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# Lake Powell Fisheries Investigations



1980 (Segment 9) Annual Report

for Colorado River Drainage and Tailwaters  
Dingell-Johnson Project F-28-R

Utah Division of Wildlife Resources  
Publication Number 81-9

LAKE POWELL FISHERIES INVESTIGATIONS

Annual Performance Report

January 1980 - December 1980

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Publication No. 81-9

Dingell-Johnson Project F-28-R-9

UTAH STATE DIVISION OF WILDLIFE RESOURCES

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## ABSTRACT

Continuing fisheries research with predator and prey species of Lake Powell was summarized for sample year 1980. Threadfin shad, the dominant forage fish, were evident throughout the reservoir; yet, numbers captured by mid-water trawl were at 5-year lows. Sport angling pressure increased approximately 10% from the previous year, and angling catch rates were slightly improved. Sport fish harvested most often were black crappie and largemouth bass, with increasing occurrence of naturally occurring walleye and the recently introduced striped bass. Gill netting to demonstrate game fish population trends showed increasing walleye numbers, while numbers of largemouth bass decreased. Striped bass were caught for the first time at the netting station most distant from the introduction site. Electrofishing surveys suggested a strong year class of largemouth bass was produced in 1980. Black crappie reproduction was also high, even though numbers were less than recorded in 1979. Striped bass reproduced for the second successive year in the Colorado River above Lake Powell. No spawning success was detected in the San Juan Arm. The best method of documenting striped bass reproduction was a standardized gill-net survey conducted in the fall.

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## THREADFIN SHAD STUDY

### JOB I

#### Methods

Monthly mid-water trawl collections were taken from June through October at Wahweap and Bullfrog, and from July through October at Hite. The sampling methods used were reported in Gustaveson et al. 1980.

#### Results and Discussion

A comparison of young-of-the-year (y-o-y) shad caught in 1980 with catches made in 1977 and 1978 indicated low production for threadfin shad in Lake Powell (Figures 1, 2 and 3). A possible explanation for the low catches was that threadfin shad were not evenly distributed in the reservoir. The uneven distribution may have been partly in response to spawning habitat.

Threadfin shad begin spawning about mid-May when surface temperatures reach 21 C. Shad spawn at the surface, randomly distributing their eggs on any floating object. Shad seek out areas where terrestrial vegetation is partially submerged or where streams have carried in drifting debris. They seem to prefer rafts of driftwood and floating debris but will also spawn around marinas on the boats, docks and cables, in the absence of preferred habitat.

Since 1979, shad have not been observed spawning in the Bullfrog or Wahweap marinas. Spawning mats placed in the Bullfrog Marina in May



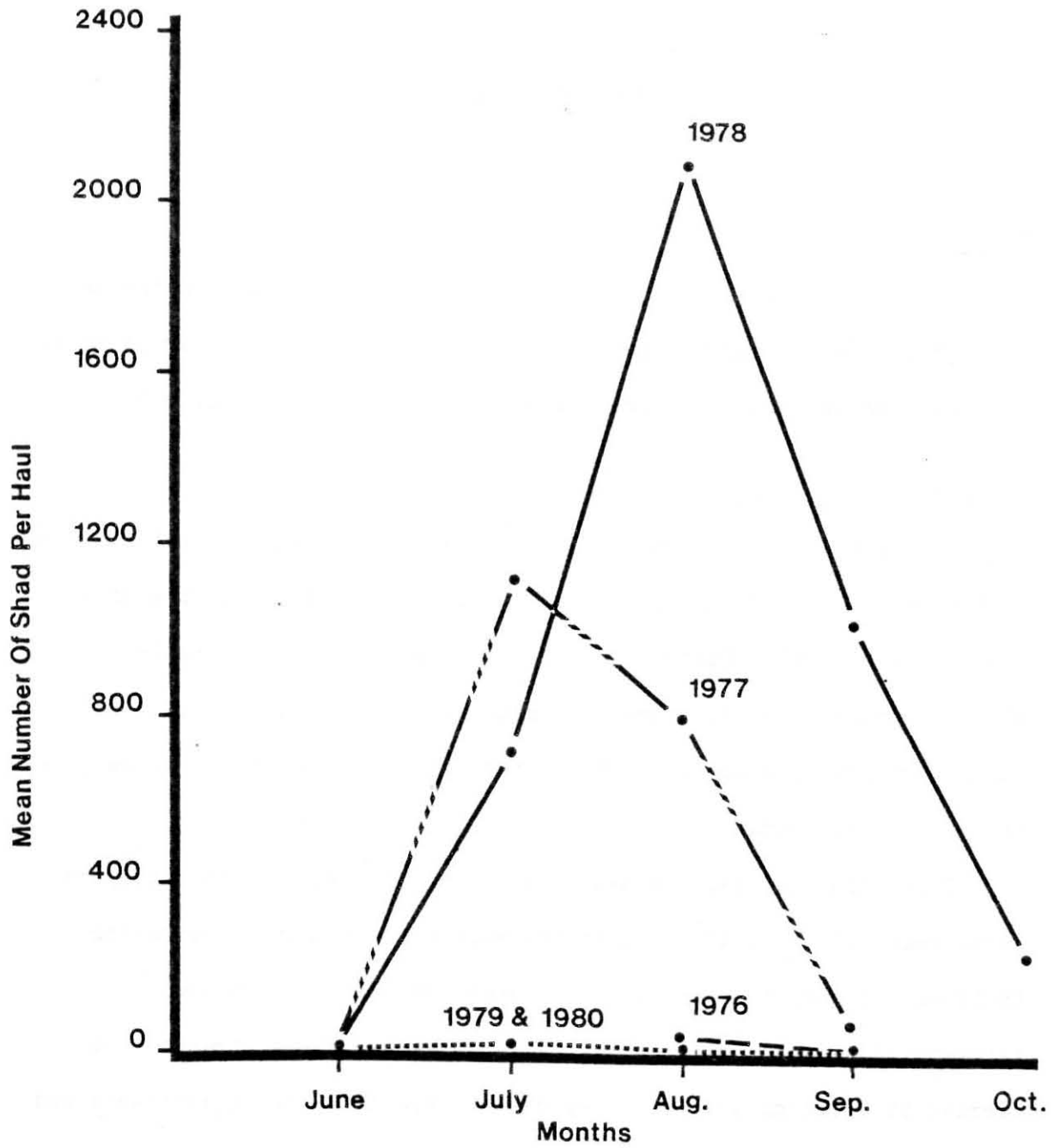


Figure 1. Mean number of young-of-the-year shad captured/trawl haul at Wahweap.

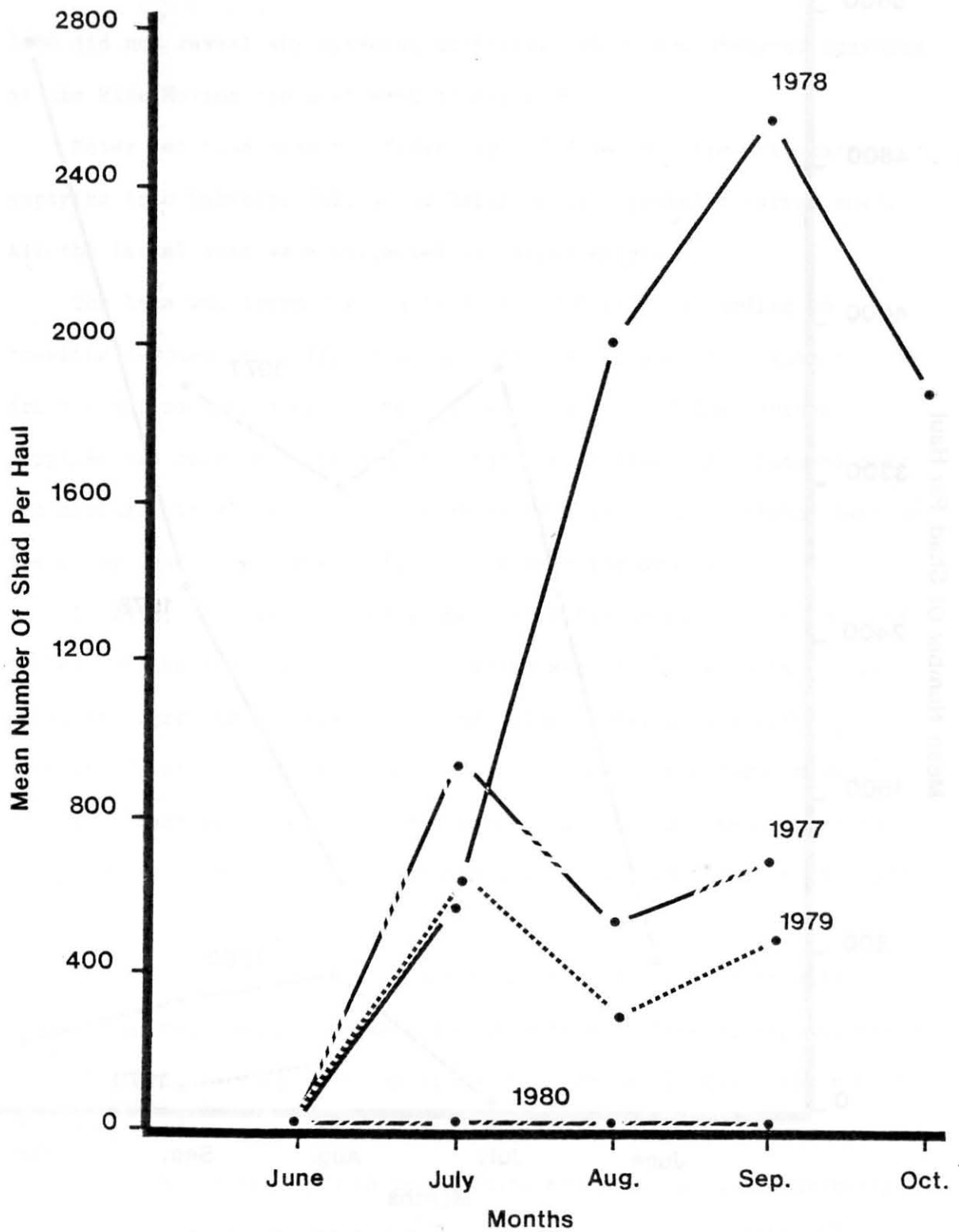


Figure 2. Mean number of young-of-the-year shad captured/trawl haul at Bullfrog.

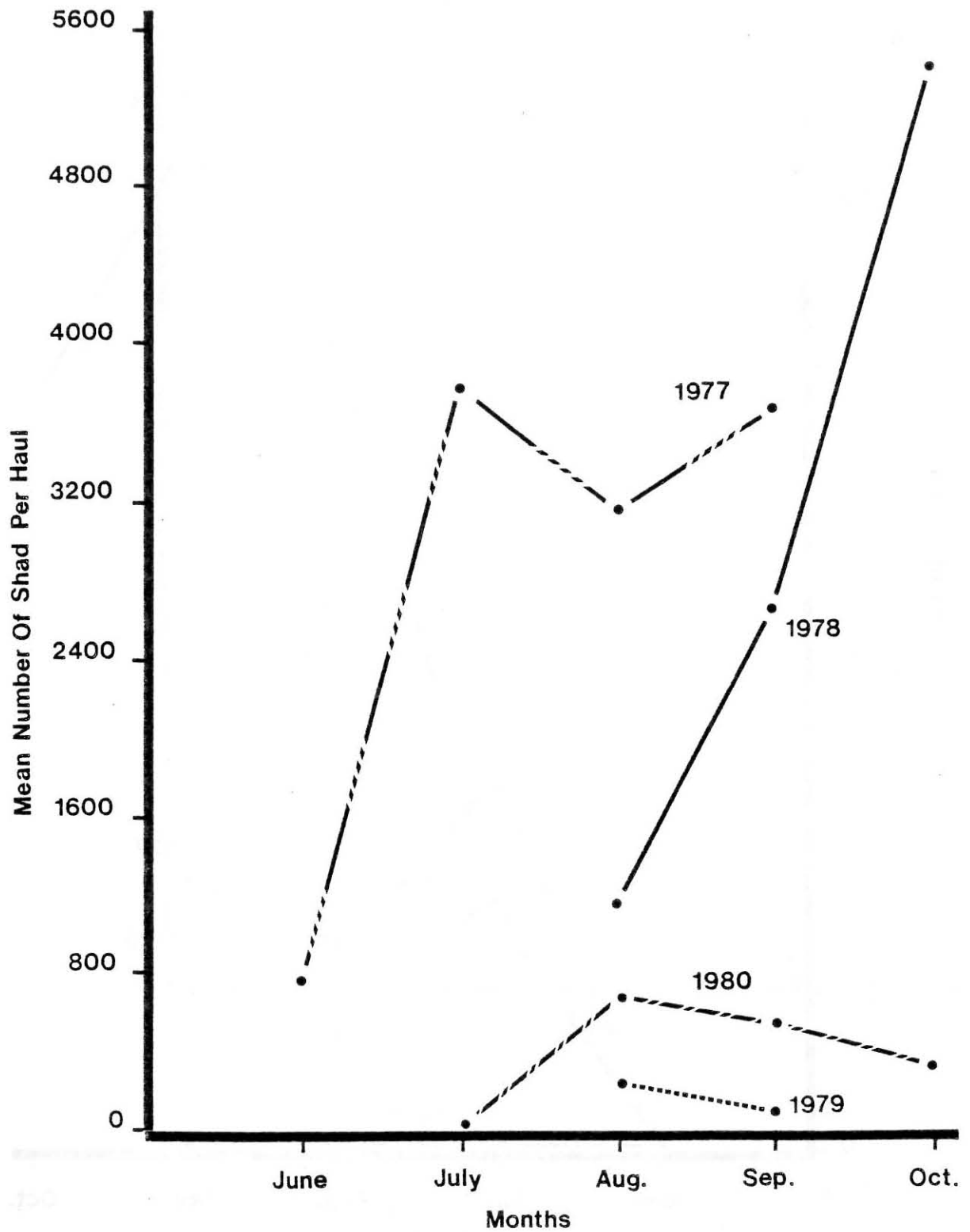


Figure 3. Mean number of young-of-the-year shad captured/trawl haul at Hite.

1980 did not reveal any spawning activity. Shad were observed spawning at the Hite Marina the last week of May 1980.

Meter net tows made the first part of June near the tributaries emptying into Wahweap, Hall's and Bullfrog bays revealed larval shad. All the larval shad were collected in turbid water.

The lake was drawn down in 1977 and 1978 when, according to trawling samples, threadfin shad had the best production. With the lake drawn down, natural spawning habitat was limited and the marinas supplied the only real spawning habitat. With trawling locations near the marinas, trawl catches were high in 1977 and 1978, probably because the y-o-y shad were concentrated in the sampling areas.

In 1979, the lake reached a new high water level; and in 1980, it filled for the first time. Shallow areas were filled with partially submerged terrestrial vegetation, and tributaries carried rafts of floating debris. Threadfin shad had an abundance of natural spawning habitat. Because the shad did not concentrate around the marinas and our sampling sites, the trawl catches were less than those of 1977 and 1978.

Several types of gear were evaluated for sampling adult shad. Sonar, gill nets and seines were not effective in determining abundance of adults. Trawl samples taken since 1978 were evaluated. The number of adults collected per tow was low but consistent (Figure 4). Mid-water trawl tows captured both adults and y-o-y and were probably the best method of determining their relative abundance (Table 1).

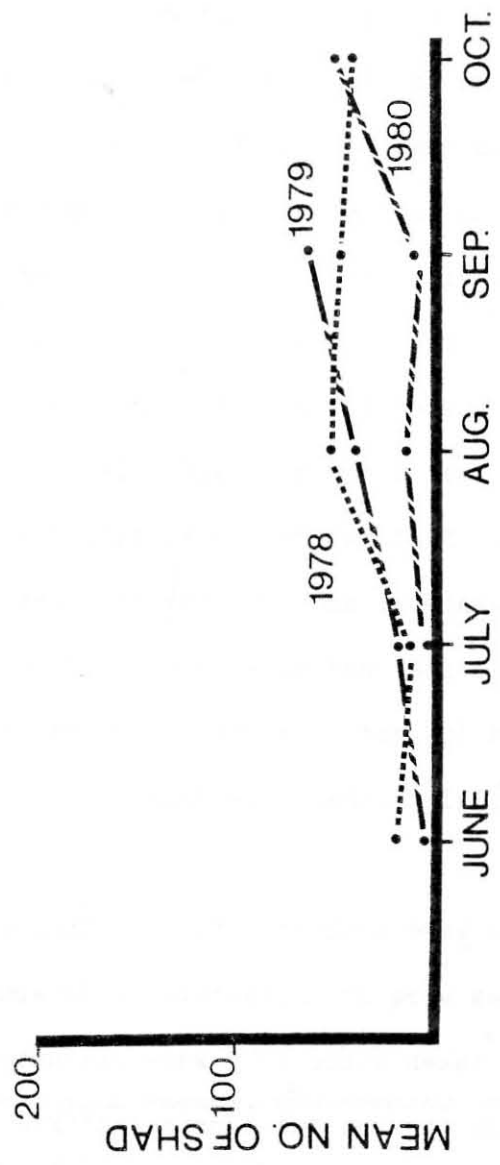


Figure 4. Mean number of adult shad captured/trawl haul at Bullfrog.

Table 1. Adult and y-o-y threadfin shad captured per standard trawl tow at Wahweap, Bullfrog and Hite, Lake Powell, 1980.

Sample Site	Life Stage	Jun	Jul	Aug	Sep	Oct
Wahweap	Adults	0	0	3	1	0
	y-o-y	0	2	4	0.25	0
Bullfrog	Adults	0	0	13.5	5	44
	y-o-y	0	0	18.5	2.5	2
Hite	Adults	<sup>a</sup>	0.25	15	212	199
	y-o-y	<sup>a</sup>	17	699	572	340

<sup>a</sup>No sample taken because of excessive driftwood.

It is unclear whether the striped bass have had any negative impact on the threadfin shad population. Even though the numbers of shad collected in trawl samples were low, threadfin shad were still the predominant food item found in striped bass stomachs (Job IV).

#### Recommendations

Continue monthly mid-water trawling at Wahweap and Bullfrog. Eliminate the Hite station because driftwood usually prohibits trawling during June and July. Add stations on the San Juan and at Good Hope Bay to assess shad populations in areas unaffected by spawning habitat provided by marinas.

Establish meter netting stations using standardized tows in the backs of bays and side canyons to evaluate spawning success and abundance of larval shad between areas. Meter net collections will be taken the same days as the mid-water trawl samples.

Utilize the standard monthly mid-water trawl program as an index of adult shad abundance. Evaluate the number of 10-minute tows necessary to adequately account for variability between replicates.

Continue monitoring movements and behavior with sonar to detect any seasonal migration from spawning areas to open bays.



## MEASUREMENT OF FISHERY HARVEST, PRESSURE AND SUCCESS

### JOB II

#### Methods

A scheduled creel census was conducted during April, May and June of 1980. Estimates of angling pressure were based on data gathered by National Park Service personnel at access areas. Catch rates (fish/angler hour) were estimated from data obtained during interviews of anglers who had completed their fishing day as they returned to launching ramps. In 1980, data were also recorded for angling reported for the day prior to the census day. A limited number of successful fishermen was interviewed during July, August and September to obtain information on the species composition of the harvest during those months.

#### Results and Discussion

A total of 1,183 boating parties was checked by creel clerks during the 3-month census period. Of these, 631 (or 53%) reported angling activity. Approximately 33% (206) of the parties reporting angling on the census day also fished on the day prior to the census. Anglers spent an average of 4.0 hours fishing per day. The mean number of anglers/fishing boat was 2.6.

Angling pressure during 1980 increased from that observed in 1979 (Figure 5). The index of angling pressure was 78,405 boat days, an

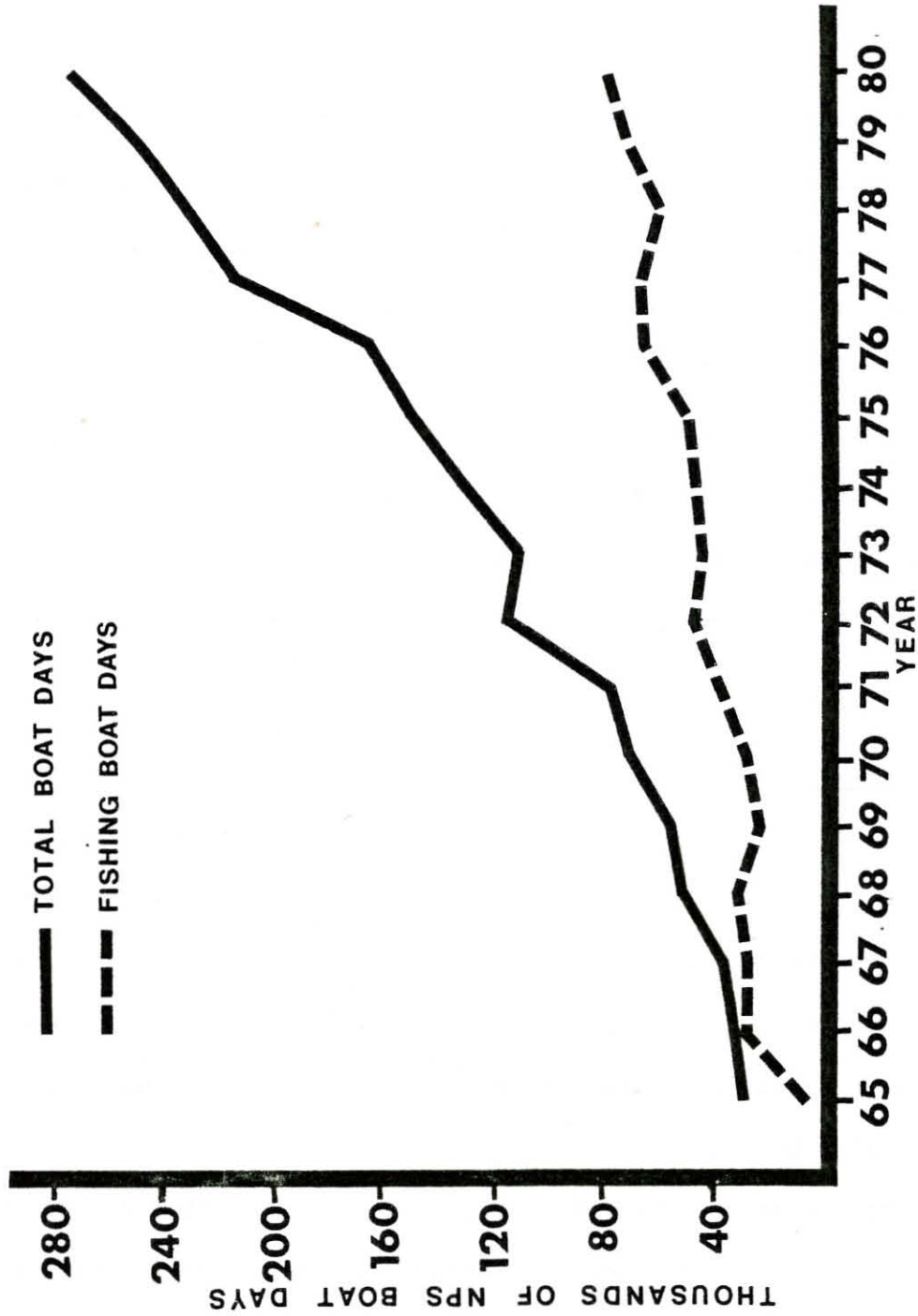


Figure 5. Indices of total recreational boat use and angling pressure, Lake Powell, 1965-80.

increase of 10% over 1979. The index of total recreational boat use (including nonfishing boats) was 274,745 boat days, compared to 248,616 boat days in 1979. For the first time since creel census has been conducted at Lake Powell, the Bullfrog access area accounted for the highest angler use (43%) of the four major access areas. One factor contributing to the increase in angler use, particularly at Bullfrog, was the development of a uranium mill and expansion of mining operations at Ticaboo 16.1 km north of Bullfrog. The trend of increasing use at Lake Powell will probably continue as energy development and the associated increases in population density occur in southern Utah.

Most angling pressure during the spring was directed at largemouth bass and black crappie. Catch rates (fish/angler hour) for those two species were similar to those of 1979 (Figure 6). Table 2 lists catch rates for all species by lake area. The best fishing occurred in the San Juan Arm and between Rainbow Bridge and Rincon. One change in the Lake Powell sport fishery in 1980 was the increased angler success for walleye. Although the overall catch rate for the 3 census months was still relatively low (0.015 fish/angler hour), it represented a substantial increase over the 0.009 fish/angler hour for the same period in 1979. The success rate for walleye continued to increase as the population density of walleye in the reservoir increased (see Job III), and anglers changed to techniques which were more effective in catching walleye and striped bass (trolling).

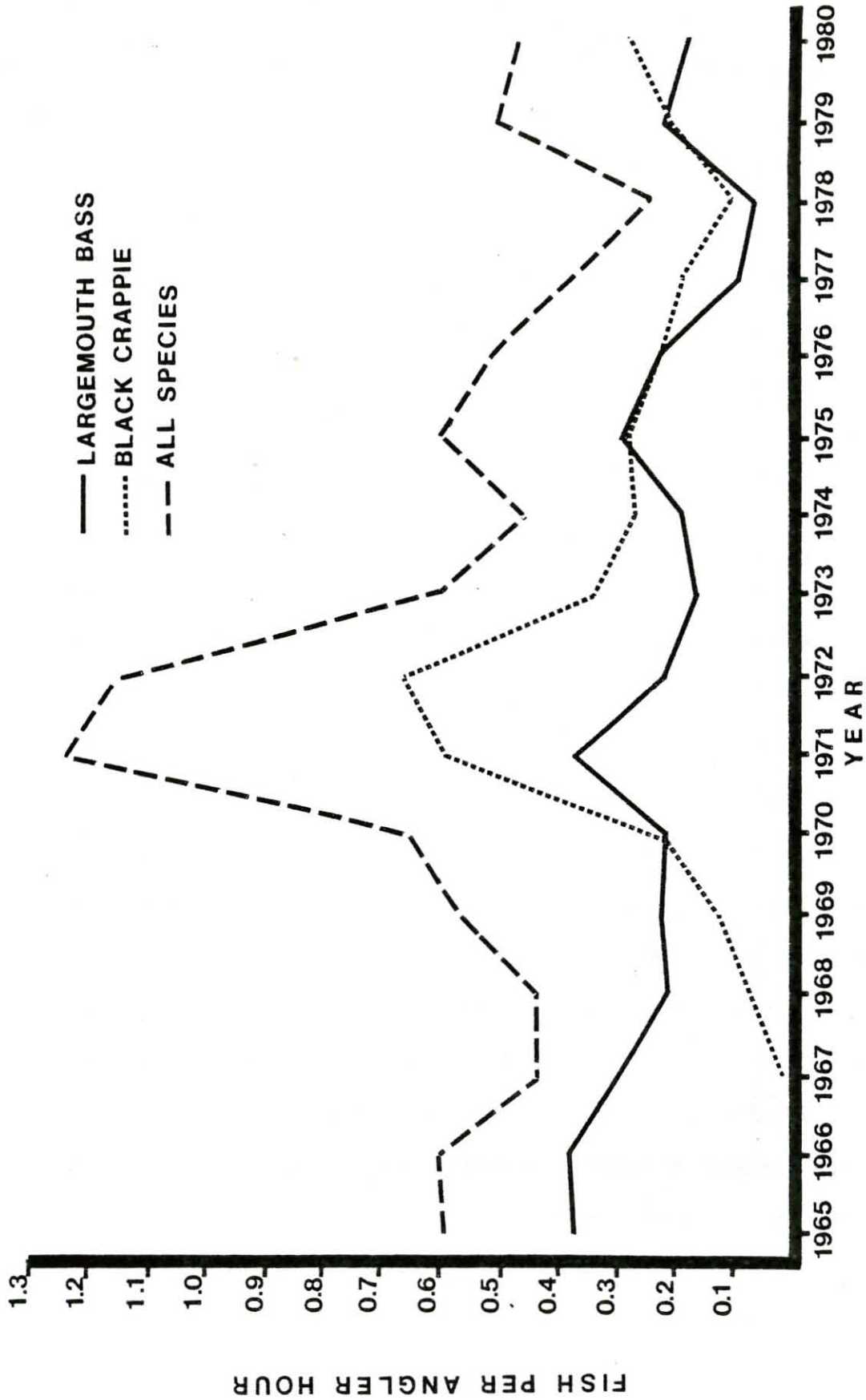


Figure 6. Catch rates (fish/angler hr) for largemouth bass, black crappie and all species during the months of April-June, 1965-80, Lake Powell.

Table 2. Sport fishery catch rates (fish/angler hour) by species and lake area, Lake Powell, April-June 1980.

Species	Lake Area <sup>a</sup>							Mean <sup>b</sup>
	1	2	3	4	5	6	7	
Largemouth bass	0.08	0.19	0.19	0.15	0.18	0.11	0.26	0.16
Black crappie	0.31	0.10	0.66	0.27	0.15	0.07	0.37	0.27
Channel catfish	t <sup>c</sup>	0.03	t	0.01	0.01	0.01	0.02	0.01
Bluegill	t	t	0.01	0.01	t	0.00	0.03	0.01
Rainbow trout	t	0.00	t	0.00	t	0.00	0.00	t
Walleye	0.02	0.03	0.02	0.01	t	0.00	0.04	0.02
Striped bass	0.02	t	t	t	t	0.00	t	t
All species	0.43	0.36	0.89	0.45	0.35	0.19	0.72	0.47

<sup>a</sup>See Figure 8 for map of lake areas:

1. Glen Canyon Dam to Gunsight Butte.
2. Gunsight Butte to Rainbow Marina.
3. Rainbow Marina to Rincon.
4. Rincon to Tapestry Wall.
5. Tapestry Wall to Hite.
6. Above Hite.
7. San Juan Arm.

<sup>b</sup>Mean = total fish divided by total anglers hours.

<sup>c</sup>t = less than 0.01 fish/angler hour.

Catch rates for striped bass were relatively low during the census months. However, the best fishing for striped bass occurred during the late summer which was not included in the census period. Striped bass comprised the majority of the harvest for anglers in the Wahweap area during August and September (Table 3). Striped bass also accounted for about 17% of the harvest in August at the Bullfrog-Hall's area (Table 4).

Little additional information was gained from questionnaires distributed at launching ramps. Less than 5% of the survey forms were returned.

#### Recommendations

Creel census should be conducted April through September in 1981. Methods should be consistent with those used in 1980. Total lengths should be recorded and scales obtained from creeled striped bass to assess the contribution of each year class to the harvest. These data would provide a baseline for comparison with future years when naturally reproducing striped bass enter the creel.

Table 3. Species composition as percent of the total recorded creel for anglers interviewed at Wahweap, April-September 1980.

Species	Apr	May	Jun	Jul	Aug	Sep
Largemouth bass	32.0	24.9	50.3	20.0	15.0	0.0
Rainbow trout	0.1	0.5	0.0	0.0	0.0	0.0
Channel catfish	0.0	7.8	5.4	15.0	10.0	0.0
Black crappie	66.6	49.6	20.5	0.0	0.0	0.0
Bluegill	0.3	4.4	2.2	49.0	12.5	0.0
Walleye	0.9	9.3	17.3	11.0	5.0	16.7
Striped bass	0.1	3.2	4.3	5.0	57.5	83.3
Other	0.0	0.2	0.0	0.0	0.0	0.0

Table 4. Species composition as percent of the total recorded creel for anglers interviewed at Bullfrog, Hall's Crossing and Hite, April-September 1980.

Species	Apr	May	Jun	Jul	Aug	Sep
Largemouth bass	28.1	44.0	38.9	59.4	4.3	34.0
Rainbow trout	0.0	0.1	0.0	0.0	0.0	0.0
Channel catfish	0.1	2.9	15.0	0.0	78.3	7.0
Black crappie	70.8	46.5	23.3	0.0	0.0	12.0
Bluegill	0.7	3.7	5.6	0.0	0.0	47.0
Walleye	0.3	2.6	14.3	37.5	0.0	0.0
Striped bass	0.0	0.2	3.0	3.1	17.4	0.0
Other	0.0	0.1	0.0	0.0	0.0	0.0



## INDEX TO ANNUAL FISH POPULATION TRENDS

### JOB III

#### Annual Netting

##### Methods

Methods used for the standardized gill netting in the spring are described in Gustaveson et al. 1980. Sampling in 1980 was carried out at four stations during the first weeks in March employing 30 net days/station. Gill netting was also conducted in November at the standard Padre Bay and Good Hope Bay stations and at an area near the San Juan station. Sampling effort in the fall at the Padre Bay and Good Hope stations was 20 net days (over a 2-day period) at each location. The fall sampling at the San Juan consisted of 14 net days of effort.

A selected sample of walleye and largemouth bass collected during the spring sampling was used to quantify fish condition according to the visceral fat index (VFI) used by the Utah Division of Wildlife Resources.

##### Results and Discussion

A total of 735 fish was collected in 120 net days during the annual netting in March 1980 (Table 5). As in the past, the majority of the catch consisted of walleye (60%) and largemouth bass (26%). The overall catch rates for bass and walleye also followed the same trends as in the past (Figure 7). The average catch rate of largemouth bass decreased to 1.6 fish/net day (down 11% from 1979). Other species collected during the spring sampling were only occasionally caught and showed no changes

Catch rate (fish/net day) during annual gill netting, Lake Powell, March 1980.

	Padre Bay	San Juan	Rincon	Good Hope Bay	Total <sup>a</sup>	% of Catch
	0.2	1.9	1.5	2.8	1.6	25.9
	4.8	1.2	3.8	4.7	3.7	59.7
ie	t <sup>b</sup>	0.1	0.0	0.0	t	0.5
	0.0	0.0	0.0	t	t	0.1
sh	0.0	t	t	0.0	t	0.4
fish	t	0.6	0.5	0.3	0.4	5.7
	0.4	0.2	t	0.6	0.3	5.2
h	0.0	t	t	0.1	t	1.0
ut	t	0.0	0.0	0.0	t	0.3
s	t	t	0.0	t	t	0.5
head	0.0	0.0	t	0.1	t	0.5
ke	0.0	0.0	0.0	t	t	0.1
	5.7	4.1	6.0	8.8	6.1	--

<sup>a</sup> fish divided by total net days.

<sup>b</sup> than 0.1 fish/net day.

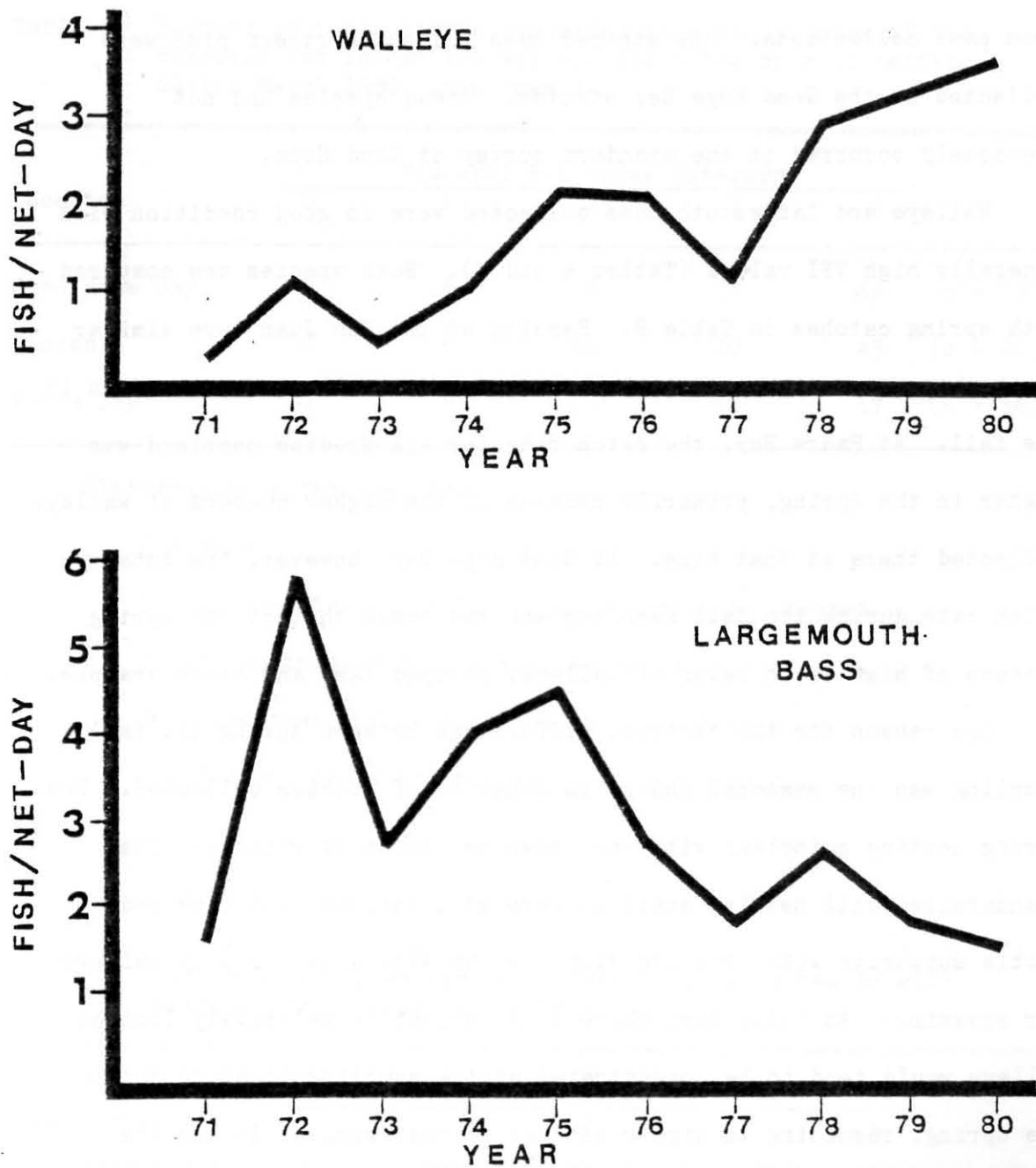


Figure 7. Catch rates (fish/net day) for largemouth bass and walleye from annual netting, 1971-80, Lake Powell.

from past collections. One striped bass and one northern pike were collected at the Good Hope Bay station. These species had not previously occurred in the standard survey at Good Hope.

Walleye and largemouth bass collected were in good condition with generally high VFI values (Tables 6 and 7). Both species are compared with spring catches in Table 8. Results at the San Juan were similar for both seasons except that black crappie were collected more often in the fall. At Padre Bay, the catch rate for all species combined was higher in the spring, primarily because of the higher numbers of walleye collected there at that time. At Good Hope Bay, however, the total catch rate during the fall sampling was two times that of the spring because of high catch rates of walleye, striped bass and black crappie.

One reason for the observed differences between spring and fall sampling was the seasonal change in behavior of species collected. The spring netting coincides with the spawning season of walleye. The standardized gill netting stations were at locations with rock and rubble substrate with moderate slopes which were areas used by walleye for spawning. At Padre Bay, where such habitat is relatively limited, walleye would tend to be concentrated at the sampling location during the spring, resulting in higher catches of that species during the spawning period. At the other two sampling stations, rock and rubble habitat is more common and the same phenomenon was not evident. Differences in the spring and fall catches at Good Hope Bay may be a function of other factors influencing fish behavior, such as water temperature, prey distribution, etc.

Table 6. Percent of total sample occurring in each category of the visceral fat index<sup>a</sup> for walleye collected by gill netting during March 1980, Lake Powell.

Location	Visceral Fat Index Category				
	0	1	2	3	4
Good Hope Bay	0	5	8	23	64 (n = 39)
Rincon	0	5	10	40	45 (n = 20)
Padre Bay	0	8	17	58	17 (n = 36)

<sup>a</sup>Internal body fat present:

0 - None.

1 - Little, less than 50% of each caecum is covered.

2 - Approximately 50% of the caecum is covered.

3 - More than 50% of each caecum is covered.

4 - Pyloric caeca are completely covered with fat.

Table 7. Percent of total sample occurring in each category of the visceral fat index for largemouth bass collected by gill netting during March 1980, Lake Powell.

Location	Visceral Fat Index Category				
	0	1	2	3	4
Good Hope Bay	0	18	43	30	10 (n = 40)
San Juan Arm	0	35	47	18	0 (n = 17)

Table 8. Comparison of catch rates (fish/net day) for spring and fall gill netting at Lake Powell, 1980.

Species	San Juan		Padre Bay		Good Hope Bay	
	Spring	Fall	Spring	Fall	Spring	Fall
Walleye	1.2	1.4	4.8	1.0	4.7	9.9
Largemouth bass	1.9	1.8	0.2	0.7	2.8	2.8
Striped bass	t <sup>a</sup>	0.5	t	0.3	t	2.9
Black crappie	0.1	3.8	t	0.0	0.0	1.4
All species	4.1	9.3	5.7	3.4	8.8	19.3

<sup>a</sup>t = less than 0.1 fish/net day.

The presence of naturally reproduced striped bass was evident at Good Hope Bay with about 3 striped bass caught/net day in the fall. Only an occasional striped bass was caught in the spring.

#### Recommendations

Annual netting for fish population trend data should continue to be conducted in March. Catches from fall sampling would not be comparable to past years' data. Although walleye may be caught in relatively high numbers in the spring, that does not preclude using spring catch data as an index for changes in fish density over time.

## Electrofishing

### Methods

Electrofishing procedures are described in Gustaveson et al. 1980. The electrode array on the electrofishing boat in 1980 was similar to that used in 1978 (Gustaveson et al. 1979). In 1980, the transect at Crappie Cove (in Bullfrog Bay) was dropped from the sampling schedule and a transect at North Wash (Figure 8) was added. The indices of abundance for the species collected at each location were the averages of the catch rates (fish/hour of electrofishing) for two nights of sampling.

### Results and Discussion

A total of 5,573 fish was collected during 10 nights of electrofishing at the five shoreline transects (Table 9). As in the past, centrarchids accounted for most of the catch. Catch rates for young-of-the-year largemouth bass were the highest recorded since 1977, suggesting a strong 1980 year class (Figure 9). Catch rates for young-of-the-year black crappie were lower than in 1979 at most of the sampling stations. Catches of young crappie were still relatively high compared to 1977 and 1978. The mean catch rates for both bass and crappie were low at North Wash compared to other areas. This resulted from lower water transparency (average Secchi disk reading 0.3 m at North Wash; 2.6 m at the other stations) which lowered sampling efficiency. Green sunfish and bluegill were also collected in substantial numbers at all stations. Large schools of adult threadfin



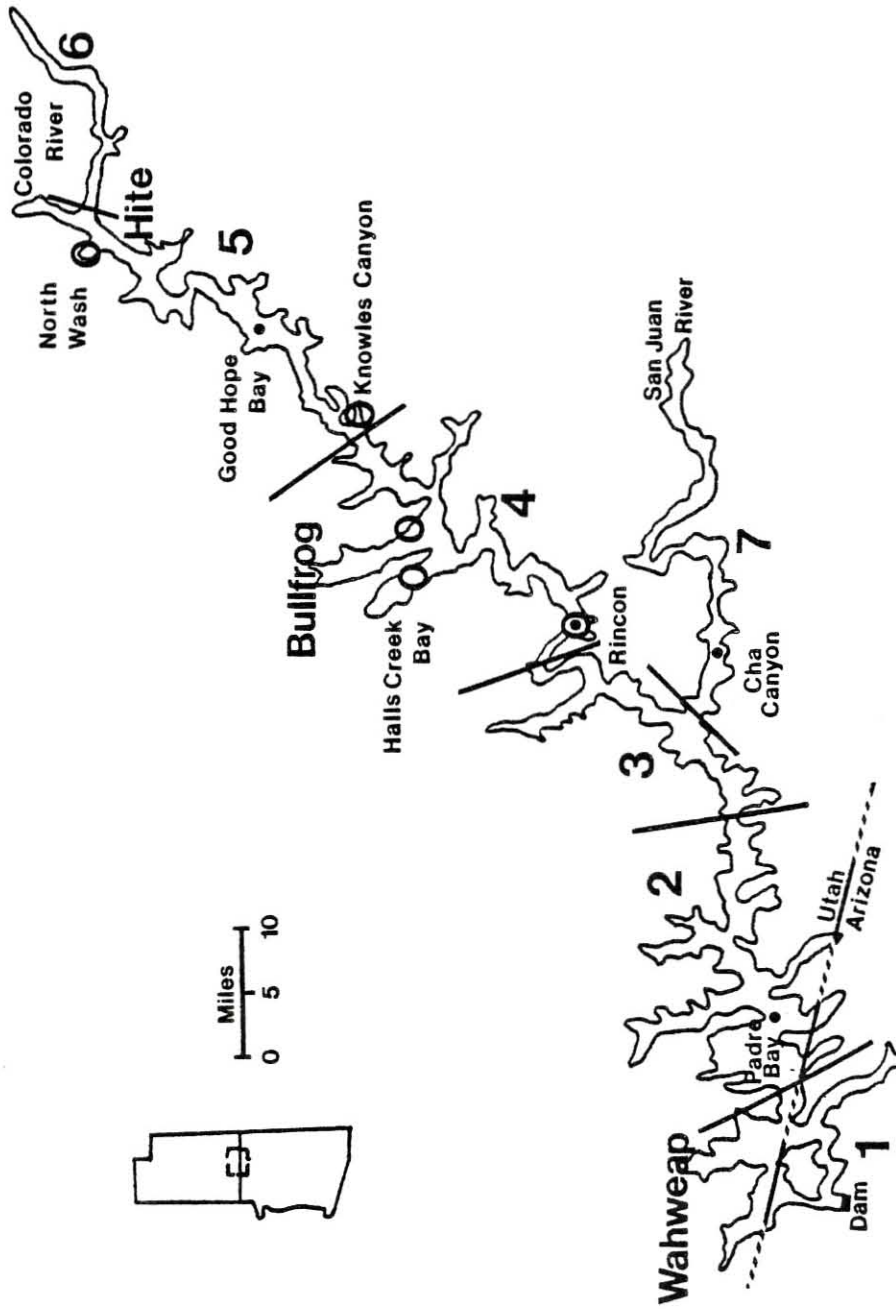


Figure 8. Map of Lake Powell showing annual netting sites (dots), electrofishing transects (circles) and lake areas.

Table 9. Number of fish caught/hour of electrofishing at Lake Powell during August 1980.

Species	Rincon	Hall's Creek Bay	Stanton Creek	Knowles Canyon	North Wash	% of Total Catch
Young-of-the-year largemouth bass	153	144	212	98	35	15.9
Age I and older largemouth bass	11	3	5	8	15	1.0
Young-of-the-year black crappie	133	179	275	83	7	16.0
Green sunfish	164	143	120	285	263	38.0
Bluegill	252	161	245	345	508	25.6
Red shiner	0	0	2	3	c	--
Channel catfish	18	17	9	4	72	2.9
Striped bass	t <sup>a</sup>	0	0	0	1	d
Yellow bullhead	1	1	t	1	1	0.1
Walleye	0	0	0	0	1	d
Green sunfish/ bluegill hybrid	0	0	0	1	8	0.3
All species	732 <sup>b</sup>	648	868	828	911	

<sup>a</sup>t = less than 1 fish/hour.

<sup>b</sup>Total fish divided by total hours of electrofishing.

<sup>c</sup>Too abundant to be sampled quantitatively.

<sup>d</sup>Less than 0.1%.

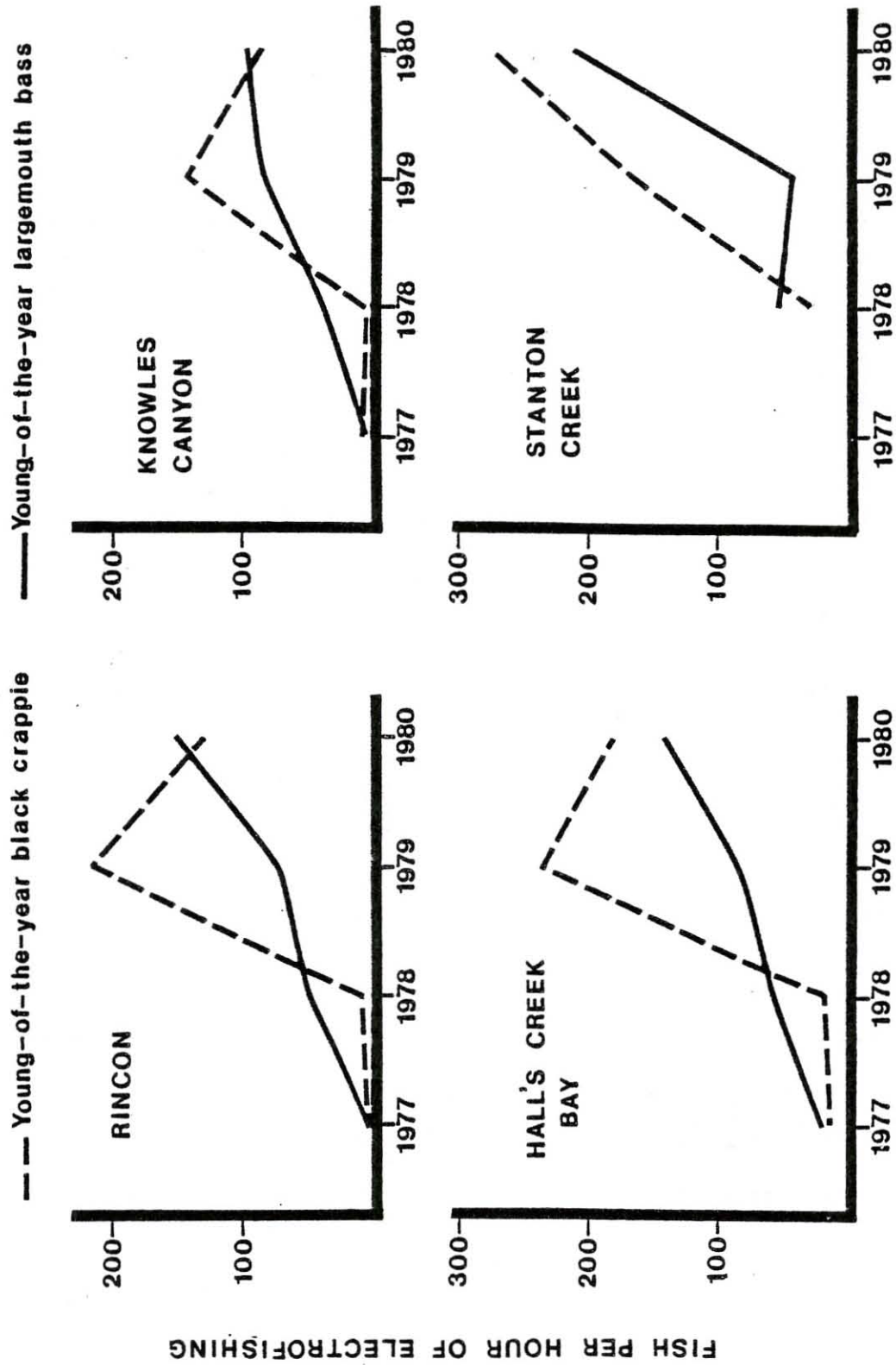


Figure 9. Mean number of young-of-the-year largemouth bass and black crappie collected/hr of electrofishing during August-September 1977-80, Lake Powell.

shad were evident at all transects but were not quantitatively sampled because they were too numerous to be collected effectively in relation to their density. A similar problem was encountered with red shiners at the North Wash transect.

Other sampling techniques were also tested during 1980. Attempts to sample young-of-the-year walleye by trawling were unsuccessful. A limited amount of data on black crappie was collected using scuba. The information obtained by scuba may be useful in describing spawning habitat but showed little promise as an index of abundance.

#### Recommendations

Continue annual electrofishing during August-September 1981. Establish sampling stations that coincide with annual netting stations to allow a comparison of data using the two different techniques. Eliminate the stations at North Wash, Knowles Canyon and Stanton's Creek; maintain the stations at Hall's Creek and Rincon; and establish new stations at Cha Canyon and Good Hope Bay. These stations would provide a sample over a larger area of the lake and give a broader picture of game fish produced in the lake as a whole.

## MONITORING OF STRIPED BASS POPULATION DEVELOPMENT

### JOB IV

#### Methods

Striped bass biological data were obtained from fish taken in gill nets, by angling, electrofishing, and during regular creel census interviews. Age, growth and food habits data were treated as described previously (Gustaveson et al. 1980). Spawning fish were sampled with 6.4 and 7.6 cm square mesh gill nets that were 61 m long and 1.8 m deep. Nets were fished in the inflow areas of the main tributaries, where current from the San Juan and Colorado rivers was detectable. Young-of-the-year were collected by electrofishing (Job III) and with experimental gill nets. Small mesh experimental gill nets were 27.4 m long with three 9.1 m panels of 1.3, 1.9 and 2.5 cm square mesh. Large mesh experimental nets were 30.5 m long with four panels of 2.5, 3.8, 5.1 and 7.6 cm square mesh.

#### Results and Discussion

Ripe adult striped bass were collected in the Colorado and San Juan river inflow areas of Lake Powell during 1980. The gill-net catch rates were nearly equal for both areas (Table 10). In addition, ripe fish were found near Glen Canyon Dam during the spawning season.

Striped bass spawning usually occurs at temperatures of 15.6 C to 17.8 C. Water temperatures in this range coincided with peaks in number

Table 10. Comparison of three spawning aggregations of striped bass in Lake Powell, April-June 1980.

	Colorado <sup>a</sup> River	San Juan River	Wahweap Bay
Effort expressed as gill-net hours	4,620	242	460
Mature striped bass caught/gill-net hour (X 100)	4.29	4.13	2.39
Total mature females caught	61	13	10 <sup>b</sup>
First spent female caught	June 11	May 21	May 28

<sup>a</sup>Persons and Bulkley 1980.

<sup>b</sup>Total includes females collected by angling and during creel census.



of t striped bass caught in the Colorado River immediately upstream of inflow (Persons and Bulkley 1980). Numbers of spawners caught apped to be more closely correlated with water temperature than with amouof discharge. Spawning began earlier on the San Juan River becau water temperatures necessary for spawning occurred earlier on the Sa Jan than on the Colorado. The first spent female was collected 21 May nhe San Juan and not until 11 June on the Colorado. The first spent fema found in the Wahweap area was collected 28 May (Table 10).

Spawng activity was not directly observed in any location nor were eggs find within the reservoir. Four eggs were collected by the Utah Cooperative Fishery Unit in the Colorado River with three of them beginning th initial stages of cell division (Persons and Bulkley 1980). Spawng began about mid-May in the lower reservoir and the San Juan River an lasted until at least mid-June in the Colorado River.

Beach seine sampling for y-o-y striped bass was not successful due to high water levels and brushy shorelines. No striped bass were collected in over 100 seine hauls during July and August. Meter net tows and trawl samples failed to capture any young striped bass. Reproductive success was first verified in August during the annual electrofishing survey (Job III), when one y-o-y was captured at the Rincon and one was taken at North Wash.

Gill-net sampling during October and November produced a total of 61 y-o-y striped bass. The capture rate exceeded that reported for y-o-y in the established, naturally reproducing fisheries at Santee Cooper and Kerr reservoirs (Table 11). The young fish were distributed



Table 11. Comparison of gill-net catch rates in naturally reproducing striped bass fisheries.

State	Reservoir	C/U <sup>a</sup> By Year Class				
		0	1	2	3	4
South Carolina	Santee-Cooper	0.59	3.19	0.23	0.33	0.03
Virginia	Kerr	0.30	3.58	0.67	0.64	0.24
Utah (present study)	Lake Powell					
	Main stem	1.26	1.13	--	--	--
	San Juan Arm	0.00	0.07	--	--	--
	Lower reservoir	0.00	2.68 <sup>b</sup>	--	--	--

<sup>a</sup>C/U = striped bass/1,000 sq ft of gill net/12 hours, standard method, AFS Striped Bass Committee, after McCloskey 1980.

<sup>b</sup>From stocked population of 222,550 striped bass introduced in 1979.

from Hite to the Rincon in the main stem. No young fish were found in the San Juan Arm or in the lower reservoir. Apparently, the only successful natural reproduction came from those fish spawning in the current of the Colorado River.

Back-calculated total lengths (TL) at annulus formation for striped bass collected in 1980 were similar to those previously reported (Gustaveson et al. 1980). Grand average TL at each successive annulus (I-VI) was 242, 438, 581, 652, 706 and 799. The only deviation from previously observed growth patterns was found among naturally reproduced y-o-y captured in the main stem. These fish averaged 319 mm TL, with a range of 181-391, which was almost 80 mm longer than the back-calculated average of the older (stocked) year classes. This rapid growth was similar to that shown by the first striped bass introduced into Lake Powell in 1974. These fish obtained average TL of 282 mm, with a range of 266-296 mm (Hepworth et al. 1976).

An additional 120 striped bass stomachs were examined in 1980, bringing the total number of stomachs examined at Lake Powell to 885. Dietary patterns (Table 12) were similar to those previously reported (Gustaveson et al. 1980). Threadfin shad occurred most often in striped bass stomachs, with crayfish occurring often in the spring and summer months (Figure 10).

#### Recommendations

Establish a standardized fall gill-netting survey to assess magnitude and distribution of the naturally reproduced y-o-y and recruitment of yearling striped bass.

Table 12. Seasonal occurrence of food items in striped bass stomachs collected during 1980. Percent occurrence of food items based on number of stomachs containing food.

	Winter Dec-Feb	Spring Mar-May	Summer Jun-Aug	Fall Sep-Nov
Sample size	11	26	63	20
Empty stomachs	2	9	16	2
<u>Food Item</u>				
Fish				
Threadfin shad	100	22	52	87
Green sunfish	0	0	0	7
Carp	0	6	0	0
Unknown	0	0	4	6
Crayfish	0	39	40	0
Zooplankton	0	22	2	0
Debris (rocks, sticks, etc.)	0	11	2	0

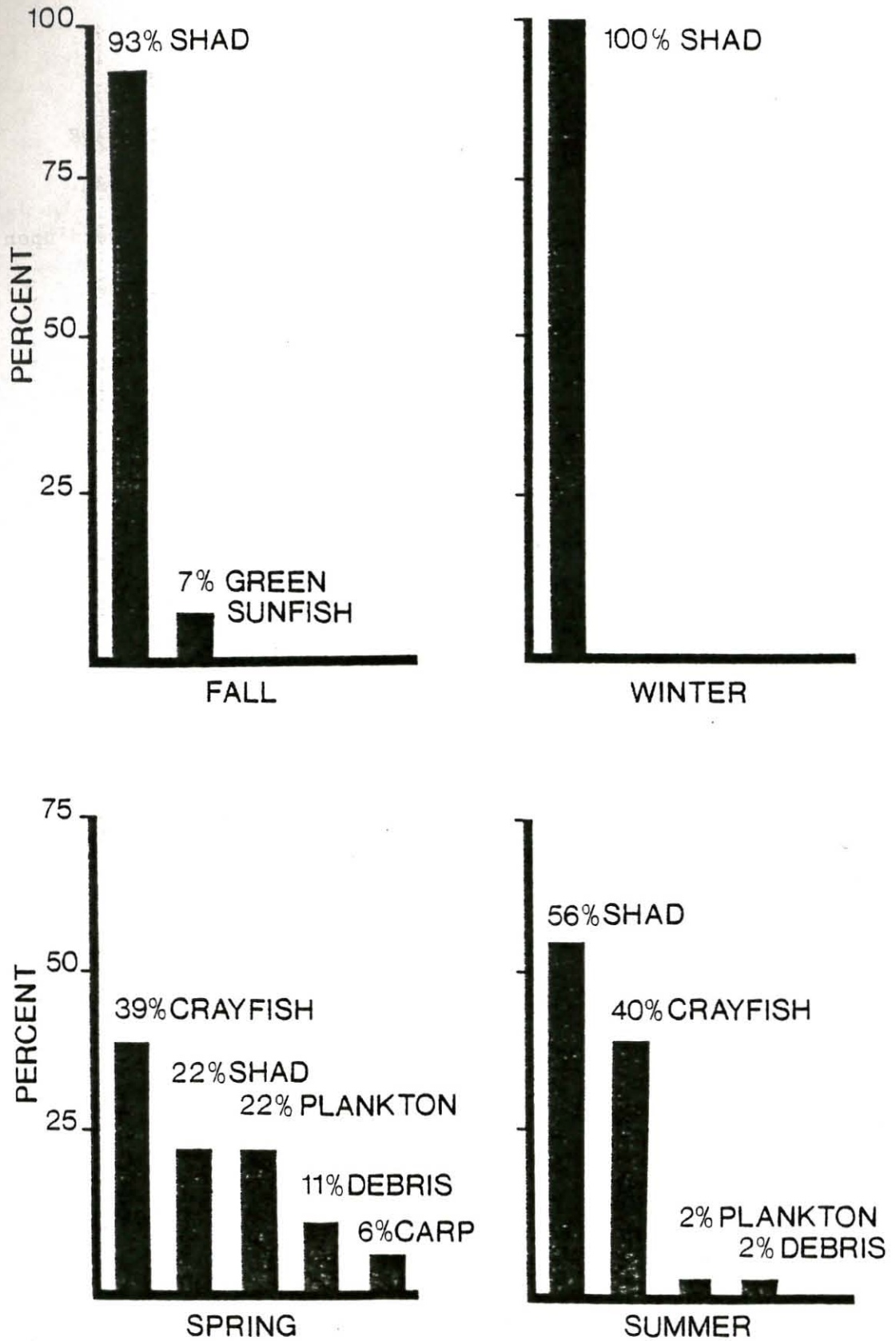


Figure 10. Seasonal occurrence of food items in striped bass stomachs collected during 1980. Percent occurrence of food items based on number of stomachs containing food.

Institute a striped bass tagging program to describe spawning movements and to determine movements of naturally reproduced fish. Since the striped bass fishery throughout the reservoir may depend upon recruitment from fish spawned in the upper reservoir, it will be important to determine the extent of movement of those fish.

Monitor size (TL) of striped bass that return to the creel to provide baseline data for future comparisons. A naturally reproduced, dominant year class would be reflected by an initial decrease in the average size of fish caught. A continually increasing average size would indicate poor recruitment and suggest the need for supplemental stocking.

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Archives No. 8100158

Appropriations No. 015926