1. Continued.

Species	Date Of Capture	Old PIT Tag Number	New PIT Tag Number	Total Length (in mm)	Weight (in g)	Capture River Mile	Sex
Colorado pikeminnow	9/18/2006	NONE	3D9257C699F92	211	60	151	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C692CCE	235	87	150	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C69916A	252	100	150	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C69B36C	204	63	150	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C69ABF4	151	21	150	I
Colorado pikeminnow	9/18/2006	NONE	3D9257C69B636	194	54	150	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C69B8D6	178	38	146	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6AE417	396	420	146	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6BADB7	404	430	146	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6992DD	393	403	146	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6BAC3F	527	960	146	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C69BF43	192	42	146	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C69F64B	445	550	145	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6978FC	455	530	145	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C699C17	395	390	145	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C69FB02	402	390	145	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C69A25E	156	13	145	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C69C377	166	29	142	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6AEE8D	396	420	142	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C69A063	372	405	142	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6B1CCE	418	400	142	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6B2421	446	530	142	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6A0580	517	660	142	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C69C7B0	150	20	142	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C69ACF9	132	17	142	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6AE8B5	418	450	142	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C699BE4	188	45	142	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C69B9F4	182	42	142	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6B9B8B	192	46	142	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C695851	457	600	142	I

Sex: I = Indeterminate; F = Female; M = Male

Table A-1. Continued.

Species	Date Of Capture	Old PIT Tag Number	New PIT Tag Number	Total Length (in mm)	Weight (in g)	Capture River Mile	Sex
Colorado pikeminnow	9/19/2006	NONE	3D9257C696A65	456	585	142	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C695D9A	416	500	142	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6A02D3	422	520	140.1	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6B1A6C	402	420	140.1	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6BB0C5	406	510	140.1	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6BABFE	356	345	140.1	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6B1A42	552	1250	140.1	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C697034	487	800	140.1	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6B0D21	471	650	140.1	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6ACF92	427	485	139	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6BABA1	395	375	139	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6BAAB4	148	21	137	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6B16D3	435	545	136	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6AE8BA	406	442	136	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C69F794	439	520	136	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6BB1F8	178	37	136	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6BADC9	450	560	136	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C698DD9	339	300	136	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6BBD8D	366	345	134	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6975E3	443	590	134	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6A1AD5	425	490	134	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6AE859	412	420	134	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6A0341	417	420	134	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6B22DD	444	510	134	I
Colorado pikeminnow	9/19/2006	NONE	3D9257C6B1D3A	410	400	134	I
Colorado pikeminnow	9/20/2006	NONE	3D91BF18C310E	306	197	131	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C6ADDE5	372	298	131	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C69D39D	175	34	131	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C697108	409	402	131	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C6B9E91	161	32	131	I

Sex: I = Indeterminate; F = Female; M = Male

Table A-1. Continued.

Species	Date Of Capture	Old PIT Tag Number	New PIT Tag Number	Total Length (in mm)	Weight (in g)	Capture River Mile	Sex
Colorado pikeminnow	9/20/2006	NONE	3D9257C69FE6E	405	400	131	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C6BB82C	428	451	131	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C6B171E	392	375	131	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C6B955B	302	207	131	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C6AEDA2	378	290	131	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C69C7BB	261	100	131	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C6BAF5A	451	515	130	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C69D08B	216	68	130	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C6B1B79	192	55	130	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C6BB524	425	430	130	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C69A9B6	383	335	130	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C69753D	458	630	130	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C697C99	400	400	130	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C699B3E	142	20	130	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C69A5EB	193	53	130	I
Colorado pikeminnow	9/20/2006	NONE	3D91BF18C2F58	388	422	130	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C69C313	284	190	127	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C6B9A39	196	50	127	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C695F26	229	100	127	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C69D6E5	157	16	127	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C69C692	200	42	127	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C699C4A	179	27	127	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C697962	433	460	127	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C6BAC00	496	740	127	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C6BB821	212	59	127	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C69A761	196	56	127	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C69D8FD	184	42	127	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C6B9342	186	37	127	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C6B0D45	462	605	127	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C6BB16A	390	99999	125.5	I

Sex: I = Indeterminate; F = Female; M = Male

Table A-1. Continued.

Species	Date Of Capture	Old PIT Tag Number	New PIT Tag Number	Total Length (in mm)	Weight (in g)	Capture River Mile	Sex
Colorado pikeminnow	9/20/2006	NONE	3D9257C6BB4B2	374	315	125.5	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C6B9992	173	32	125.5	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C69B51A	198	53	125.5	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C698112	198	50	125.5	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C697905	457	430	125.5	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C69AEAE	187	41	123	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C697451	390	370	123	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C6BA2BD	168	28	123	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C699963	485	830	123	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C69D47C	209	56	123	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C696CC1	436	495	123	I
Colorado pikeminnow	9/20/2006	NONE	3D9257C69740E	410	470	123	I
Colorado pikeminnow	9/21/2006	NONE	3D9257C69C423	159	24	178	I
Colorado pikeminnow	9/21/2006	NONE	3D9257C69991C	163	27	175	I
Colorado pikeminnow	9/21/2006	NONE	3D9257C6BC05C	248	125	175	I
Colorado pikeminnow	9/21/2006	NONE	3D9257C696694	186	40	175	I
Colorado pikeminnow	9/21/2006	NONE	3D9257C6957F9	187	49	175	I
Colorado pikeminnow	9/21/2006	NONE	3D9257C6B7006	118	14	175	I
Colorado pikeminnow	9/21/2006	NONE	3D9257C6960DB	197	41	175	I
Colorado pikeminnow	9/21/2006	NONE	3D9257C69DAB4	157	20	175	I
Colorado pikeminnow	9/21/2006	NONE	3D9257C69B0F9	174	32	173	I
Colorado pikeminnow	9/21/2006	NONE	3D9257C69BCD2	155	18	173	I
Colorado pikeminnow	9/21/2006	NONE	3D9257C69D544	260	130	172	I
Colorado pikeminnow	9/21/2006	NONE	3D9257C698D66	207	57	172	I
Colorado pikeminnow	9/21/2006	NONE	3D9257C69C784	181	41	169.8	I
Colorado pikeminnow	9/21/2006	NONE	3D9257C69545C	193	40	169	I
Colorado pikeminnow	9/21/2006	NONE	3D9257C6B9B8F	188	40	169	I
Colorado pikeminnow	9/21/2006	NONE	3D9257C6B9C0B	168	31	169	I
Colorado pikeminnow	9/21/2006	NONE	3D9257C6BBFDF	251	100	169	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C6BA8D1	228	84	166	I

Sex: I = Indeterminate; F = Female; M = Male

Table A-1. Continued.

Species	Date Of Capture	Old PIT Tag Number	New PIT Tag Number	Total Length (in mm)	Weight (in g)	Capture River Mile	Sex
Colorado pikeminnow	9/22/2006	NONE	3D9257C6B9FDE	216	69	164	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C695B09	242	100	164	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C69CCFC	152	19	164	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C69CCA3	155	32	164	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C69D889	203	54	164	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C6B4D1D	247	120	164	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C695D66	206	43	163	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C67A824	206	44	163	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C69A258	161	21	163	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C6A01AD	179	31	163	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C69C6CD	151	23	163	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C6BBD9E	176	33	163	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C6BA6D3	182	34	161	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C69F191	163	24	161	I
Colorado pikeminnow	9/22/2006	NONE	3D91BF18E12C2	154	16	161	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C69D2A6	153	17	161	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C69B4AD	180	37	161	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C699AED	175	34	161	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C69AB91	185	48	160	I
Colorado pikeminnow	9/22/2006	NONE	3D9257C699CE9	155	33	160	I
Colorado pikeminnow	10/2/2006	NONE	3D9257C6B92BB	280	170	118	I
Colorado pikeminnow	10/2/2006	NONE	3D9257C6B2A1A	413	390	118	I
Colorado pikeminnow	10/2/2006	NONE	NONE	130	7	118	I
Colorado pikeminnow	10/2/2006	NONE	3D9257C6B9F86	161	33	118	I
Colorado pikeminnow	10/2/2006	NONE	3D9257C6BAE1C	190	39	116	I
Colorado pikeminnow	10/2/2006	NONE	3D9257C6B93D2	225	65	116	I
Colorado pikeminnow	10/2/2006	NONE	3D9257C69B152	330	220	116	I
Colorado pikeminnow	10/2/2006	NONE	3D9257C69BF12	206	54	116	I
Colorado pikeminnow	10/2/2006	NONE	3D9257C6B3404	433	490	116	I
Colorado pikeminnow	10/2/2006	NONE	3D9257C6B9B53	191	52	115	I

Sex: I = Indeterminate; F = Female; M = Male

Table A-1. Continued.

Species	Date Of Capture	Old PIT Tag Number	New PIT Tag Number	Total Length (in mm)	Weight (in g)	Capture River Mile	Sex
Colorado pikeminnow	10/2/2006	NONE	3D9257C66EE36	354	290	115	I
Colorado pikeminnow	10/2/2006	NONE	3D9257C69C722	267	142	115	I
Colorado pikeminnow	10/2/2006	NONE	3D9257C6A0814	391	350	113	I
Colorado pikeminnow	10/2/2006	NONE	3D9257C69BF3D	196	52	112	I
Colorado pikeminnow	10/2/2006	NONE	3D9257C6B4F7B	249	92	110	I
Colorado pikeminnow	10/2/2006	NONE	3D9257C69C51B	180	40	110	I
Colorado pikeminnow	10/3/2006	NONE	NONE	123	15	107	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C6B1A5C	414	407	107	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C69D1E9	202	70	107	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C6BC499	237	95	107	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C679FA2	244	95	107	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C696FCC	420	460	107	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C69C6FA	162	25	107	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C6998CF	192	50	107	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C6BA7EF	194	50	107	I
Colorado pikeminnow	10/3/2006	NONE	NONE	119	5	106	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C67AD2C	231	80	106	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C6BBBDB	375	330	106	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C696969	406	395	106	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C6956C7	420	460	106	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C6AF393	410	415	106	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C6A0906	361	265	104	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C679980	222	80	104	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C69BC8D	166	27	104	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C6B2443	272	125	104	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C6BBCE0	180	42	104	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C6912B7	227	90	104	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C69D71B	152	16	103	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C69CF5F	323	215	103	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C69D53A	302	195	103	I

Sex: I = Indeterminate; F = Female; M = Male

Table A-1. Continued.

Species	Date Of Capture	Old PIT Tag Number	New PIT Tag Number	Total Length (in mm)	Weight (in g)	Capture River Mile	Sex
Colorado pikeminnow	10/3/2006	NONE	3D9257C69C05E	150	18	100	I
Colorado pikeminnow	10/3/2006	NONE	3D9257C69C8C8	155	15	97	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C68940F	206	60	95	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C6958EB	383	370	95	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C6AF312	439	520	95	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C6B1CB7	403	430	94	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C69DA9A	210	55	92	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C69D8F1	210	62	92	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C6BA1C1	202	48	92	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C69845B	374	280	91	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C66E08E	392	345	91	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C66E3B2	359	310	91	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C69B095	216	74	91	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C69C769	177	41	91	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C69CB72	196	42	91	I
Colorado pikeminnow	10/4/2006	NONE	3D91BF18E42D0	298	200	91	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C6BB2BE	407	380	91	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C6B9557	309	210	89	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C6B7FA1	361	270	89	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C6BA87C	211	70	89	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C6BBD2A	411	432	89	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C6B421C	176	34	88	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C69C556	131	19	88	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C69D6DC	192	50	86	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C69B768	177	30	86	I
Colorado pikeminnow	10/4/2006	NONE	3D9257C6B996C	212	64	85	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C6BB5E0	460	640	83	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C692F67	173	33	83	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C6B9D8F	195	50	83	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C6B1DFD	400	450	83	I

Sex: I = Indeterminate; F = Female; M = Male

Table A-1. Continued.

Species	Date Of Capture	Old PIT Tag Number	New PIT Tag Number	Total Length (in mm)	Weight (in g)	Capture River Mile	Sex
Colorado pikeminnow	10/5/2006	NONE	3D91BF18C72E4	395	410	82	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C6B1C94	372	310	82	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C6B8880	370	350	82	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C69CC07	220	70	82	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C69ED6A	197	42	82	I
Colorado pikeminnow	10/5/2006	NONE	3D91BF1D8AADF	355	320	82	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C6BA7AA	318	200	79	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C6B52D0	221	72	79	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C697D7D	444	470	77	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C697A77	252	135	77	I
Colorado pikeminnow	10/5/2006	NONE	3D91BF18E71AE	176	35	77	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C69B89D	230	75	76	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C69E342	195	50	76	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C699BD2	196	42	76	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C6B934B	197	43	76	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C6BB9AD	225	71	76	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C6BA7FD	218	53	73.9	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C69D02B	195	50	73.9	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C6B519	206	54	73.9	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C69B6E6	176	38	73.9	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C699A74	222	80	73.9	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C69CFE4	191	39	73.9	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C6B98CA	210	60	73.9	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C69EC8D	229	71	73.9	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C69795D	393	380	73.9	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C699D2A	197	54	73	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C699D1C	205	56	73	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C69B9D8	205	49	73	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C69D104	196	34	73	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C69D746	235	90	73	I

Sex: I = Indeterminate; F = Female; M = Male

Table A-1. Continued.

Species	Date Of Capture	Old PIT Tag Number	New PIT Tag Number	Total Length (in mm)	Weight (in g)	Capture River Mile	Sex
Colorado pikeminnow	10/5/2006	NONE	3D9257C6BA06A	181	31	73	I
Colorado pikeminnow	10/5/2006	NONE	3D9257C6 ???	180	32	73	I
Colorado pikeminnow	10/6/2006	NONE	3D9257C697EE4	243	99	70.8	I
Colorado pikeminnow	10/6/2006	NONE	3D9257C6B5E90	223	60	70.8	I
Colorado pikeminnow	10/6/2006	NONE	3D9257C697821	247	120	70.8	I
Colorado pikeminnow	10/6/2006	NONE	3D9257C6BB9FB	409	450	70	I
Colorado pikeminnow	10/6/2006	NONE	3D9257C697A0E	303	190	70	I
Colorado pikeminnow	10/6/2006	NONE	3D9257C6BB243	314	175	70	I
Colorado pikeminnow	10/6/2006	NONE	3D9257C696ED4	221	66	68	I
Colorado pikeminnow	10/6/2006	NONE	3D9257C6988DF	223	62	68	I
Colorado pikeminnow	10/6/2006	NONE	3D9257C695388	226	92	68	I
Colorado pikeminnow	10/6/2006	NONE	3D9257C6977A1	205	42	68	I
Colorado pikeminnow	10/6/2006	NONE	3D91BF1D4FB6D	393	370	68	I
Colorado pikeminnow	10/6/2006	NONE	3D9257C696F0A	260	110	67	I
Colorado pikeminnow	10/6/2006	NONE	3D9257C696B70	227	68	67	I
Colorado pikeminnow	10/6/2006	NONE	3D9257C69F38D	455	540	65	I
Colorado pikeminnow	10/6/2006	NONE	3D9257C697A7A	248	105	64	I
Colorado pikeminnow	10/6/2006	NONE	3D9257C699580	402	415	64	I
Colorado pikeminnow	10/7/2006	NONE	3D9257C6BC057	206	58	56	I
Colorado pikeminnow	10/7/2006	NONE	3D9257C6B9358	233	70	56	I
Colorado pikeminnow	10/7/2006	NONE	3D9257C6BAEAB	198	49	55	I
Colorado pikeminnow	10/7/2006	NONE	3D9257C6BB760	205	52	55	I
Colorado pikeminnow	10/7/2006	NONE	3D9257C69BE05	196	40	53	I
Colorado pikeminnow	10/7/2006	NONE	3D9257C6BB205	195	53	53	I
Colorado pikeminnow	10/7/2006	NONE	3D9257C69D515	192	46	52	I
Colorado pikeminnow	10/7/2006	NONE	3D9257C6B0FD4	405	440	49	I
Colorado pikeminnow	10/7/2006	NONE	3D9257C69C5B8	230	70	49	I
Colorado pikeminnow	10/7/2006	NONE	3D91BF1A01A0D	317	190	49	I
Colorado pikeminnow	10/7/2006	NONE	3D9257C6B9703	203	55	49	I
Colorado pikeminnow	10/7/2006	NONE	3D9257C69960E	287	135	46	I

Sex: I = Indeterminate; F = Female; M = Male

Table A-1. Continued.

Species	Date Of Capture	Old PIT Tag Number	New PIT Tag Number	Total Length (in mm)	Weight (in g)	Capture River Mile	Sex
Colorado pikeminnow	10/8/2006	NONE	3D9257C69DBDD	200	47	41	I
Colorado pikeminnow	10/8/2006	NONE	3D9257C699B15	199	39	41	I
Colorado pikeminnow	10/8/2006	NONE	3D9257C696A80	173	32	41	I
Colorado pikeminnow	10/8/2006	NONE	3D9257C6B10CD	438	540	41	I
Colorado pikeminnow	10/8/2006	NONE	3D9257C69D426	305	200	41	I
Colorado pikeminnow	10/8/2006	NONE	3D9257C6B31A7	367	315	41	I
Colorado pikeminnow	10/8/2006	NONE	3D9257C695856	402	370	40	I
Colorado pikeminnow	10/8/2006	NONE	3D9257C6977E6	186	42	40	I
Colorado pikeminnow	10/8/2006	NONE	3D9257C6BA979	220	53	38	I
Colorado pikeminnow	10/8/2006	NONE	3D9257C6BA7B3	187	40	37	I
Colorado pikeminnow	10/8/2006	NONE	3D9257C695823	212	50	37	I
Colorado pikeminnow	10/8/2006	NONE	3D9257C69B25B	208	63	37	I
Colorado pikeminnow	10/8/2006	NONE	3D9257C6BB254	197	33	32.5	I
Colorado pikeminnow	10/8/2006	NONE	3D9257C69611E	242	84	30	I
Colorado pikeminnow	10/8/2006	NONE	3D91BF18D1ACA	408	466	27	I
Colorado pikeminnow	10/9/2006	NONE	3D91BF18C99E2	348	248	17.6	I
Colorado pikeminnow	10/9/2006	NONE	3D9257C6973ED	191	42	17.6	I
Colorado pikeminnow	10/9/2006	NONE	3D9257C69BB74	302	160	16	I
Colorado pikeminnow	10/9/2006	NONE	3D9257C69B604	309	185	14.3	I
Colorado pikeminnow	10/9/2006	NONE	3D91BF18E7988	167	20	11	I
Colorado pikeminnow	10/9/2006	NONE	3D9257C6B313F	395	375	11	I
Colorado pikeminnow	10/9/2006	NONE	3D9257C6BB0F8	152	20	10	I
Colorado pikeminnow	10/9/2006	NONE	3D9257C6B1B6A	180	29	10	I
Colorado pikeminnow	10/9/2006	NONE	3D9257C6B2F56	159	18	10	I

Sex: I = Indeterminate; F = Female; M = Male

Table A-2. Razorback sucker collected from the San Juan River on the fall 2006 Adult Monitoring trip (n = 144).

Species	Date Of Capture	Old PIT Tag Number	New PIT Tag Number	Total Length (in mm)	Weight (in g)	Capture River Mile	Sex
razorback sucker	9/18/2006	NONE	3D9257C6B92B7	410	580	158	I
razorback sucker	9/18/2006	NONE	3D9257C6A0B01	471	960	158	I
razorback sucker	9/18/2006	NONE	3D9257C6BA3E8	412	555	158	I
razorback sucker	9/18/2006	NONE	3D9257C69E165	422	592	158	I
razorback sucker	9/18/2006	NONE	3D9257C69C33D	364	420	158	I
razorback sucker	9/18/2006	NONE	3D9257C6B9F01	323	307	158	I
razorback sucker	9/18/2006	NONE	3D9257C6BB0E0	474	910	158	I
razorback sucker	9/18/2006	NONE	3D9257C69CD95	309	328	158	I
razorback sucker	9/18/2006	NONE	3D9257C69C595	465	860	158	I
razorback sucker	9/18/2006	NONE	3D9257C6AEEEF	300	270	158	I
razorback sucker	9/18/2006	NONE	3D9257C69CF57	453	680	158	I
razorback sucker	9/18/2006	NONE	3D9257C69C08E	395	517	158	I
razorback sucker	9/18/2006	NONE	UNKNOWN	438	820	158	I
razorback sucker	9/18/2006	NONE	3D9257C69FD04	308	332	158	I
razorback sucker	9/18/2006	NONE	3D9257C69DCAD	454	860	158	I
razorback sucker	9/18/2006	NONE	3D9257C69D495	197	116	158	I
razorback sucker	9/18/2006	NONE	3D9257C6B1EEC	321	253	158	I
razorback sucker	9/18/2006	4365556268	3D9257C69B9DE	486	1005	158	I
razorback sucker	9/18/2006	NONE	3D9257C6B76A3	427	585	158	M
razorback sucker	9/18/2006	NONE	3D9257C69B68D	431	680	158	M
razorback sucker	9/18/2006	NONE	3D9257C69A7AE	463	800	158	I
razorback sucker	9/18/2006	NONE	3D9257C6B82ED	502	1100	158	I
razorback sucker	9/18/2006	NONE	3D91BF18E5622	349	315	158	I
razorback sucker	9/18/2006	NONE	3D9257C69AC4C	408	545	158	M
razorback sucker	9/18/2006	NONE	3D9257C6B2714	430	585	158	I
razorback sucker	9/18/2006	NONE	3D9257C69C67A	491	1060	158	I
razorback sucker	9/18/2006	NONE	3D9257C6BA8D9	280	160	157	I
razorback sucker	9/18/2006	NONE	3D9257C699DB3	278	170	157	I
razorback sucker	9/18/2006	NONE	3D9257C69C650	308	235	157	I

Sex: I = Indeterminate; F = Female; M = Male

Table A-2. Continued.

Species	Date Of Capture	Old PIT Tag Number	New PIT Tag Number	Total Length (in mm)	Weight (in g)	Capture River Mile	Sex
razorback sucker	9/18/2006	NONE	3D9257C6954A8	282	175	157	I
razorback sucker	9/18/2006	NONE	3D9257C6B0FED	290	180	157	I
razorback sucker	9/18/2006	NONE	3D9257C6B9B51	247	110	157	I
razorback sucker	9/18/2006	NONE	3D9257C6AE38D	291	185	157	I
razorback sucker	9/18/2006	NONE	3D9257C6968AC	483	975	157	I
razorback sucker	9/18/2006	NONE	3D9257C69D51A	410	610	157	I
razorback sucker	9/18/2006	NONE	3D9257C6B9CAF	245	115	157	I
razorback sucker	9/18/2006	NONE	3D9257C69D2B9	311	205	157	I
razorback sucker	9/18/2006	NONE	3D9257C69C8E0	294	180	157	I
razorback sucker	9/18/2006	NONE	3D9257C6B9D48	274	160	157	I
razorback sucker	9/18/2006	NONE	3D9257C69C06B	418	610	154.3	I
razorback sucker	9/18/2006	45046C1F37	3D9257C6935F1	466	910	154.3	M
razorback sucker	9/18/2006	NONE	3D9257C69BE59	410	560	154.3	I
razorback sucker	9/18/2006	NONE	3D91BF18D17CA	457	830	154.3	M
razorback sucker	9/18/2006	NONE	3D9257C6BC047	379	525	154.3	I
razorback sucker	9/18/2006	NONE	3D9257C6BB505	404	520	154.3	M
razorback sucker	9/18/2006	447B4B4D45	3D9257C699BBA	442	740	154.3	I
razorback sucker	9/18/2006	NONE	3D9257C69D41A	332	300	154.3	I
razorback sucker	9/18/2006	450444687E	3D91BF1D8A6F3	477	450	154.3	I
razorback sucker	9/18/2006	NONE	3D9257C69D577	370	460	154.3	I
razorback sucker	9/18/2006	NONE	3D91BF1E92DC3	437	720	154.3	I
razorback sucker	9/18/2006	NONE	3D9257C6935A8	396	515	154.3	I
razorback sucker	9/18/2006	NONE	3D9257C69A3CC	442	860	154.3	I
razorback sucker	9/18/2006	NONE	3D9257C69C61C	406	610	154.3	I
razorback sucker	9/18/2006	NONE	3D9257C69AC64	401	530	154.3	I
razorback sucker	9/18/2006	NONE	3D91BF1A05177	437	750	154.3	I
razorback sucker	9/18/2006	NONE	3D9257C69B0AF	469	760	154.3	I
razorback sucker	9/18/2006	NONE	3D9257C6BB36E	441	940	154.3	I
razorback sucker	9/18/2006	NONE	3D9257C6B218E	437	610	154.3	I
razorback sucker	9/18/2006	NONE	3D9257C69BDD3	450	800	154.3	I

Sex: I = Indeterminate; F = Female; M = Male

Table A-2. Continued.

Species	Date Of Capture	Old PIT Tag Number	New PIT Tag Number	Total Length (in mm)	Weight (in g)	Capture River Mile	Sex
razorback sucker	9/18/2006	NONE	3D91BF1AF99F7	326	280	154.3	I
razorback sucker	9/18/2006	NONE	3D9257C69A510	391	525	154.3	I
razorback sucker	9/18/2006	NONE	3D9257C69FFC4	275	180	154.3	I
razorback sucker	9/18/2006	NONE	3D9257C6BA87E	402	590	151	M
razorback sucker	9/18/2006	NONE	3D9257C693A1B	284	185	151	I
razorback sucker	9/18/2006	NONE	3D9257C697EF8	479	790	151	I
razorback sucker	9/18/2006	NONE	3D9257C69C548	394	490	151	I
razorback sucker	9/18/2006	NONE	3D9257C69A2E4	467	790	151	I
razorback sucker	9/18/2006	NONE	3D9257C6B312B	323	255	150	I
razorback sucker	9/18/2006	NONE	3D9257C69C145	286	185	150	I
razorback sucker	9/18/2006	52282F0727	3D9257C69CA1A	444	840	150	M
razorback sucker	9/19/2006	NONE	3D9257C6997C5	262	194	146	I
razorback sucker	9/19/2006	NONE	3D9257C69FB05	276	205	146	I
razorback sucker	9/19/2006	NONE	3D9257C6B989A	280	230	146	I
razorback sucker	9/19/2006	NONE	3D9257C6BB559	340	414	145	I
razorback sucker	9/19/2006	NONE	3D9257C69CC75	177	40	142	I
razorback sucker	9/19/2006	434F041F04	3D9257C69DB46	434	770	142	M
razorback sucker	9/19/2006	NONE	3D9257C69A02A	341	295	140.1	I
razorback sucker	9/19/2006	NONE	3D9257C6B9DC3	435	763	140.1	I
razorback sucker	9/19/2006	NONE	3D9257C69B1C4	325	320	139	I
razorback sucker	9/19/2006	NONE	3D91BF18F9928	463	950	139	M
razorback sucker	9/19/2006	NONE	3D9257C6AF24F	281	210	139	I
razorback sucker	9/19/2006	NONE	3D9257C69D45E	191	55	139	I
razorback sucker	9/19/2006	NONE	3D9257C6BA839	483	1020	137	I
razorback sucker	9/19/2006	NONE	3D9257C6BBEED	221	142	137	I
razorback sucker	9/19/2006	441528673A	3D9257C6BB25B	430	810	137	M
razorback sucker	9/19/2006	NONE	3D9257C6B7879	480	1140	136	M
razorback sucker	9/19/2006	NONE	3D91BF18D7E60	435	825	136	I
razorback sucker	9/19/2006	NONE	3D91BF1D6DA5F	483	810	134	I
razorback sucker	9/19/2006	NONE	3D9257C6B9829	408	570	134	I

Sex: I = Indeterminate; F = Female; M = Male

Table A-2. Continued.

Species	Date Of Capture	Old PIT Tag Number	New PIT Tag Number	Total Length (in mm)	Weight (in g)	Capture River Mile	Sex
razorback sucker	9/19/2006	NONE	3D9257C6AF2A8	412	470	134	I
razorback sucker	9/19/2006	44796B7861	3D9257C69CAA9	456	750	134	M
razorback sucker	9/19/2006	NONE	3D9257C69B021	329	185	134	I
razorback sucker	9/19/2006	NONE	3D9257C69B2C7	285	230	134	I
razorback sucker	9/19/2006	NONE	3D9257C6ADF53	264	170	134	I
razorback sucker	9/19/2006	NONE	3D9257C6BB4A8	427	365	134	M
razorback sucker	9/19/2006	NONE	3D9257C6B863E	236	93	134	I
razorback sucker	9/19/2006	NONE	3D91BF19BD10B	435	680	134	I
razorback sucker	9/20/2006	NONE	3D9257C69B7EC	157	18	131	I
razorback sucker	9/20/2006	NONE	3D9257C6B863E	231	98	131	I
razorback sucker	9/20/2006	NONE	3D9257C69D88C	157	34	130	I
razorback sucker	9/20/2006	NONE	3D91BF1A09A63	404	648	130	M
razorback sucker	9/20/2006	4244555175	3D9257C69BA04	460	870	127	M
razorback sucker	9/20/2006	NONE	3D9257C6BAE29	331	280	127	I
razorback sucker	9/20/2006	NONE	3D9257C6B9FA7	139	21	127	I
razorback sucker	9/20/2006	NONE	3D9257C6BB99E	229	94	127	I
razorback sucker	9/20/2006	NONE	3D9257C69C830	452	930	125.5	I
razorback sucker	9/20/2006	NONE	3D9257C696B3D	266	155	125.5	I
razorback sucker	9/22/2006	NONE	3D9257C698DAA	326	260	160	I
razorback sucker	10/2/2006	NONE	3D9257C6999B4	282	180	116	I
razorback sucker	10/2/2006	NONE	3D9257C69CF0A	405	490	116	I
razorback sucker	10/2/2006	NONE	3D9257C697E3E	302	210	115	I
razorback sucker	10/2/2006	43641B7716	3D9257C6BA219	415	640	112	I
razorback sucker	10/3/2006	NONE	3D91BF18D630F	437	802	107	I
razorback sucker	10/3/2006	NONE	3D9257C69ADA2	424	600	104	I
razorback sucker	10/3/2006	4269496E35	3D9257C69133B	417	660	103	I
razorback sucker	10/3/2006	NONE	3D9257C69CF3F	335	230	103	I
razorback sucker	10/4/2006	NONE	3D9257C6BBEFD	245	115	89	I
razorback sucker	10/4/2006	4268483D55	3D9257C6B9FAF	437	800	86	M
razorback sucker	10/5/2006	NONE	3D91BF18E367A	340	590	82	I

Sex: I = Indeterminate; F = Female; M = Male

Table A-2. Continued.

Species	Date Of Capture	Old PIT Tag Number	New PIT Tag Number	Total Length (in mm)	Weight (in g)	Capture River Mile	Sex
razorback sucker	10/5/2006	NONE	3D91BF1CD2FAB	422	690	79	I
razorback sucker	10/5/2006	NONE	3D9257C6BA0DF	304	240	77	I
razorback sucker	10/5/2006	45047E2D75	3D9257C69A100	426	820	73.9	M
razorback sucker	10/5/2006	NONE	3D9257C69E1F8	315	280	73	I
razorback sucker	10/6/2006	512D650604	3D9257C695ACD	526	1400	70.8	I
razorback sucker	10/6/2006	NONE	3D9257C69CA74	441	740	70	I
razorback sucker	10/6/2006	NONE	3D9257C69C858	151	35	70	I
razorback sucker	10/6/2006	NONE	3D91BF1AFA2D5	406	600	70	I
razorback sucker	10/6/2006	4473492A5F	3D9257C69A2CA	430	745	68	M
razorback sucker	10/6/2006	NONE	3D9257C69CB94	263	160	68	I
razorback sucker	10/6/2006	NONE	3D9257C69F7CE	251	120	68	I
razorback sucker	10/6/2006	NONE	3D9257C69C365	400	600	68	I
razorback sucker	10/7/2006	NONE	3D9257C69DB1E	258	135	47	I
razorback sucker	10/7/2006	NONE	3D9257C69C3EE	161	35	43.5	I
razorback sucker	10/7/2006	NONE	3D9257C69B88C	152	36	43.5	I
razorback sucker	10/8/2006	NONE	3D9257C69B812	170	43	41	I
razorback sucker	10/8/2006	NONE	3D91BF18E41B6	368	370	40	I
razorback sucker	10/8/2006	NONE	3D91BF1D8B2B5	414	710	40	I
razorback sucker	10/8/2006	NONE	3D9257C69FC98	180	58	32.5	I
razorback sucker	10/8/2006	NONE	3D91BF18E4493	402	530	27	I
razorback sucker	10/8/2006	NONE	3D9257C6B91C0	263	170	24.5	I
razorback sucker	10/8/2006	NONE	3D9257C6BC201	243	130	24.5	I
razorback sucker	10/9/2006	NONE	3D9257C6999FA	341	410	19.6	I
razorback sucker	10/9/2006	NONE	3D9257C697644	210	90	11	I
razorback sucker	10/9/2006	NONE	3D9257C6B7958	361	380	10	I
razorback sucker	10/9/2006	NONE	3D9257C696974	170	40	10	I

Sex: I = Indeterminate; F = Female; M = Male

APPENDIX B

Scaled CPUE for Colorado pikeminnow stocked as age-0 fish in the fall (2002-2005) and collected in subsequent years. The number of Colorado pikeminnow collected riverwide was scaled to what it theoretically would have been had 100,000 age-0 fish been stocked. The following formula (Robertson and Holden 2007) was used:

$$SCPM = (100{,}000/N)CPM$$

where SCPM = the scaled number of Colorado pikeminnow collected, N = the total number of age-0 Colorado pikeminnow stocked in a given year, and CPM = the total number of Colorado pikeminnow collected riverwide from that same group of stocked age-0 fish in subsequent years. The SCPM value obtained was divided by the total sampling effort for a given trip to determine the scaled CPUE.

Table B-1. Scaled CPUE values for Colorado pikeminnow stocked as age-0 fish and collected during their age-1 year-class. CPUE values are scaled to represent what they theoretically would have been had an equal number of age-0 fish (in this case 100,000) been stocked each year.

Year Stocked As Age-0 Fish	Number Of Age-0 Fish Stocked (N)	100,000 / N	Year Collected As Age-1 Fish	Actual Number Collected (CPM) And Actual CPUE* At Age-1	Scaled Number Collected (SCPM) = [(100,000/N) (CPM)]	**Scaled CPUE** = SCPM/Hours*	Rank Relative To Other Scaled CPUE Values In This Comparison
2005	302,270	0.331	2006	170 fish 2.19 fish/hr	56.270 fish	0.723 fish/hr	2
2004	280,000	0.357	2005	67 fish 0.78 fish/hr	23.915 fish	0.278 fish/hr	3
2003	175,928	0.568	2004	130 fish 1.39 fish/hr	73.840 fish	0.788 fish/hr	1
2002	210,418	0.475	2003	32 fish 0.34 fish/hr	15.200 fish	0.161 fish/hr	4

Table B-2. Scaled CPUE values for Colorado pikeminnow stocked as age-0 fish and collected during their age-2 year-class. CPUE values are scaled to represent what they theoretically would have been had an equal number of age-0 fish (in this case 100,000) been stocked each year.

Year Stocked As Age-0 Fish	Number Of Age-0 Fish Stocked (N)	100,000 / N	Year Collected As Age-2 Fish	Actual Number Collected (CPM) And Actual CPUE* At Age-2	Scaled Number Collected (SCPM) = [(100,000/N) (CPM)]	**Scaled CPUE** = SCPM/Hours*	Rank Relative To Other Scaled CPUE Values In This Comparison
2004	280,000	0.357	2006	26 fish 0.33 fish/hr	9.282 fish	0.119 fish/hr	3
2003	175,928	0.568	2005	33 fish 0.38 fish/hr	18.749 fish	0.218 fish/hr	1
2002	210,418	0.475	2004	29 fish 0.31 fish/hr	13.775 fish	0.147 fish/hr	2

Table B-3. Scaled CPUE values for Colorado pikeminnow stocked as age-0 fish and collected on Adult Monitoring trips during their age-3 year-class. CPUE values are scaled to represent what they theoretically would have been had an equal number of age-0 fish (in this case 100,000) been stocked each year.

Year Stocked As Age-0 Fish	Number Of Age-0 Fish Stocked (N)	100,000 / N	Year Collected As Age-3 Fish	Actual Number Collected (CPM) And Actual CPUE* At Age-3	Scaled Number Collected (SCPM) = [(100,000/N) (CPM)]	**Scaled CPUE** = SCPM/Hours*	Rank Relative To Other Scaled CPUE Values In This Comparison
2003	175,928	0.568	2006	3 fish 0.038 fish/hr	1.704 fish	0.022 fish/hr	1
2002	210,418	0.475	2005	3 fish 0.035 fish/hr	1.425 fish	0.017 fish/hr	2

* Total electrofishing effort by year: 2006 = 77.80 hrs; 2005 = 85.95 hrs; 2004 = 93.75 hrs; 2003 = 94.42 hrs

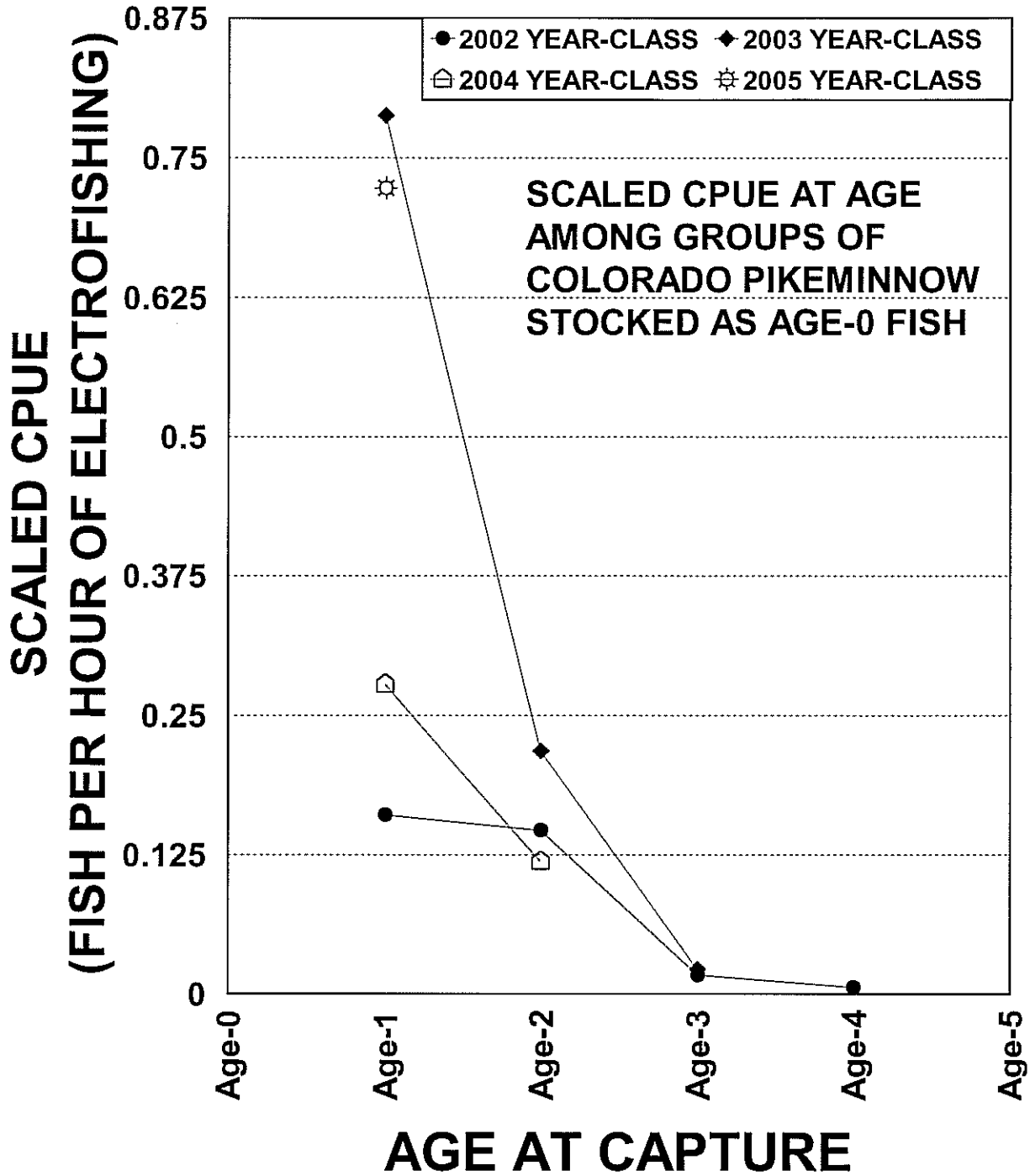

Figure B-1. Scaled catch per unit effort (CPUE) at age among groups of Colorado pikeminnow stocked as age-0 fish in the fall (2002-2005) and collected in subsequent years.