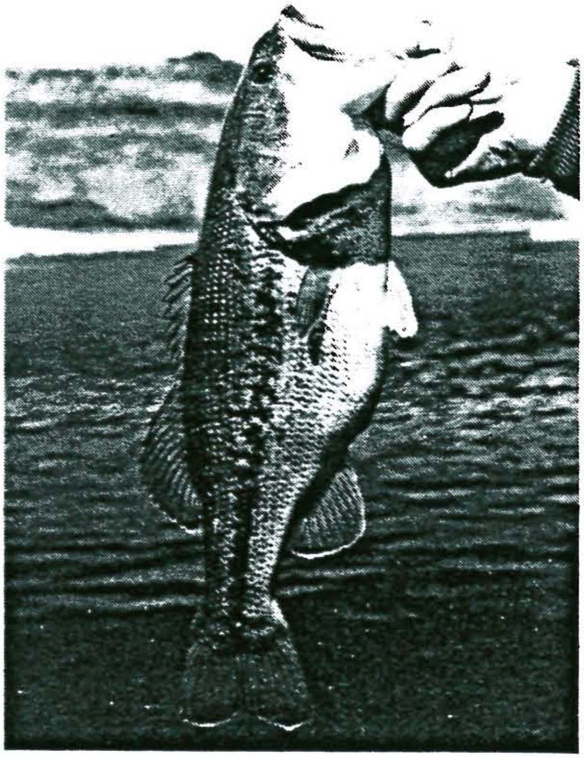
Lake Powell Fisheries Investigations



1987 (Segment 3) Annual Report

Dingell-Johnson Project F-46-R-3

UTAH
NATURAL RESOURCES
Wildlife Resources

LAKE POWELL FISHERIES INVESTIGATIONS

1987 Performance Report

A. Wayne Gustaveson, Project Leader
Bruce L. Bonebrake, Project Biologist
Kevin Christopherson, Project Biologist
James E. Johnson, Fisheries Program Coordinator

Dingell-Johnson Project F-46-R-3
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Utah Department of Natural Resources
Division of Wildlife Resources
1596 West North Temple
Salt Lake City, UT 84116

William H. Geer
Director

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ABSTRACT

For the third consecutive year threadfin shad, Lake Powell's major forage species, produced a very small year class. Reproduction was quite low and there was virtually no recruitment of young-of-the-year (yoy) shad into the pelagic zone of Lake Powell. Poor forage conditions caused the striped bass population to decrease in average total length. Striped bass fishing was slow with only small striped bass being taken. Relative abundance of adult game fish was similar to last year but well below historical levels. Production of yoy game fish was less than seen in 1985 and 1986, except for smallmouth bass which showed an increase.

More than 34,000 smallmouth bass were stocked at four locations in Lake Powell. Natural reproduction was again documented. Results of smallmouth bass studies in 1986 indicated a promising future for this species in Lake Powell.

A total of 58,870 fingerling smallmouth bass was produced at the Wahweap Warmwater Facility in 1986. Some 24,100 of these fish were stocked in Rockport Reservoir in northern Utah.

FORAGE CONDITION STUDY

JOB I

METHODS

Threadfin shad (Dorosoma petenense) spawning was monitored with ichthyoplankton net collections, which began in May and continued until September. Weekly samples were taken in the backs of bays at Wahweap Creek, Bullfrog Creek and Halls Creek. Biweekly samples were collected at Piute Farms Wash, Piute Farms Red Wall, the San Juan River Inflow and Navajo Canyon (Figure 1).

Recruitment of young-of-the-year (yoy) threadfin shad into the pelagic areas of Lake Powell was monitored by monthly midwater trawl collections and eight-minute sonar transects. Sampling was conducted from July through September at Wahweap, Bullfrog and Good Hope bays (Figure 1). A complete description of both the ichthyoplankton and trawling sampling methods can be found in Gustaveson et al. 1985.

RESULTS AND DISCUSSION

Ichthyoplankton netting began in May and continued until September, when shad spawning ended. At the lower lake stations spawning was fairly good at the Warm Creek site, but the lowest in four years at the Wahweap station (Figure 2). Threadfin shad spawning was likewise the lowest sampled in four years at both mid-lake stations (Figure 3).

Spawning success at both Navajo Canyon and the San Juan River Arm in 1987 was improved over 1986 (Tables 1 & 2). High numbers of larval shad were collected at Navajo Canyon from May through July, while spawning peaked during June on the San Juan Arm. A few larvae were collected from June through August from the San Juan River, indicating that at least some shad used the inflow for spawning in 1987 (Table 2).

Midwater trawl catches of yoy shad during 1987 were among the lowest ever observed since trawling was begun at Lake Powell ten years ago (Figure 4). Echograms run during each sample period also reflected the lack of shad in the open water zone. Although it was anticipated that a peak in the pelagic population of threadfin shad might be seen in 1987, no recovery of shad numbers occurred. This marks the first break in the three year shad cycles described by Gustaveson et al. (1985). It may indicate that the shad population has been predator impacted to the point that pelagic shad populations cannot exist in high numbers in Lake Powell.

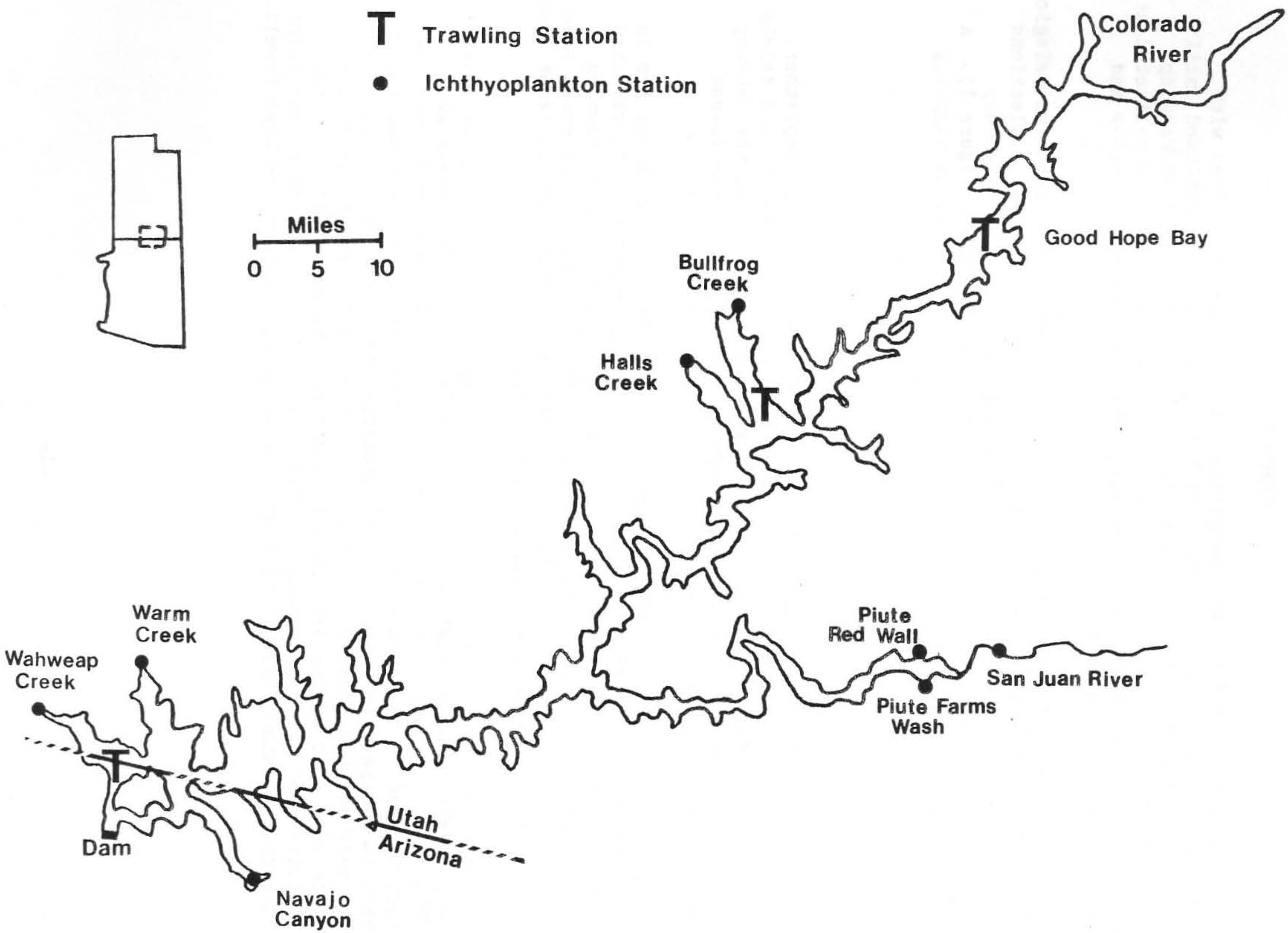


Figure 1. Map of Lake Powell showing trawling and icthyoplankton netting station for threadfin shad, 1987.

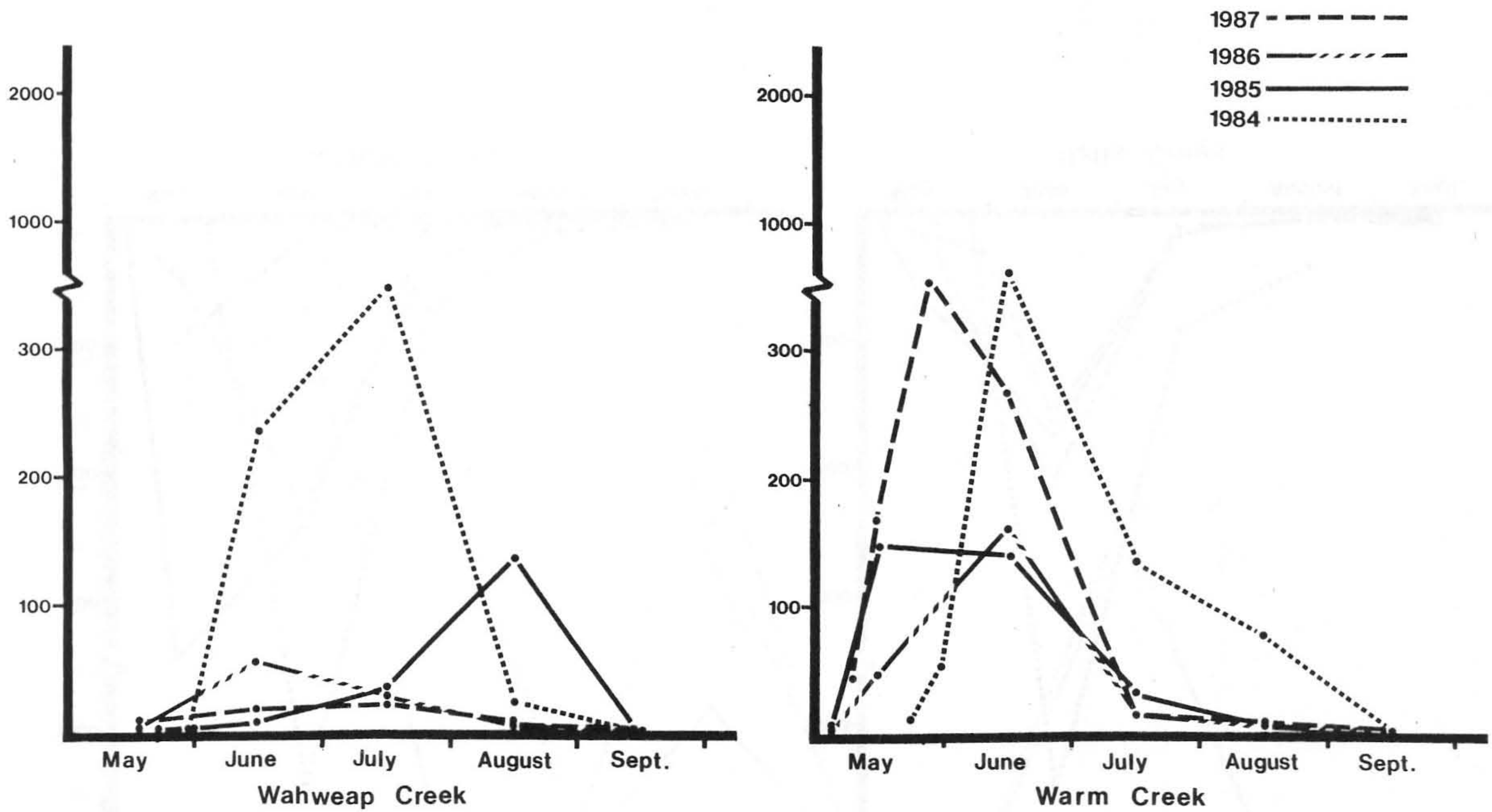


Figure 2. Mean number of larval shad collected per icthyoplankton net tow, lower Lake Powell, 1984-87.

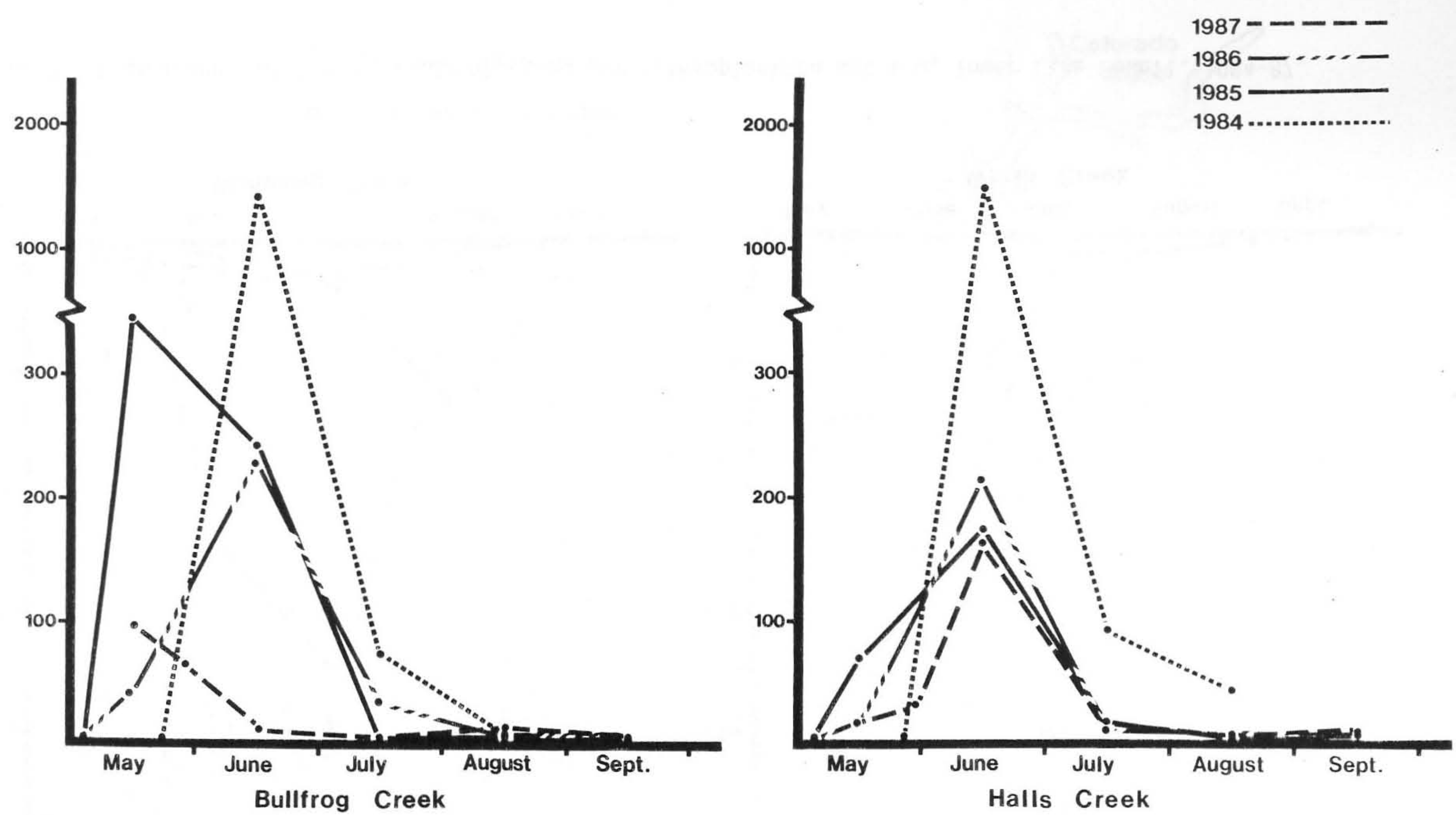


Figure 3. Mean number of larval shad collected per icthyoplankton net tow, mid. Lake Powell, 1984-87.

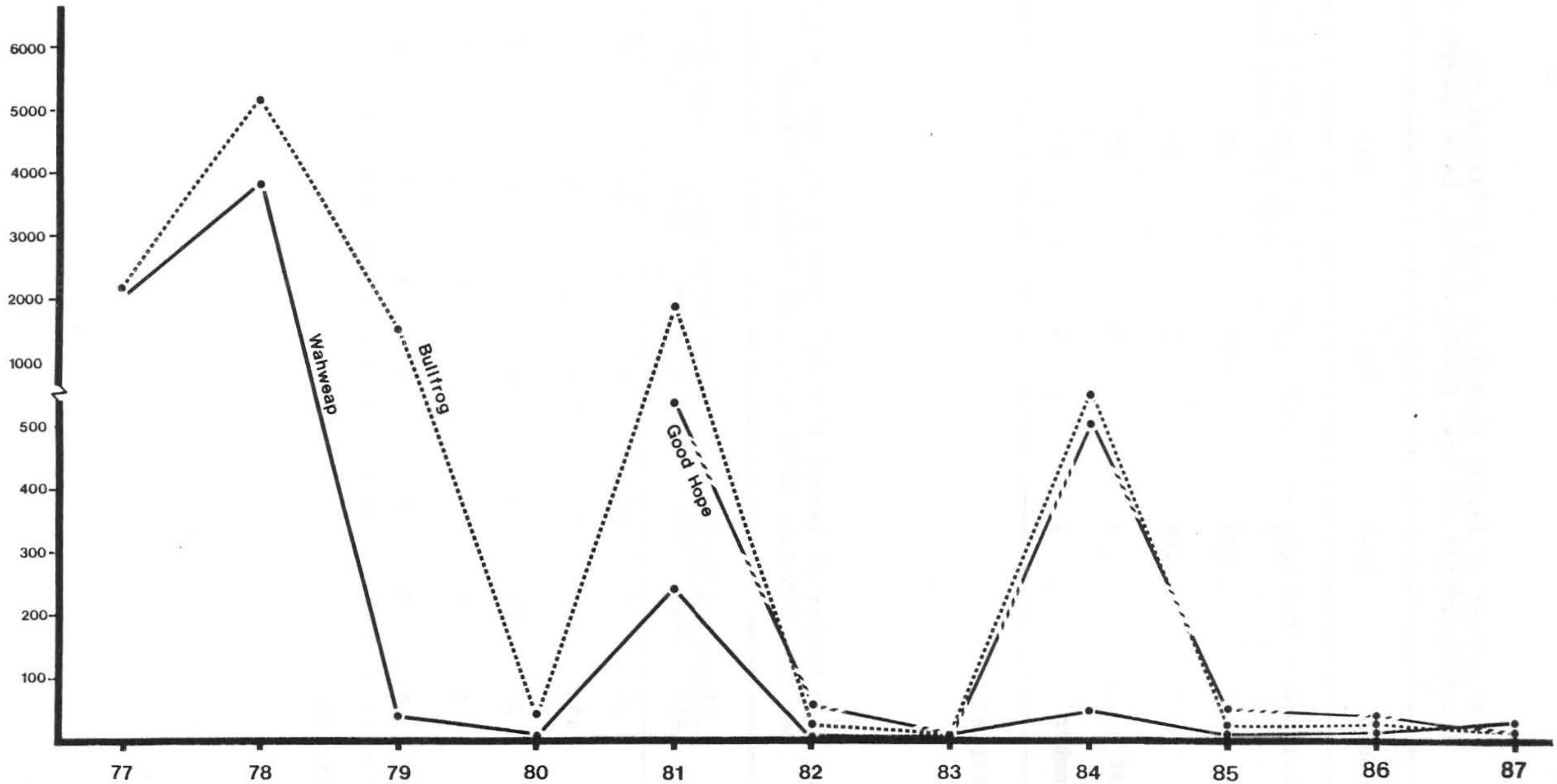


Figure 4. Mean number of threadfin shad collected per trawl tow, July-September, Lake Powell, 1977-87.

Table 1. Mean number of larval threadfin shad collected per ichthyoplankton net tow, Navajo Canyon, Lake Powell, 1984-87.

Sample Month	1987	1986	1985	1984
May	551	23	48	791
June	251	702	40	47
July	149	2	24	4
August	4	0	65	2
September	1	1	10	a

[a] Not sampled

Table 2. Mean number of larval threadfin shad collected per ichthyoplankton net tow, San Juan River Arm, Lake Powell, 1985-87.

Sample	Piute Red Wall			Piute Farms Wash			San Juan River Inflow		
Month	1987	1986	1985	1987	1986	1985	1987	1986	1985
May	16	28	69	3	5	17	0	1	1
June	473	227	31	151	129	6	7	1	1
July	37	23	1	0	6	1	3	31	0
August	6	1	1	1	0	0	1	1	0
September	a	a	5	a	a	0	a	a	1

[a] Not sampled

MEASUREMENT OF FISHERY HARVEST, PRESSURE AND SUCCESS

JOB II

No work was scheduled for this job during 1987. The next scheduled creel census will occur in 1989.

Table 1. [illegible]

Sample month	
[illegible]	[illegible]
June	[illegible]
July	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

* Not [illegible]

INDEX TO ANNUAL FISH POPULATION TRENDS

JOB III

ANNUAL NETTING

METHODS

Methods for standardized gillnetting are described in Gustaveson et al. 1985.

Stomach samples from largemouth bass (Micropterus salmoides), walleye (Stizostedion vitreum), and striped bass (Morone saxatilis) were used to quantify food habits by percent occurrence.

RESULTS AND DISCUSSION

A total of 174 fish was collected in 80 net-days. Catch rate was highest at the San Juan followed by Good Hope Bay, Rincon and Padre Bay, respectively (Table 3). Total catch rate for all species and stations combined (2.18 fish/net-day) was approximately the same as seen in 1986 (2.16 fish/net-day).

Walleye were the most frequently sampled fish in 1987. Average catch rate for walleye remained stable, while striped bass catch rate decreased from 0.70 fish/net day in 1986 to 0.49 in 1987. Largemouth bass catch rates stabilized or rose slightly from the population low point of 1986 (Figure 5).

Springtime is a period of low food availability. Consequently, the majority of striped bass and walleye stomachs were empty (Table 4). Crayfish (Orconectes virilis) were the dominant food item of striped bass and largemouth bass, but walleye took mainly threadfin shad and green sunfish (Lepomis cyanellus).

Table 3. Catch rate (fish/net day) during annual gillnetting, Lake Powell, March 1987.

	Good Hope Bay	Rincon	San Juan	Padre Bay	Total[a]	% of Catch
Striped Bass	1.05	0.75	0.15	0.00	0.49	22.5
Walleye	0.40	0.50	1.35	0.50	0.69	31.7
Largemouth Bass	0.15	0.45	0.75	0.25	0.40	18.3
Carp	0.45	0.40	0.25	0.15	0.31	14.2
Channel catfish	0.15	0.10	0.15	0.10	0.13	6.0
Green Sunfish	0.05	0.15	0.00	0.00	0.05	2.3
Bluegill	0.30	0.15	0.00	0.00	0.11	5.0
Total	2.55	2.50	2.65	1.00	2.18	100.0

[a] Total = Total number of fish divided by total net-days.

Table 4. Percent occurrence of food items in striped bass, largemouth bass, and walleye collected in gill nets, Lake Powell, 1987. (Percentage based only on number of stomachs containing food.)

	Striped bass	Largemouth bass	Walleye
Sample size (n)	38	32	55
Empty stomachs	22 (58%)	11 (34%)	36 (65%)
Stomachs with food	16	21	19
Food Items			
Zooplankton	25%	0%	0%
Crayfish	62%	90%	0%
Fish			
Threadfin shad	19%	5%	63%
Green sunfish	0%	14%	19%
Bluegill	0%	5%	0%
Channel catfish	0%	0%	5%
Striped bass	6%	0%	0%
Unknown fish	6%	5%	23%

ELECTROFISHING

METHODS

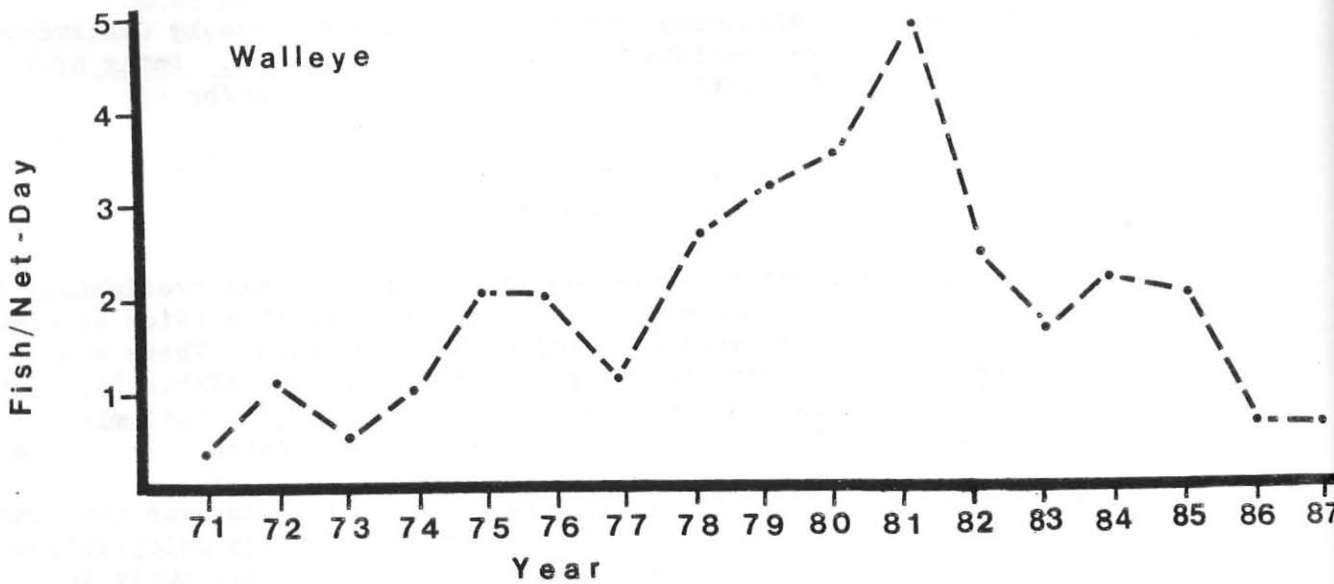
Electrofishing procedures were similar to those described by Gustaveson et al. 1985. Each of five stations was sampled for one hour. Index of species abundance at each location was mean catch rate (fish/hr of electrofishing).

RESULTS AND DISCUSSION

A total of 2217 fish was collected during 5 nights of electrofishing. Catch rate for all species combined at San Juan was more than twice as high as the other sites due to an abundant crop of green sunfish. There was little difference among total catches of the other stations (Table 5). The majority of fish captured were green sunfish and bluegill (Lepomis macrochirus), which combined to represent 69.4% of total catch.

Largemouth bass yoy made up 4.8% of total catch which was less than the 20.1% seen in 1986. Conversely, smallmouth bass (Micropterus dolomieui) yoy increased from 4.7% of total catch in 1986 to 16% in 1987. Only 5 striped bass yoy were caught in 1986 compared to the 102 taken in 1987, increasing their composition in the catch from 0.2% to 4.6%. Total catch of black crappie (Pomoxis nigromaculatus) was only 1.9% and virtually all of these fish were caught at the Warm Creek station (Table 5).

Largemouth, smallmouth, and striped bass yoy had greatest average length at the Stanton Creek station. Smallest average lengths occurred at the Rincon station. Average length was usually greater for smallmouth than largemouth collected from the same area (Table 6). Smallmouth bass have reproduced and grown well in 1987 (Job 5).



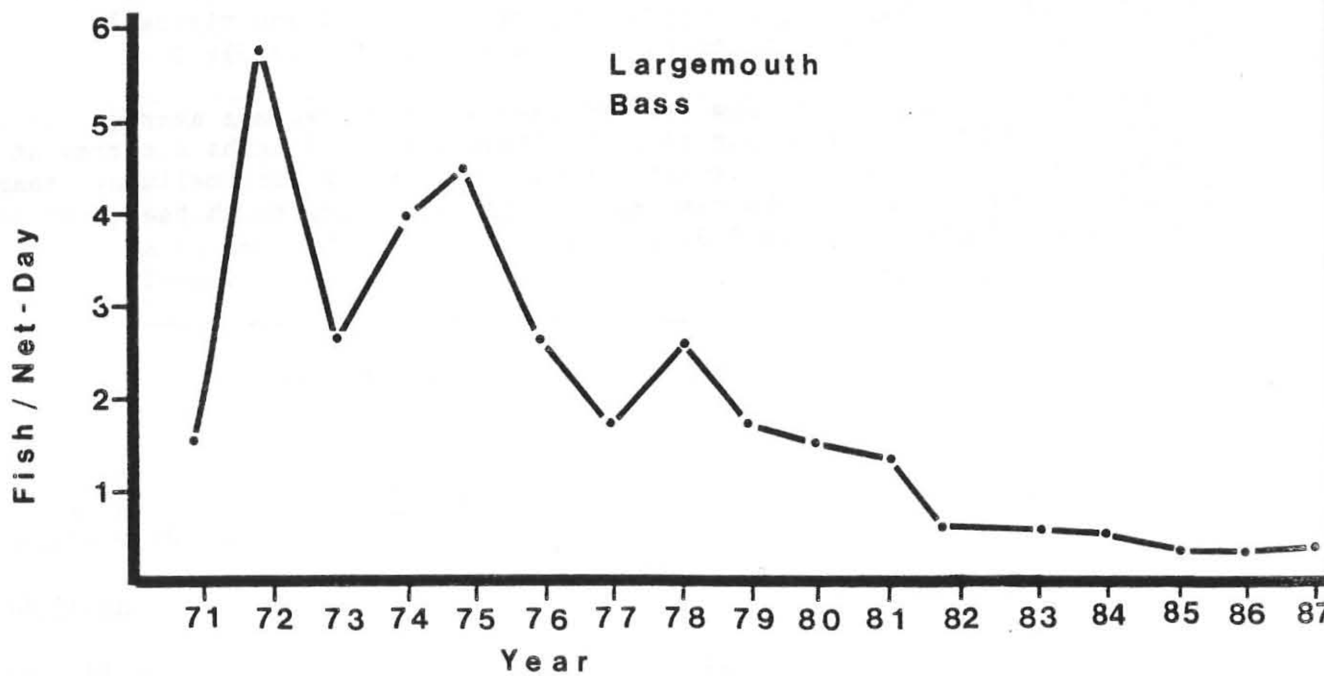


Figure 5. Catch rates (fish/net day) for walleye and largemouth bass annual netting, Lake Powell, 1971-87.

Table 5. Average catch rate (fish/hr) of fish collected by electrofishing, Lake Powell, September, 1987.

Species	Good Hope Bay	Stanton Creek	Rincon	San Juan	Warm Creek	% of Total Catch
Largemouth bass, yoy	20	8	3	32	44	4.8
Largemouth bass, age 1 and older	1	1	1	0	5	0.4
Black crappie, yoy	0	0	0	2	40	1.9
Striped bass, yoy	60	3	1	30	8	4.6
Smallmouth bass, yoy	131	74	68	53	28	16.0
Smallmouth bass, age 1 and older	1	0	7	4	0	0.5
Bluegill, all ages	53	50	31	127	155	18.7
Green sunfish, all ages	95	203	217	550	59	50.7
Channel catfish, all ages	2	8	6	30	8	2.4
All Species	363	347	334	826	347	100.0

Table 6. Average total length (mm) of yoy fish collected by electrofishing, Lake Powell, September, 1987.

	Good Hope Bay	Stanton Creek	Rincon	San Juan	Warm Creek	Lake wide mean
Largemouth	112.6	115.6	87.3	96.7	83.7	99.2
Smallmouth	110.1	145.6	96.7	113.7	112.5	115.7
Striped bass	108.6	136.7	107.0	117.8	93.8	112.8
Black crappie	-	-	-	24.5	62.0	43.3
Bluegill	106.0	102.0	64.3	95.3	50.2	83.6
Green sunfish	97.2	92.1	84.9	76.7	77.8	85.7
Channel catfish	139.0	110.4	69.3	106.9	79.1	100.9

STRIPED BASS POPULATION DEVELOPMENT

JOB IV

HYBRID STRIPED BASS EXPERIMENTATION

The hybrid cross between female striped bass and male white bass produces a highly sought after fish with excellent sporting qualities and management capabilities. The Colorado Division of Wildlife (CDW) sent an eight man team to Lake Powell to make this cross between female striped bass from Lake Powell and white bass males from Utah Lake. The progeny would be used in Colorado waters.

A portable hatchery building housed in a semi-trailer was set up near the Wahweap Culture Facility pump house. The trailer contained a series of circular fiberglass spawning tanks which were supplied with water from the DWR well. Approximately 15 gal/min of water (19.4 C) was piped from the well and circulated through the system of circular tanks and then discharged into two square fiberglass tanks which contained 30 ripe white bass males from Utah Lake. Fifteen white bass males were injected with hormones to insure an immediate source of viable sperm was available when a female striped bass was captured. The other 15 white bass were held in reserve for later use. Five pounds of salt was added to the white bass holding tank to aid in osmoregulation. None of the 30 fish were lost.

CDW personnel attempted to take female striped bass with 200 ft gill nets containing single size mesh panels of 2.5, 3, and 4.5 inch square mesh. Their goal was to collect 10 females in excess of 20 pounds each.

RESULTS AND DISCUSSION

Joint efforts by UDWR and CDW to collect female striped bass began on 6 May. Mature fish were seen surfacing at a spawning site in Wahweap Bay that had been used in previous years. The fish were too small to be collected with the largest mesh nets. On 7 May smaller nets were used and the operation was moved into Warm Creek where a school of spawning fish was located. Small ripe males and green females were readily caught by angling but females eligible for hormone injection and subsequent spawning were taken only with 2.5 and 3 inch gill nets. A total of 3 eligible females from 4-8 pounds was captured. Unfortunately, one died during transport to the hatchery, and two others died shortly after being placed in the hatchery tanks. CDW reported that these fish would have spawned in the wild on the night of capture.

The spawning peak was reached on 8 May. Fish were readily caught on hook and line. Many ineligible females were handled but only one eligible female survived the trip to the hatchery. This fish spawned during transport and had only a spoonful of eggs remaining when examined.

All females handled on 9 May were ineligible. Spawning was much less intense with cooling evening temperatures and windy conditions. Inclement weather and cooling temperatures were not conducive to fish collection on 10 May. Males could still be caught by angling but no females were captured. Schools of fish could be located with sonar at depths of 60-120 feet, but active spawning was not detected this night.

CDW made the decision to cancel further collections on 11 May. The hatchery building was packed up and the collection team left for Colorado on the morning of 12 May.

Valuable information gained from this experiment included insight into striped bass spawning at Lake Powell. We knew that spawning normally occurs between 20 April and 30 May. We saw that a rapid warming of lake temperature can induce active spawning. Temperatures rose from 17.8 C to 21.1 C immediately prior to the night of most active fish collection. A subsequent drop in temperature to 20 C slowed spawning considerably.

Striped bass appear to return to the same spawning areas year after year. All fish in the lake do not spawn at the same time. The spawning event is more drawn out and fragmented than we suspected. Striped bass surface activity near shore during this time period is definitely spawning activity and not feeding activity. There are three known spawning sites near Glen Canyon Dam. All are on points of land extending from Antelope Island into Wahweap and Warm Creek Bays. There must be literally hundreds of other spawning locations within the lake that we do not know about.

I was pleased with our ability to locate and collect spawning fish. It was disappointing that the fish could not be kept alive. I suspect a combination of warm water temperature during collection and the generally poor condition of the striped bass population caused the high mortality rate. If we attempt to repeat this experiment in the future it would be possible to use an anesthetic and salt solution in the holding tanks on the boat to reduce stress of handling and capture. Bottled oxygen was used in the holding tanks along with salt, but anesthetic was not used. We could also attempt collection only in years when general physical condition of the population was high.

LAKE POWELL STRIPED BASS STUDY

METHODS

Biological information was obtained from all striped bass sampled by UDWR. Data necessary to determine age and growth, food habits, maturity and condition (K_{fl}) were routinely taken from all fish sampled. A complete description of sampling methods is found in Gustaveson et al. 1985.

RESULTS AND DISCUSSION

Successful striped bass spawning occurred for the 9th consecutive year. Yoy striped bass were qualitatively sampled with seines in the upper San Juan Arm near the inflow, Wahweap, Warm Creek and Good Hope Bays. The September electrofishing survey confirmed high numbers of yoy on shore at Good Hope Bay (60 fish/hr) and San Juan (30 fish/hr) with fewer fish collected at Rincon and Wahweap (Table 5).

The annual fall gill net survey confirmed relatively high striped bass reproductive success despite the small size and poor condition of brood fish. Yoy were collected at an average lakewide rate of 0.93 fish/1000 sq ft gill net/12 hr (Figure 6). Yoy were collected most often at Warm Creek (1.85) and Good Hope Bay (1.4) with less fish sampled at Rincon (0.30) and San Juan (0.15). Yearling and older fish were sampled in relatively higher numbers than seen in 1986.

The physical condition of striped bass sampled in 1987 was essentially the same as seen in 1986. Juvenile fish (<500 mm) averaged 1.15 K_{FL} while adults averaged 0.94 K_{FL} factor (Figure 7). Average total length of striped bass sampled continued to decline. All fish seen in 1987 averaged 393 mm TL. Fish sampled in 1986 averaged 423 mm, which was considerably less than the 555 mm average in 1985 and 640 mm in 1984.

Four hundred fifty five striped bass stomachs were examined during 1987. The contents suggest that striped bass were preferentially piscivorous with shad being the dominant food item. Shad occurred in 81% of the stomachs during the summer but in only 24% of stomachs by November (Table 7). Number of empty stomachs increased from 20% to 52% over the same time period. As shad abundance declined, fish were replaced in the diet by zooplankton. The highest use of zooplankton occurred at Good Hope Bay and Rincon where use of shad was the lowest.

Crayfish were the only other major food item consistently found in striped bass stomachs. Crayfish were seen in about 20% of stomachs (Table 7).

Approximately 10% of striped bass stomachs examined were found to have an ulcerous sore inside the stomach. It is theorized that stomach ulcers are a symptom of chronic stress that occurs in the striped bass population during periods of low food availability.

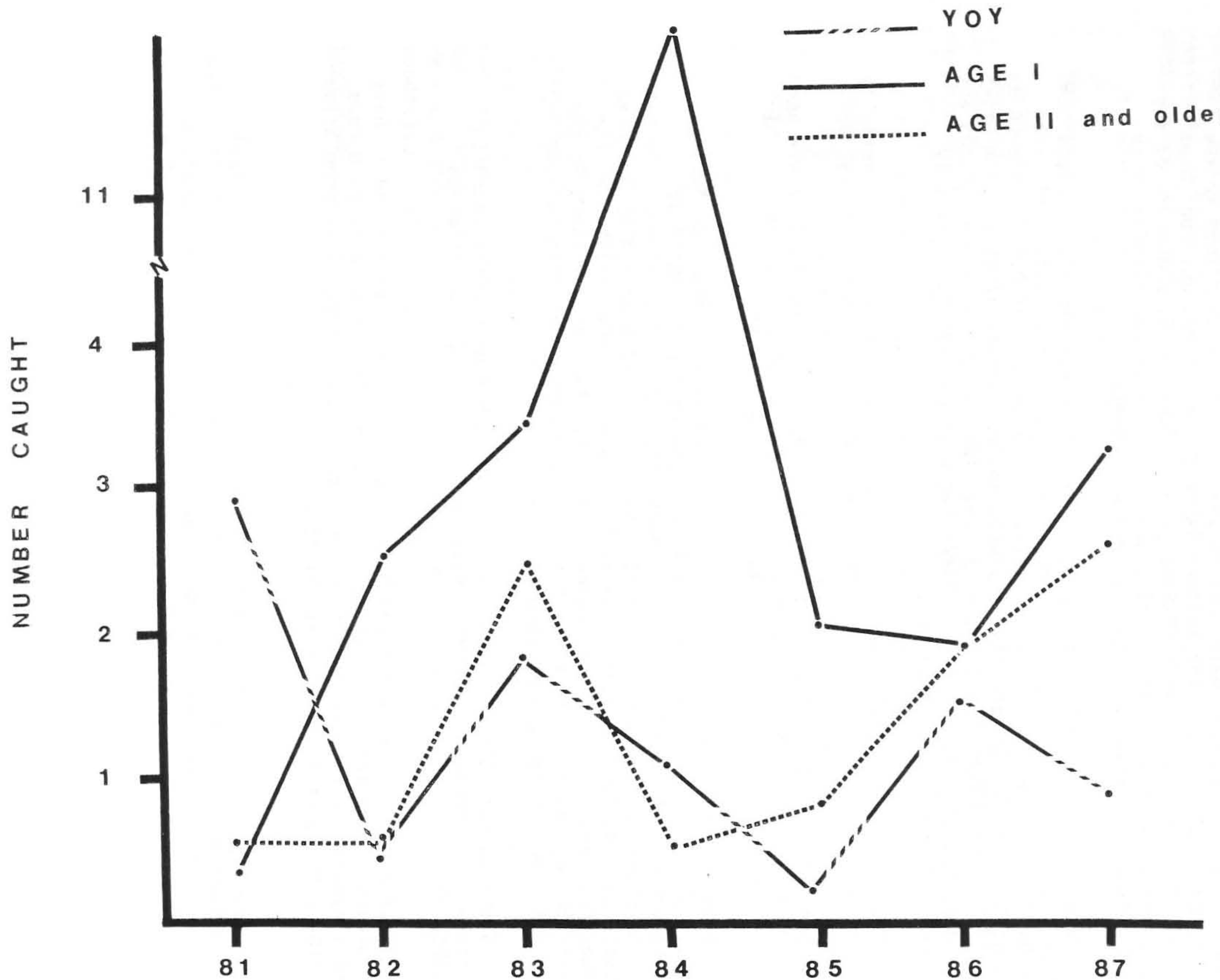


Figure 6. Average number of striped bass caught in fall gill-net sampling at four stations on Lake Powell expressed as fish caught/1,000 ft^2 of net/12 hr set, 1981-87.

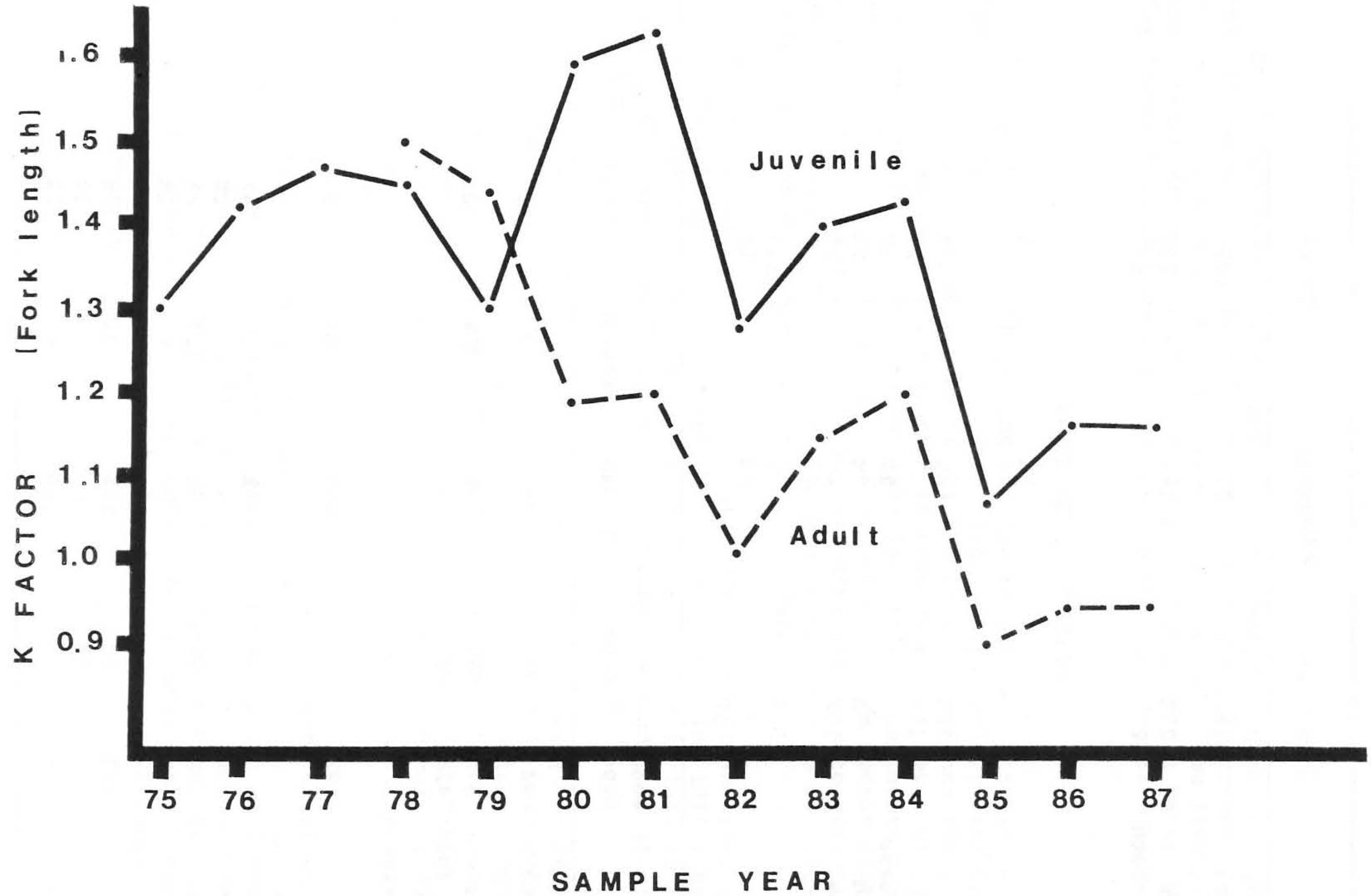


Figure 7. Year-end (November) average condition factor (K_{FL}) of adult and juvenile striped bass, Lake Powell, 1975-87.

Table 7. Percent occurrence of food items in striped bass stomachs, Lake Powell, 1987. (Percentage based only on number of stomachs containing food.)

SUMMER	Good Hope	Wahweap	Total
Sample size (n)	28	81	109
Empty stomachs	25%	19%	20%
Stomachs with Food	21	66	87
Food Items			
Zooplankton	–	8%	5%
Fish			
Shad	38%	94%	81%
Sunfish spp.	19%	–	5%
Largemouth bass	–	2%	1%
Unknown fish	5%	2%	2%
Striped bass	10%	–	2%
Crayfish	52%	11%	21%
Chironomid	–	2%	1%
Ephemeroptera	5%	–	1%

FALL	Good Hope	Rincon	San Juan	Wahweap	Total
Sample size (n)	98	73	76	99	346
Empty Stomachs	57%	55%	53%	45%	52%
Stomachs with food	42	33	26	54	165
Food Items					
Zooplankton	69%	85%	44%	26%	53%
Fish					
Shad	–	3%	11%	63%	24%
Green sunfish	10%	–	–	–	2%
Unknown fish	10%	9%	3%	11%	8%
Bait (Anchovy)	2%	–	–	–	1%
Crayfish	12%	9%	50%	3%	17%
Chironomid	–	3%	–	–	1%
Debris (Stick)	–	–	3%	–	1%

SMALLMOUTH BASS POPULATION DEVELOPMENT

JOB V

METHODS

Smallmouth bass population development was monitored through collections made in Jobs I-IV, as well as by snorkel surveys used to document natural reproduction. Stockings were made from fish raised at the Wahweap Warmwater Culture Facility located near Big Water, Utah. Smallmouth bass culture and stocking are not funded under federal aid.

RESULTS AND DISCUSSION

A total of 34,770 fingerling smallmouth bass was stocked in Lake Powell during 1987 (Table 8). New release sites include West Canyon, and Nokai Canyon in the upper end of the San Juan Arm. Since 1982, when smallmouth bass were first stocked in Lake Powell, a total of 199,865 fish has been stocked in 12 different lake locations. Smallmouth bass have restricted home ranges in lakes and do not move even modest distances (Coble 1975). The goal of multiple stocking sites is to establish as many satellite populations of smallmouth bass as possible to facilitate quicker development of the fishery throughout the lake.

Natural reproduction of smallmouth bass was first observed at Lake Powell in 1985 and 23 active nests were located during 1986 (Gustaveson et al. 1986, 1987). Several active nests were located in 1987 in both Wahweap and Warm Creek Bays, but no sampling was conducted at other lake locations.

A total of 366 smallmouth bass was collected during the September electrofishing survey (Table 9). Most of the yoy fish were collected at Good Hope Bay (131), however, good numbers of yoy smallmouth were taken at all sample sites. Yoy smallmouth bass had attained the largest size of all yoy fishes collected during the fall electrofishing survey (Job III). Condition factors (K_{tl}) recorded for adult smallmouth bass (1.43) and largemouth bass (1.50) collected by angling and gillnetting were quite similar in 1987.

Interspecific competition for habitat has not been observed between smallmouth bass and largemouth bass at Lake Powell. No largemouth bass nests have been observed in areas found to have nesting smallmouth bass. From results of the electrofishing survey it appears that yoy prefer points with gravel or rocks, whereas yoy largemouth bass prefer the brushy habitat in the backs of coves and bays. As the smallmouth bass population becomes firmly established at Lake Powell, interspecific competition will be studied more fully.

A few smallmouth bass stomachs were examined in 1987 from fish which died during sampling. The main food items encountered were centrarchids and crayfish for adult fish, and both aquatic and terrestrial Diptera for juvenile fish. Now that the smallmouth population is becoming established at Lake Powell, future effort can be directed at food habit studies for smallmouth bass.

Table 8. Smallmouth bass stocking history, Lake Powell, 1982-87.

Year	Number	Size	Location	Method
1982	3,100	2-4"	Warm Creek	Truck
	59	10-15"	Warm Creek	Truck
1983	199	2-4"	Wahweap Creek	Truck
	26	10-15"	Wahweap Creek	Truck
1984	26,600	2-4"	Wahweap-Warm Creek	Truck
	4,000	2-4"	Stanton Creek	Aerial
1985	13,289	2-4"	Wahweap Creek	Truck
	12,389	2-4"	Antelope Canyon	Truck
	22	10-15"	Antelope Canyon	Truck
	31,995	2-4"	Rincon	Aerial
	19,360	2-4"	Good Hope Bay	Aerial
	26,328	2-4"	Neskahi Canyon	Aerial
	702	10-15"	Hite-Dirty Devil River	Truck
1986	6,123	2-4"	Wahweap Creek	Truck
	8,136	2-4"	Piute Farms	Truck
	12,758	2-4"	Escalante River	Aerial
1987	220	3-6"	Wahweap-Warm Creek	Truck
	24,200	2-3"	West Canyon	Aerial
	7,200	2-3"	Nokai Canyon	Truck
	3,150	2-4"	Piute Farms	Truck
Total	199,865		Lake Powell	

Table 9. Average catch rate[a] (fish/hour) of young-of-the-year smallmouth bass collected by electrofishing, Lake Powell, 1982-87. (1+ and older fish denoted by brackets)

Year	Good Hope Bay	Stanton Creek	Rincon	San Juan	Warm Creek	Total yoy & adult
1982	0	0	0	0	22	22
1983	0	0	0	0	0 (3)	3
1984	0	5	0	0	46	51
1985	4	0 (1)	36	5	5 (1)	52
1986	1 (2)	81	0 (2)	0 (17)	10	113
1987	131 (1)	74	68 (7)	53 (4)	28	366

[a] Total fish divided by total hours of electrofishing.

1987 SMALLMOUTH BASS CULTURE SUMMARY

WAHWEAP WARMWATER CULTURE FACILITY, BIG WATER, UTAH

(Not an element of F-46-R)

PRODUCTION

A total of 366,600 smallmouth bass fry were produced at the Wahweap Warmwater Facility during 1987 (Table 10). Of these, 55,600 (15.2%) survived to fingerling size and harvest. An additional 120 fingerling were seined from the brood ponds at the D.I. Ranch and 3,150 collected from the spawning ponds bringing the total harvest for the culture operation to 58,870 (Table 10).

Additional fry were received from Arkansas Game and Fish (25,000) and Colorado Division of Wildlife (5,000) during 1987. The 25,000 fish received from Arkansas were in poor condition upon arrival. They were placed in Pond 6 on 14 May. It is not known how much these fish contributed to the 24,200 fry harvested from Pond 6. The 5,000 fry received from Colorado on 18 June were placed in Pond 5. These fry disappeared along with the 111,300 fry we stocked in this pond. It is presently unknown what happened to these fry, but their disappearance is believed associated with overstocking and/or a shortage of food supply. This pond had been filled long before it was stocked with fry, and it is possible that the plankton population was too large and too advanced for the fry.

Pond 6, which received a total of 49,400 fry, plus the 25,000 fry from Arkansas, was also stocked with 39 adult brood fish at the beginning of the culture season. These fish produced several nests of black fry which were present when the other fry were stocked. It is unknown how much these "wild" fry contributed to the 24,000 fry produced in Pond 6, however, because this pond had the highest percent survival (32.5 %, counting Arkansas fry), it is probable that some of these fingerling were from natural spawns. The natural spawning method needs to be tested in the future.

A total of 24,100 fingerling smallmouth bass were stocked by truck into Rockport Reservoir on 11 June and 28 July 1987. The remaining 1987 production (34,770) was stocked into Lake Powell (Job V). Neither the culture or stocking of smallmouth bass was funded by Federal Aid.

Table 10. Smallmouth bass production at the Wahweap Facility, 1987.

Pond #	# of fry stocked	# of fing. harvested	% survival	size of fing.	pounds harvested
1 & 2	----	3,150	----	450/lb	7.0
3	71,500	18,100	25.3	682/lb	26.6
3 (refill)	39,900	6,300	15.8	450/lb	14.0
4	94,500	7,000	7.4	500/lb	14.0
5	111,300	0	0.0	----	----
6	49,400	24,200	49.0[a]	440/lb	55.0
D.I. Ranch	----	120	----	200/lb	0.6
Total	366,600	58,750	15.2 (Ponds 3-6)		117.2

[a]Does not include Arkansas fry

BROOD FISH

On 1 and 4 April 1987, 211 adult smallmouth bass were collected from the overwintering ponds at the D.I. Ranch. A total of 79 and 132, respectively, were collected from the upper and lower ponds by a combination of electrofishing and gillnetting. One fish was lost in transport, which left 210 brood fish to be used for the 1987 culture season. These were placed 90 in spawning pond 1, 81 in spawning pond 2, and 39 in rearing pond 6.

After the 1987 culture season, 188 brood fish were recovered from the Wahweap Facility ponds and transported back to the overwintering ponds at the D.I. Ranch. Of these, 12 died in transport, while 41 and 135 were placed in the upper and lower ponds, respectively. Most of the smallmouth that died in transport were in poor condition from the long spawning season (average K_{tl} of 1.37).

Forage was provided at both the overwintering ponds at the D.I. Ranch and the spawning ponds at Wahweap during 1987. The following forage was provided (RBT=rainbow trout Salmo gairdneri):

Date of stocking	Location	Forage Provided
9 Jan. 1987	D.I. Ranch ponds	24,748 RBT (532/lb)
3 April 1987	Ponds 1&2, Wahweap	14,616 RBT (218/lb)
15 Dec. 1987	D.I. Ranch ponds	10,021 RBT (36/lb)

To help maintain optimum body condition of our brood fish, forage will continue to be provided for brood fish in 1988. The following request has been submitted for 2-3" RBT fingerling for stocking at the D.I. Ranch and the culture ponds:

Date Needed	Number Needed
February 1988	20,000
April 1988	10,000
Sept.-Oct. 1988	20,000

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