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OCCURRENCE AND ABUNDANCE OF PREDATOR FISH IN CLIFTON COURT FOREBAY, CALIFORNIA

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ABSTRACT

Between March 1983 and February 1984, studies were conducted to determine the composition and abundance of predator fish populations in Clifton Court Forebay. Fish were captured using gill-nets, angling, Merwyn traps, hoop traps, and electrofishing. Predator abundance was estimated during six 8-week periods by the Petersen mark/recapture method and through monthly individual gear catch-per-effort. Seven species of potential predator fish were found: white catfish *(Ictalurus catus),* striped bass *(Morone saxatilis),* channel catfish *(I. punctatus),* black crappie *(Pomoxis nigromaculatus),* largemouth bass *(Micropterus salmoides),* brown bullhead *(I. nebulosus),* and Sacramento squawfish *(Ptychocheilus grandis).* White catfish and striped bass were the most numerous predators, with population estimates ranging between 67,000 and 246,000 catfish and between 35,000 and 118,000 striped bass. Fluctuation in abundance appeared to be the result of both entrainment into and emigration out of the forebay.

CONTENTS

ABSTRACT iii

ACKNOWLEDGEMENTS vii

INTRODUCTION 1

Description of the Study Area 1

METHODS 3

Mark/Recapture Experiments 3

Catch-Per-Effort Abundance Indices 3

RESULTS 5

White Catfish 5

Striped Bass 7

Other Species 8

DISCUSSION 11

LITERATURE CITED 13

Figures

1 Clifton Court Forebay, Area of 1983-1984 Predator Fish Occurrence and Abundance Study 1

2 Petersen Mark/Recapture Estimates of White Catfish in Clifton Court Forebay 6

3 Monthly Hoop Trap Catch-Per-Effort Abundance Index of White Catfish Caught in Clifton Court Forebay 6

4 Petersen Mark/Recapture Estimates of Striped Bass in Clifton Court Forebay 7

5 Monthly Gill-Net Catch-Per-Effort Abundance Index of Striped Bass Caught in Clifton Court Forebay 8

6 Monthly Catch-Per-Effort Abundance Indices of Channel Catfish, Black Crappie, Largemouth Bass, and Brown Bullhead Caught in Clifton Court Forebay 9

Tables

1 Monthly Numbers of Potential Predator Fish Species Caught in Clifton Court Forebay 5

2 Relative Length Frequency Distributions of White Catfish Caught in Clifton Court Forebay 6

3 Relative Length Frequency Distributions of Striped Bass Caught in Clifton Court Forebay 7

4 Angler Harvest of White Catfish and Striped Bass Observed During Creel Census of Clifton Court Forebay 12

5 Monthly Length Frequency Distribution and Estimated Total Salvage of White Catfish and Striped Bass at John E. Skinner Delta Fish Protective Facility 12

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INTRODUCTION

Water diverted from the Sacramento-San Joaquin Delta into the State Water Project system initially passes through Clifton Court Forebay. Numerous fish, including the juveniles of several anadromous species, are entrained into the forebay and must cross it before being salvaged at the John E. Skinner Delta Fish Protective Facility. Estimated losses of young chinook salmon *(Oncorhynchus tshawytscha)* between the forebay intake and the Skinner Fish Facility have ranged from 63 percent to 97 percent (Schaffter 1978; Hall 1980; Kano 1985b, 1986).

Potential sources of loss were hypothesized as:

- Passing through the louver fish screens,
- Exiting Clifton Court Forebay through its intake,
- Remaining in Clifton Court Forebay,
- Being eaten by predators, or
- A combination of the above (Schaffter 1978).

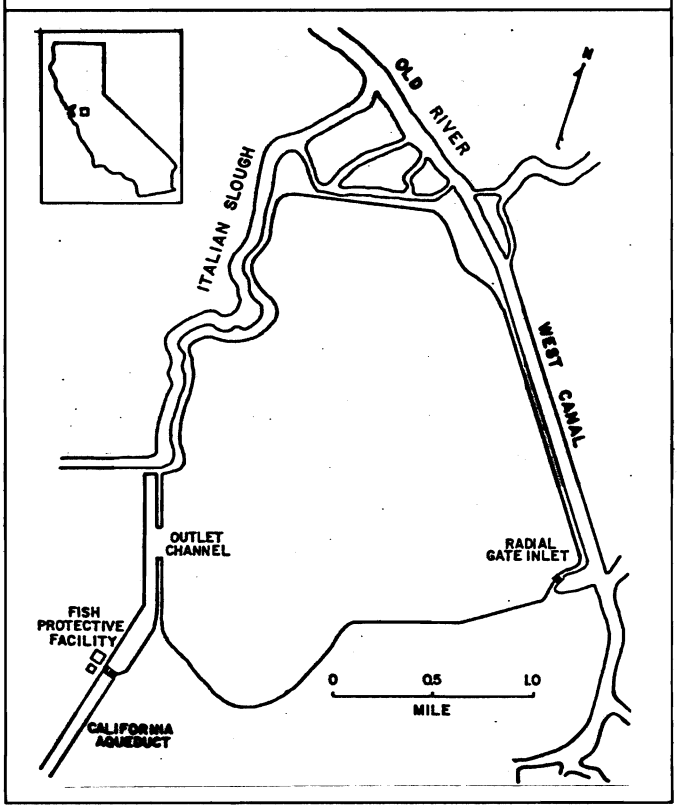
Predation was thought to be the major factor contributing to losses. However, little evidence was available on what predator fish were in Clifton Court Forebay and how numerous they were. A creel census of the forebay sport fishery (Mecum 1980) showed that several potential predator species were present, including white catfish *(Ictalurus catus)*, striped bass *(Morone saxatilis)*, black crappie *(Pomoxis nigromaculatus)*, largemouth bass *(Micropterus salmoides)*, and Sacramento squawfish *(Ptychocheilus grandis)*. Since forebay anglers are restricted to fishing only from the shoreline, the angler catch does not fully represent the extent of the predator community. Initial sampling of the forebay's open waters during the loss evaluations showed that occurrence of certain species, especially striped bass, was greater than indicated in the angler catch (Schaffter 1978; Hall 1980).

This report describes studies between March 1983 and March 1984 to determine the composition and relative abundance of populations of potential predatory species in Clifton Court Forebay.

Description of the Study Area

Clifton Court Forebay is about 3 miles southeast of Byron, Contra Costa County, California (Figure 1). The forebay was created in 1969 by inundating a

Figure 1
CLIFTON COURT FOREBAY,
AREA OF 1983-1984 PREDATOR FISH
OCCURRENCE AND ABUNDANCE STUDY



2,200-acre tract to serve as a temporary storage pool from which water is pumped into the California Aqueduct. Water is drafted into the forebay according to head differences and tidal stage; typically, diversions occur during the ebb of a tidal cycle.

The intake control structure consists of five radial gates, each 22 feet wide, and is located in the southeast portion of the forebay. Each gate can be raised or lowered independently to admit water from the bottom at velocities that often exceed 10 feet per second.

Clifton Court Forebay has a length of about 2.6 miles and breadth of 2.1 miles. Aside from the intake gates and some runoff return pipes, there are no other structures around its 7-mile perimeter. The shoreline consists of an earthen levee with an average slope of 1:2. The entire bank is lined with a gunite sealer to prevent erosion, which also discourages most terrestrial and aquatic vegetation from becoming established. A 0.6-mile section

along the eastern shore is reinforced with riprap, providing the only relief along an otherwise uniform bank. The forebay's outline is fairly regular, with few sharp points of land or deep embayments. It has no exposed beaches or nearshore shallows.

Water is withdrawn from Clifton Court Forebay through a 0.8-mile-long rock-lined outlet channel paralleling the western edge of the forebay. This channel originally connected Italian Slough to the initial section of the California Aqueduct. After construction of the forebay, the connection was blocked, and the northern end of the channel became a deadend backwater. The Skinner Fish Facility fish screens at the southern end of the outlet channel separate the California Aqueduct and the forebay system.

State Water Project pumps have the capacity to export about 12,700 acre-feet daily. However, continuous maximum operation is limited by water level in Clifton Court Forebay. Forebay storage ranges between 15,000 and 24,000 acre-feet, and exports average about 6,000 acre-feet per day. Typically, maximum pumping occurs during a period of off-peak power demand (2200 to 0800 hours), with exports reduced the rest of the day.

Annual fluctuation in water surface level in the forebay can be as much as 4 feet, but average daily ranges are about 0.7 feet. Average water depth is 9 feet. Maximum depths are inside of the radial gates (20-feet) and in the outlet channel (28 feet). Shoals are also associated with the intake and outlet areas, where flow patterns allow deposition of suspended sediment. At low storage levels, these shallow areas are often completely exposed. Beds of aquatic plants that form along the shoals during warm weather comprise the only underwater cover except isolated brush and debris drawn in through the radial gates and deposited in the forebay.

Water temperature in Clifton Court Forebay averages 6°-8°C in January and 21°-26°C in June. Maximum turbidities are during summer, when average secchi disk readings are as low as 14 inches. Water clarity increases during winter, with readings are often greater than 4.5 feet. Specific conductance varies throughout the year, depending on the quality of Delta water. Average dissolved oxygen levels vary between 7.2 ppm *(parts per million)* in summer and 10.9 ppm during winter. Water circulation in the forebay is dependent on intake, export, and wind action. Simultaneous intake and export can create a generalized continuous flow pattern between the gates and the outlet.

Predator fish in Clifton Court Forebay were sampled from March 1983 through February 1984. Several types of gear were used to capture the variety of predator fish expected. Capture methods included gill-nets, angling, hoop traps, Merwyn traps, and electrofishing.

Gill-nets and angling were used daily to sample the forebay. Two types of monofilament gill-nets were used, each measuring 12 feet deep, and 200 feet long, with variable stretch mesh sizes of either 2.5 to 4.0 inches or 4.5 to 6.0 inches. For angling, rod and reel and various artificial lures were used. Nets were fished in stationary sets of half an hour or less. Angling was conducted during intervals between net-tending (catch removal) or when gill-net fishing was not practical.

Hoop traps were in continuous use throughout the study. Each trap measured 10 feet long and consisted of 1.5-inch stretch mesh netting on 3- to 4-foot-diameter hoops. Four tandem sets of traps were fished simultaneously and tended at weekly intervals, after which they were reset at random locations in the forebay.

Merwyn traps (Smith 1963) were used experimentally. This type of gear was originally used to catch juvenile chinook salmon, but has also proved reasonably effective for adult striped bass (L. Weeks, California Dept. of Fish and Game, personal communication). Merwyn traps used in Clifton Court Forebay had 12-feet-square by 10-foot-deep enclosures and 200-foot-long leads constructed of 0.4-inch webbing. Traps were typically fished near the shoreline and tended at 3- to 5-day intervals.

Electrofishing surveys were conducted bimonthly using a Smith-Root™ SR-16 shocker boat. This method was used primarily along the shoreline, although some open-water sampling was also attempted.

All fish caught were identified, measured to the nearest millimeter fork length, and released. Predator fish larger than 180 mm were marked for population estimate experiments.

Mark/Recapture Experiments

Abundance of predator fish was estimated through mark/recapture experiments conducted for six 8-week periods. Catfish species caught by the hoop traps were marked by fin-clipping, with each marking period distinguished by removal of a different fin (right pectoral, left pelvic, etc.). Other predator species were tagged with numbered disk dangler tags (Chadwick 1963). Since striped bass shorter than minimum sport possession size were tagged, information regarding the source of tags was not imprinted on them. This was done to avoid conflicts with anglers who would otherwise retain sublegal bass.

Regular surveys of Clifton Court Forebay and its shoreline were made for marking mortalities, which were deleted from the marked pool. A creel census of the forebay sport fishery was conducted every third day to determine removal of marked fish by anglers. Although few large predators were salvaged at the Skinner Fish Facility, Department of Water Resources personnel were asked to note any marked fish they encountered.

Any marked predators captured by the various sampling gear were recorded for determination of population size by Petersen estimates. Abundance estimates for each marking period were calculated based on numbers of fish marked during the period and numbers recaptured or caught in the subsequent 8-week period.

Catch-Per-Effort Abundance Indices

Abundance of predator fish was also evaluated through catch-per-effort data. A monthly CPE index for each species was calculated from catch and fishing effort of a particular capture method and expressed in gear-month. A gill-netting gear-month was set as 20 six-hour days of fishing one gill net. Angling and electrofishing gear-months were derived from total boat time and were 20 six-hour days for angling and 4 six-hour days for electrofishing. Hoop and Merwyn trap gear-months were thirty 24-hour days of fishing.

A total of 26,884 fish from seven potential predator species were captured in Clifton Court Forebay from March 1983 to February 1984 (Table 1). Of the total, white catfish constituted 74 percent and striped bass constituted 22.8 percent. Abundance of these species was determined through Petersen population estimates and monthly catch per effort.

Table 1
MONTHLY NUMBERS OF POTENTIAL PREDATOR FISH SPECIES CAUGHT IN CLIFTON COURT FOREBAY
March 1983 through February 1984

	White Catfish	Striped Bass	Channel Catfish	Black Crappie	Largemouth Bass	Brown Bullhead	Sacramento Squawfish
March	1,039	299	64	23	9	5	0
April	1,598	737	72	24	2	5	0
May	1,272	689	49	51	33	8	1
June	2,332	758	40	5	4	7	0
July	1,206	295	18	12	18	0	0
August	2,085	635	37	21	1	3	2
September	1,226	499	15	21	11	2	3
October	1,683	435	15	4	0	1	0
November	2,103	842	44	0	5	4	0
December	3,623	223	58	17	1	7	0
January	992	385	35	2	0	0	0
February	725	332	9	38	3	22	0
Total	19,884	6,129	456	218	87	64	6
% of Overall Catch	74.07	22.83	1.70	0.81	0.32	0.24	0.02
Mean Size *(mm FL)*	255.2	375.2	433.6	228.6	297.6	254.8	297.8

White Catfish

Altogether, 15,546 white catfish caught in the hoop traps were marked for population size estimations. Petersen estimates of the catfish population increased throughout the study (Figure 2), from 66,859 for March and April 1983 to 245,747 for January and February 1984.

Changes in size composition of the catfish population throughout the study suggest that population increases probably resulted mainly from movement of smaller fish into the forebay (entrainment). From March through May, catfish in the 300- 325-mm size group comprised the largest portion (about 20 percent) of catches (Table 2). Mean size of catfish decreased from 303.6 mm fork length in May to 265.8 mm FL in June. Throughout summer and fall, the predominant size of catfish remained in the range of 200 to 275 mm. Between November and December, mean size further decreased from 262.5 to 229 mm FL as fish in the range of 180 to 200 mm were captured most frequently.

Catches of white catfish larger than 400 mm FL decreased as the study progressed. Decreases in numbers of larger fish may not have noticeably affected overall abundance, because the relative proportion of these large fish was small (about 0.1 to 1 percent of the monthly catches). However, a

more significant implication might be that their *absence* from the population indicates fish were leaving the forebay (emigration).

Hoop trap catch-per-effort data also suggest emigration of catfish from Clifton Court Forebay. White catfish reached a peak in December (Figure 3) and then declined rather than continue to rise as did Petersen population estimates. The peak CPE coincided with increases in occurrence of catfish in the size range of 180 to 200 mm. Decline in CPE during January and February was accompanied by a shift in size composition back toward larger catfish, suggesting there were fewer of the smaller fish in the forebay.

Figure 2
PETERSEN MARK/RECAPTURE ESTIMATES OF WHITE CATFISH IN CLIFTON COURT FOREBAY
March 1983 through February 1984

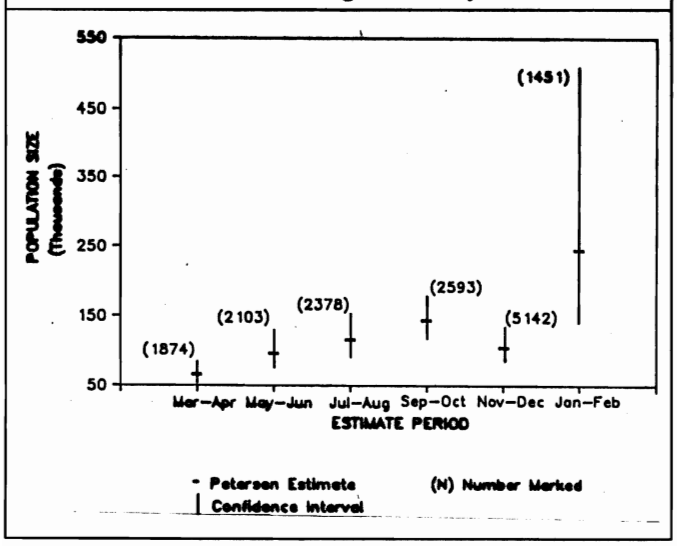


Figure 3
MONTHLY HOOP TRAP CATCH-PER-EFFORT ABUNDANCE INDEX OF WHITE CATFISH CAUGHT IN CLIFTON COURT FOREBAY
March 1983 through February 1984

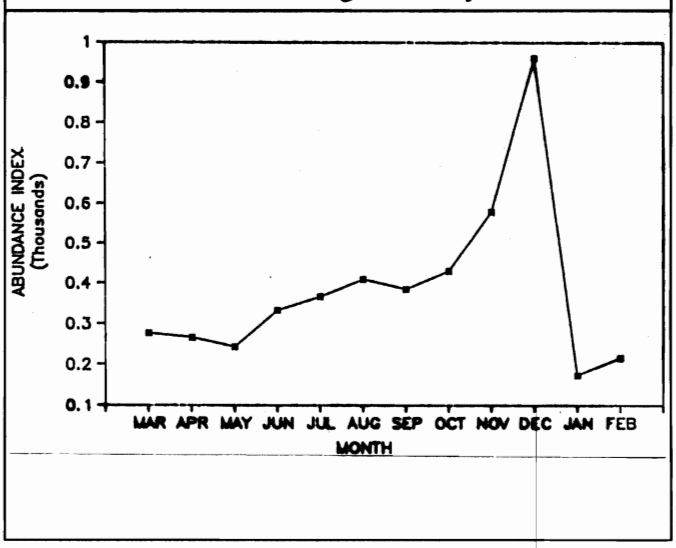


Table 2
RELATIVE LENGTH FREQUENCY DISTRIBUTIONS OF WHITE CATFISH CAUGHT IN CLIFTON COURT FOREBAY
March 1983 through February 1984

Length Interval *(mm FL)*	Percent Frequency of Monthly Catch											
	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB
180-200	7.6	5.5	4.1	6.5	15.8	13.1	11.9	17.9	6.8	33.0	11.1	9.2
200-225	6.5	5.8	4.5	17.3	22.7	19.1	17.7	24.0	11.5	25.7	10.7	23.5
225-250	10.0	8.2	5.8	20.3	21.1	22.7	25.3	21.2	19.3	13.8	16.1	20.0
250-275	15.6	16.6	11.0	16.6	16.9	20.3	19.3	18.6	27.0	11.1	20.0	23.2
275-300	20.1	19.5	18.5	15.1	10.7	12.3	11.8	9.7	19.2	8.7	18.3	10.7
300-325	20.6	20.3	21.2	10.5	7.0	7.4	6.9	5.1	10.0	4.4	15.1	8.3
325-350	11.0	13.0	17.7	7.2	3.3	3.6	3.9	2.4	4.1	2.3	5.5	3.0
350-375	5.9	7.3	12.3	4.3	1.9	1.1	2.1	0.7	1.4	0.9	2.8	1.7
375-400	1.7	3.0	3.9	1.2	0.3	0.4	1.2	0.5	0.4	0.3	0.4	0.4
400-425	0.3	0.4	0.5	0.4	0.1	0.1	0.1		0.2			
425-450	0.2	0.2	0.2	0.2								
>450	0.5	0.3	0.2	0.4	0.2	0.1						
Average FL *(mm)*	285.8	291.7	303.6	266.5	246.8	251.7	251.9	240.5	262.5	229.0	264.5	250.3
Standard Deviation FL	50.6	50.0	49.6	50.9	45.3	42.8	44.6	40.6	40.0	43.2	46.0	41.7

Striped Bass

A total of 4,967 striped bass were tagged during the mark/recapture experiments. Petersen estimates showed peaks of abundance in spring and fall (Figure 4). Estimates were 93,314 for March and April and 118,357 for September and October. Lowest abundance was for January and February, with an estimated population of 35,390.

Changes were observed in the average size of striped bass in Clifton Court Forebay. While the peaks of the frequency distribution of bass lengths were between 300 and 400 mm fork length throughout the study, mean size was generally smaller from May through September (Table 3). Mean size decreased from 389.1 mm FL in April to 354.3 mm in May. Between September and October, mean size increased from 337.5 to 362.5 mm FL, then continued to increase through February as fish larger than 500 mm became more numerous. These changes in size composition probably reflect movement by striped bass out of and into the forebay.

Figure 4
PETERSEN MARK/RECAPTURE ESTIMATES OF STRIPED BASS IN CLIFTON COURT FOREBAY
March 1983 through February 1984

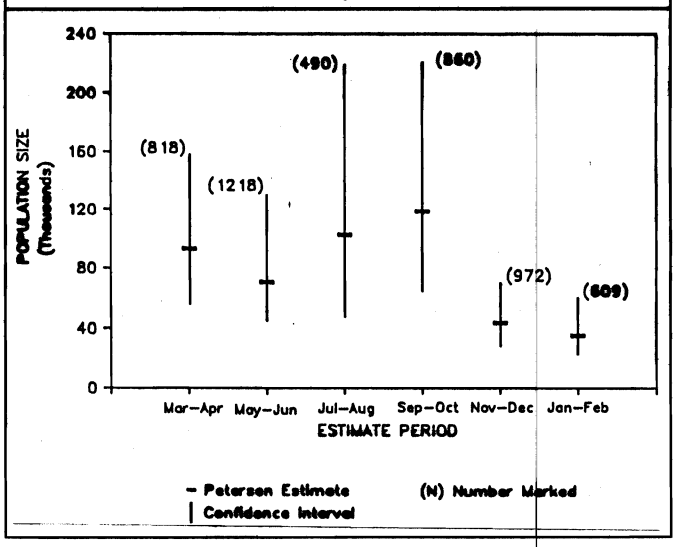
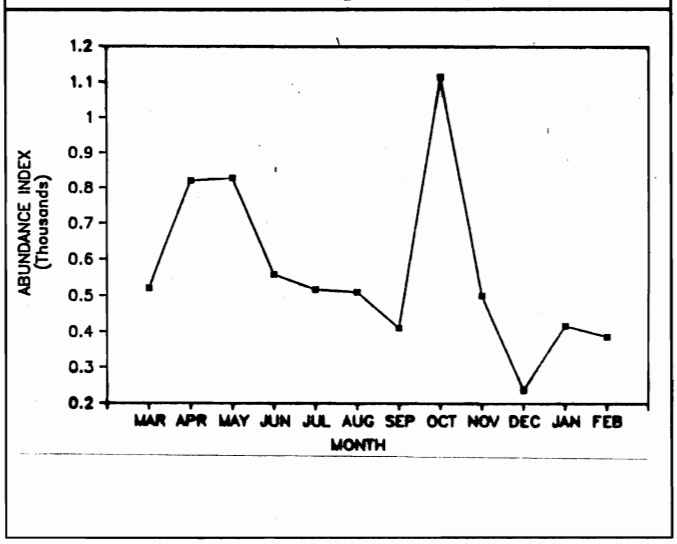


Table 3
RELATIVE LENGTH FREQUENCY DISTRIBUTIONS OF STRIPED BASS CAUGHT IN CLIFTON COURT FOREBAY
March 1983 through February 1984

Length Interval *(mm FL)*	Percent Frequency of Monthly Catch											
	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB
180-200	0.3					1.4	5.1	0.5				
200-225	2.3		1.2	0.4	0.7	2.9	5.3		0.5			
225-250	5.0	7.0	4.5	0.8	0.7	2.5	5.1	1.9	0.7	0.5	0.5	
250-275	8.7	2.5	7.3	7.1	4.8	3.0	3.1	1.9	1.2	0.9	0.8	0.3
275-300	5.7	3.4	8.9	13.0	16.7	10.6	3.7	3.5	1.0	0.5	0.8	0.9
300-325	9.7	6.7	11.0	12.5	17.0	21.1	14.3	11.4	6.3	3.6	1.6	4.8
325-350	16.8	15.6	20.1	21.8	18.0	13.8	18.4	25.5	17.0	14.9	12.0	11.4
350-375	20.8	25.7	18.2	21.6	23.5	19.7	15.4	22.5	22.0	19.0	15.9	18.7
375-400	12.8	12.6	11.9	7.9	11.6	13.3	15.2	14.8	21.0	19.0	22.7	19.3
400-425	6.4	8.5	5.1	5.2	3.1	3.6	7.0	9.3	13.1	17.6	17.2	14.5
425-450	6.0	5.2	3.8	1.7	1.0	1.9	2.0	3.5	6.2	8.6	7.0	8.7
450-475	1.7	7.3	2.0	1.3	1.7	2.7	1.0	1.6	2.0	5.4	3.9	3.9
475-500	1.7	4.4	1.9	1.9		0.8	0.6	1.6	2.3	1.4	1.3	3.6
>500	2.0	7.4	4.0	4.6	1.2	3.3	2.6	1.9	6.8	8.8	16.4	13.2
Average FL *(mm)*	349.2	389.1	354.3	353.3	341.5	343.5	337.5	362.5	388.1	402.1	427.4	422.9
Standard Deviation FL	66.8	75.1	78.3	74.1	57.4	64.8	76.2	60.3	70.1	74.3	109.6	112.5

Although Petersen estimates of the bass population showed increasing abundance during May through September, gill-net catch-per-effort declined (Figure 5). This is the period when mean size of fish was smaller, possibly indicating that larger bass were not as available, having emigrated from the forebay. CPE peaks in spring and fall were accompanied by increased mean size of bass, possibly resulting from immigration into the forebay.

Figure 5
MONTHLY GILL-NET CATCH-PER-EFFORT ABUNDANCE INDEX OF STRIPED BASS CAUGHT IN CLIFTON COURT FOREBAY
March 1983 through February 1984



Other Species

Channel catfish, black crappie, largemouth bass, brown bullhead, and Sacramento squawfish were not caught or recaptured in sufficient numbers to warrant calculation of Petersen estimates. Relative monthly abundance of these species, except squawfish, were estimated from catch per effort (Figure 6). Only 6 squawfish were captured, mainly in August and September.

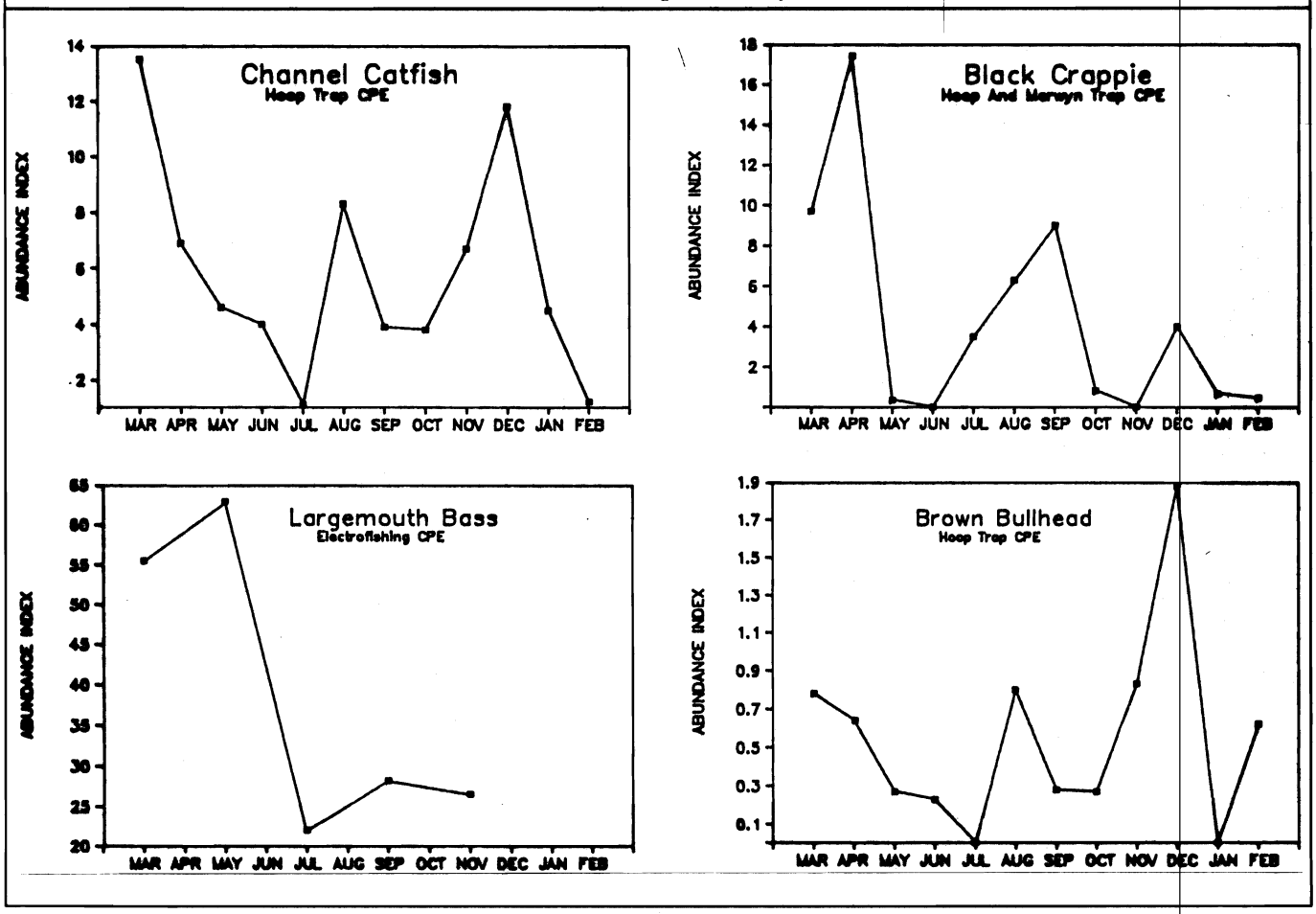
A total of 456 channel catfish were captured. Mean length was 433.6 mm FL, and fish were as large as 674 mm. Monthly hoop trap CPE ranged between 1.1 and 13.5 fish per gear-month, with peaks in March, August, and December.

A total of 218 black crappie were captured. CPE indices were calculated using combined catches of Merwyn and hoop traps. Fish were most abundant during early spring and late summer. Mean length was 228.6 mm FL, ranging from 180 to 326 mm.

Only 87 largemouth bass were captured. Electrofishing CPE abundance indices ranged from 21.5 to 62.9 fish per gear-month. This species was captured primarily along riprap areas of the shoreline and was most abundant during spring. Largemouth bass ranged in size from 186 to 485 mm FL, with mean size of 297.6 mm.

Relatively few (64) brown bullhead were captured. Hoop trap CPE for most of the year was less than 2.0 fish per gear-month. Highest abundance was in December, when catch was 1.9 fish per gear-month. Mean length was 254.8 mm FL, ranging from 217 to 308 mm.

Figure 6
MONTHLY CATCH-PER-EFFORT ABUNDANCE INDICES OF
CHANNEL CATFISH, BLACK CRAPPIE, LARGEMOUTH BASS, AND BROWN BULLHEAD
CAUGHT IN CLIFTON COURT FOREBAY
March 1983 through February 1984



The possibility that predation can account for some loss of fish crossing Clifton Court Forebay has become stronger in light of the numbers of potential predator fish found during this study. Although white catfish comprise a larger proportion of the predator population, striped bass probably have a greater impact on fish loss. Bass are especially effective predators in an impoundment situation because of their mobility and schooling feeding behavior. This species' effectiveness in controlling forage fish is a primary reason for its introduction into many reservoirs (Axon 1985).

Fluctuation in abundance and size composition of catfish and bass populations suggests these species not only are entrained into the forebay but also undergo reduction in numbers. Levels of angler harvest and salvage of larger fish by Skinner Fish Facility were not high enough to account for removal of significant numbers of white catfish or striped bass (Tables 4 and 5). There were no large die-offs of either species during the study. Emigration through the forebay intake is a likely explanation for decreases in abundance.

Before this study, it was assumed that high velocities of water through the radial intake gates prevented fish from exiting the forebay. Observation of velocities less than 2.0 feet per second for short periods suggested that flow through the gates might not be a barrier, especially for large fish. Although fish were not actually monitored swimming out through the gates, angler capture of several hundred of our tagged striped bass outside the forebay was taken as conclusive evidence that this species did emigrate. Tagged striped bass were recovered from as far away as the Feather and Stanislaus rivers and the Pacific Ocean, showing that migration patterns of bass emigrating from Clifton Court Forebay were similar to those of other striped bass in the estuary.

The effects of immigration and emigration on the population estimation procedure used (Petersen method) make the actual level of predator abundance questionable. Emigration, especially, would cause an over-estimate of the population. Nevertheless, it is evident that substantial numbers of predators are in Clifton Court Forebay and that means should be developed to reduce the impact of predation on fish loss.

The implication that striped bass in Clifton Court Forebay are not isolated from the rest of the Delta population complicates the task of controlling this species through traditional management techniques.

Increased angler opportunities to harvest could be provided by allowing boat fishing in the forebay, but most of the bass captured during this study were shorter than the legal limit. Decreasing the size limit or increasing the possession limit specifically for the forebay would present enforcement problems and would also affect the overall Delta population. Large-scale and frequent physical removal of striped bass from the forebay would have to include transplanting them back to the Delta to ensure survival. Reducing predator opportunity is an alternative to physical removal. A reservoir preceding a fish screen, such as Clifton Court Forebay, increases the opportunity for predation and should be avoided. Relocating the fish screens would reduce this problem.

Table 4
ANGLER HARVEST OF WHITE CATFISH AND STRIPED BASS
OBSERVED DURING CREEL CENSUS OF CLIFTON COURT FOREBAY
March 1983 through February 1984

	White Catfish				Striped Bass			
	Number of Fish Caught	Fish per Angler Hour	% of Monthly Catch	Mean Fork Length *(mm)*	Number of Fish Caught	Fish per Angler Hour	% of Monthly Catch	Mean Fork Length *(mm)*
April	19	0.03	14.8	253.8	19	0.03	14.8	469.5
May	105	0.11	59.3	302.6	24	0.02	13.6	482.2
June	54	0.07	40.6	253.2	15	0.02	11.3	495.5
July	128	0.11	56.1	264.6	11	0.009	4.8	431.6
August	84	0.08	69.4	270.2	3	0.003	2.5	448.5
September	134	0.17	82.2	285.1	1	0.009	0.6	430.0
October	67	0.07	78.8	281.4	3	0.003	3.5	452.3
November	104	0.16	79.4	261.1	20	0.03	15.3	618.8
December	28	0.1	82.4	244.4	4	0.01	11.8	512.3
January	2	0.006	25	267.0	4	0.01	50.0	576.8
February	5	0.01	31.3	272.5	4	0.01	25	536.3

NOTE: Creel census conducted every third day.

Table 5
MONTHLY LENGTH FREQUENCY DISTRIBUTION AND ESTIMATED TOTAL SALVAGE OF
WHITE CATFISH AND STRIPED BASS AT JOHN E. SKINNER DELTA FISH PROTECTIVE FACILITY
March 1983 through February 1984

White Catfish

Length Interval *(mm FL)*	Percent Frequency											
	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB
<180	45.2	-	95.0	97.1	97.0	99.7	97.3	72.7	78.6	70.7	70.0	31.5
180-200	19.0	-	5.0	2.9				9.1	6.2	8.6	16.7	11.2
200-250	28.6	-			1.0		1.4	13.6	9.0	17.2	10.0	21.3
250-300	4.8	-			1.0	0.3	1.4	4.5	5.5	3.4	3.3	16.9
300-350	2.4	-			1.0				0.7			14.6
350-400		-										4.5
>400		-										
Total Salvage Estimate	2,309	-	1,201	8,034	13,065	87,538	4,295	361	9,492	12,569	1,347	8,475

Striped Bass

Length Interval *(mm FL)*	Percent Frequency											
	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB
<180	*	-	100.0	100.0	100.0	99.2	100.0	93.3	97.3	100.0	100.0	96.2
180-200	*	-										
200-250	*	-				0.8						
250-300	*	-						6.7	0.9			
300-350	*	-							0.9			
350-400	*	-										3.8
>400	*	-							0.9			
Total Salvage Estimate	443	-	6,839	16,897	18,174	39,211	2,501	343	5,933	19,795	896	1,105
Acre-Feet Exported	81,660	0	23,597	108,118	69,677	167,707	39,917	20,773	45,731	30,847	21,895	113,226

- Facility not operated in April 1983.
* No data recorded.

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