Lake Powell Fisheries Investigations

1986 (Segment 2) Annual Report

Dingell-Johnson Project F-46-R-2
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LAKE POWELL FISHERIES INVESTIGATIONS

Annual Performance Report
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ABSTRACT

For the second 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 shad into the pelagic zone of Lake Powell. The striped bass population declined in number and average size as many adult fish were harvested or died from malnutrition. Anglers caught many striped bass during spring and early summer but by fall the fishery had drastically declined. Measurement of adult fish population trends showed decreases in all game fish species in response to the low forage conditions that existed in 1986. Production of young-of-the-year for all game species was less than seen in 1985.

More than 27,000 smallmouth bass were stocked at three locations in Lake Powell. Natural reproduction was documented at three lake locations. Results of smallmouth bass studies in 1986 indicate a promising future for this species in Lake Powell.

A total of 64,322 fingerling smallmouth bass was produced at the Wahweap Warmwater Culture Facility in 1986.

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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 Chaol Canyon (Figure 1).

Recruitment of young-of-the-year (y-o-y) 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 thru 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. Compared to 1985, spawning success for threadfin shad was quite similar at lower and mid Lake Powell (Figures 2 and 3), with the exception of Bullfrog Creek where the spawning peak occurred later and was somewhat reduced.

Spawning success at Chaol Canyon and the San Juan River Arm was improved in 1986 over 1985, with June being the peak of activity at most locations (Tables 1 and 2). Spawning activity at Chaol Canyon was similar to 1984 except that the peak occurred one month later (Table 1). This was more typical of this station which experienced

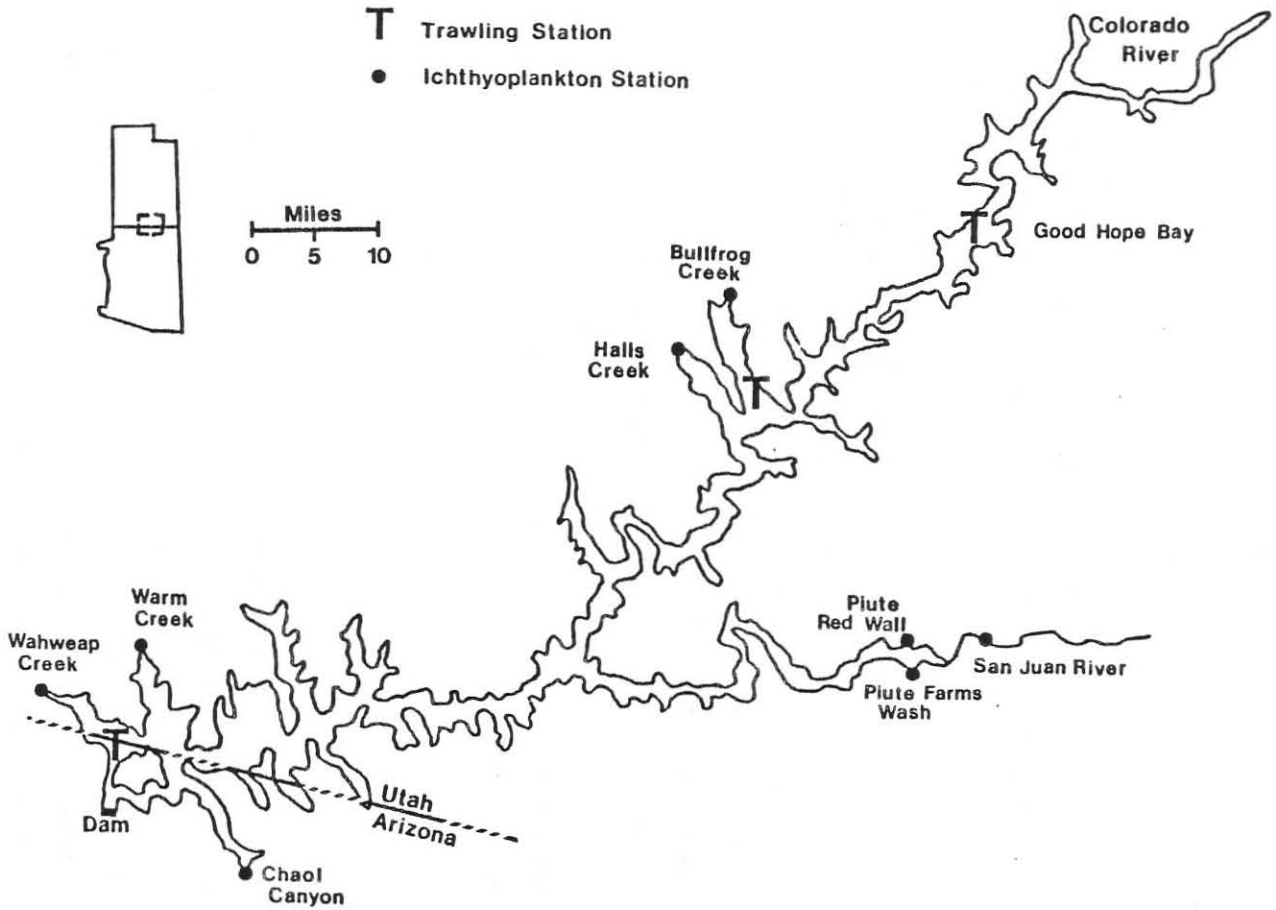

Figure 1. Map of Lake Powell showing trawling and ichthyoplankton netting stations for threadfin shad, 1986.

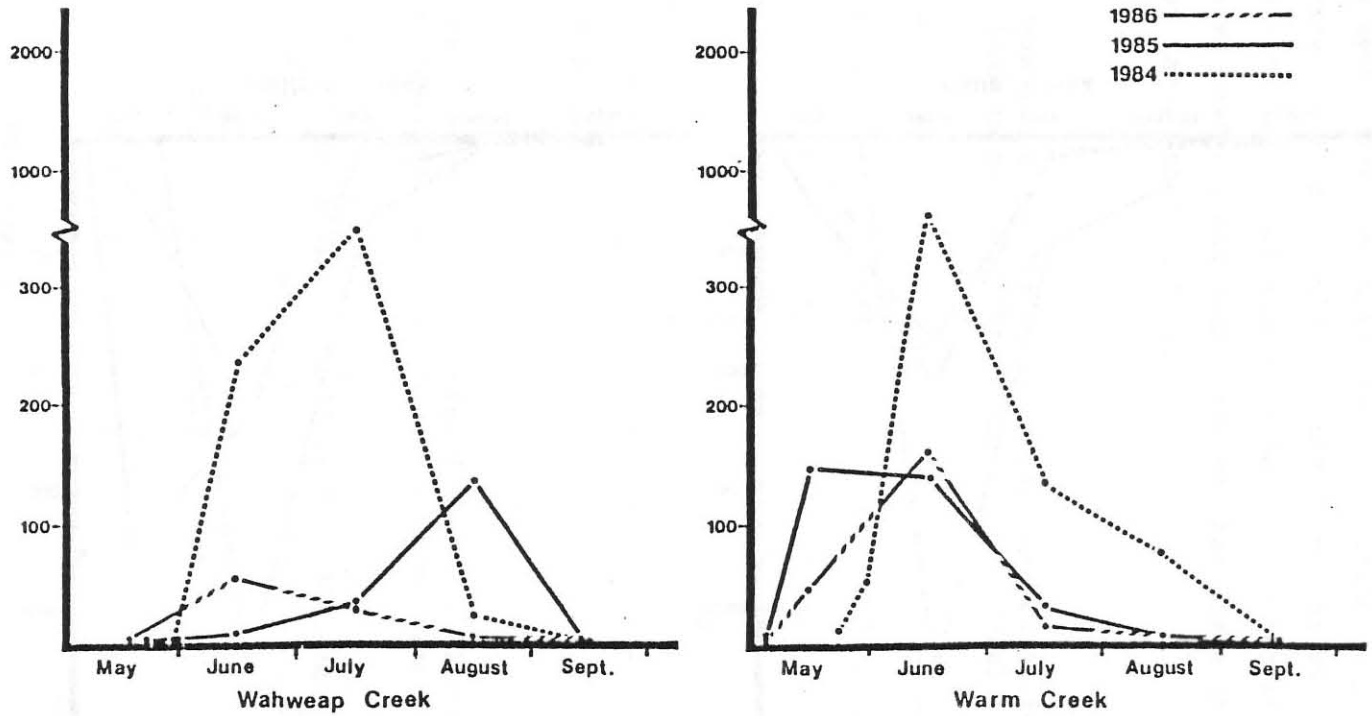

Figure 2. Mean number of larval shad collected per ichthyoplankton net tow, lower Lake Powell, 1984-86.

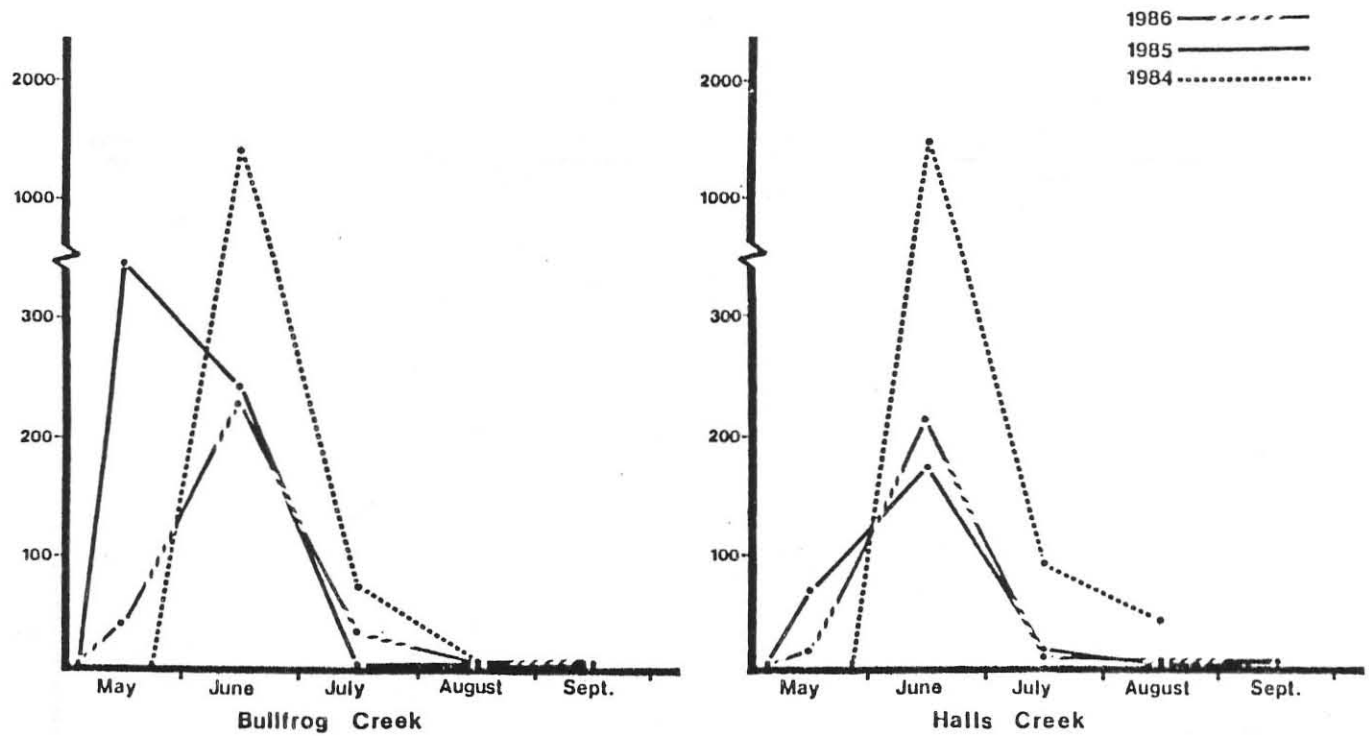

Figure 3. Mean number of larval shad collected per ichthyoplankton net tow, mid Lake Powell, 1984-86.

an unusual spawn in 1985, when there was no distinct peak, but a continuous spawn over the entire season. During July 1986, 31 fish/tow were collected in the San Juan River Inflow. This is the first time fair numbers of shad have been collected at this station and indicated that the San Juan River may have been an important producer of larval shad in 1986.

Table 1. Mean number of larval threadfin shad collected per ichthyoplankton net tow, Chaol Canyon, Lake Powell, 1984-86.

Sample Month	1986	1985	1984
May	23	48	791
June	702	40	47
July	2	24	4
August	0	65	2
September	<1	10	[a]

[a]Not sampled.

Table 2. Mean number of larval threadfin shad collected per ichthyo plankton net tow, San Juan River Arm, Lake Powell, 1985-86.

Sample	Piute Red Wall		Piute Farms Wash		San Juan River Flow	
Month	1986	1985	1986	1985	1986	1985
May	28	69	5	17	<1	1
June	227	31	129	6	1	1
July	23	1	6	1	31	0
August	1	1	0	0	<1	0
September	[a]	5	[a]	0	[a]	1

[a]Not sampled.

Midwater trawl catches of y-o-y shad were quite low during 1986 and indicated another extremely low recruitment year for Lake Powell's pelagic shad population (Figure 4). Echograms run during

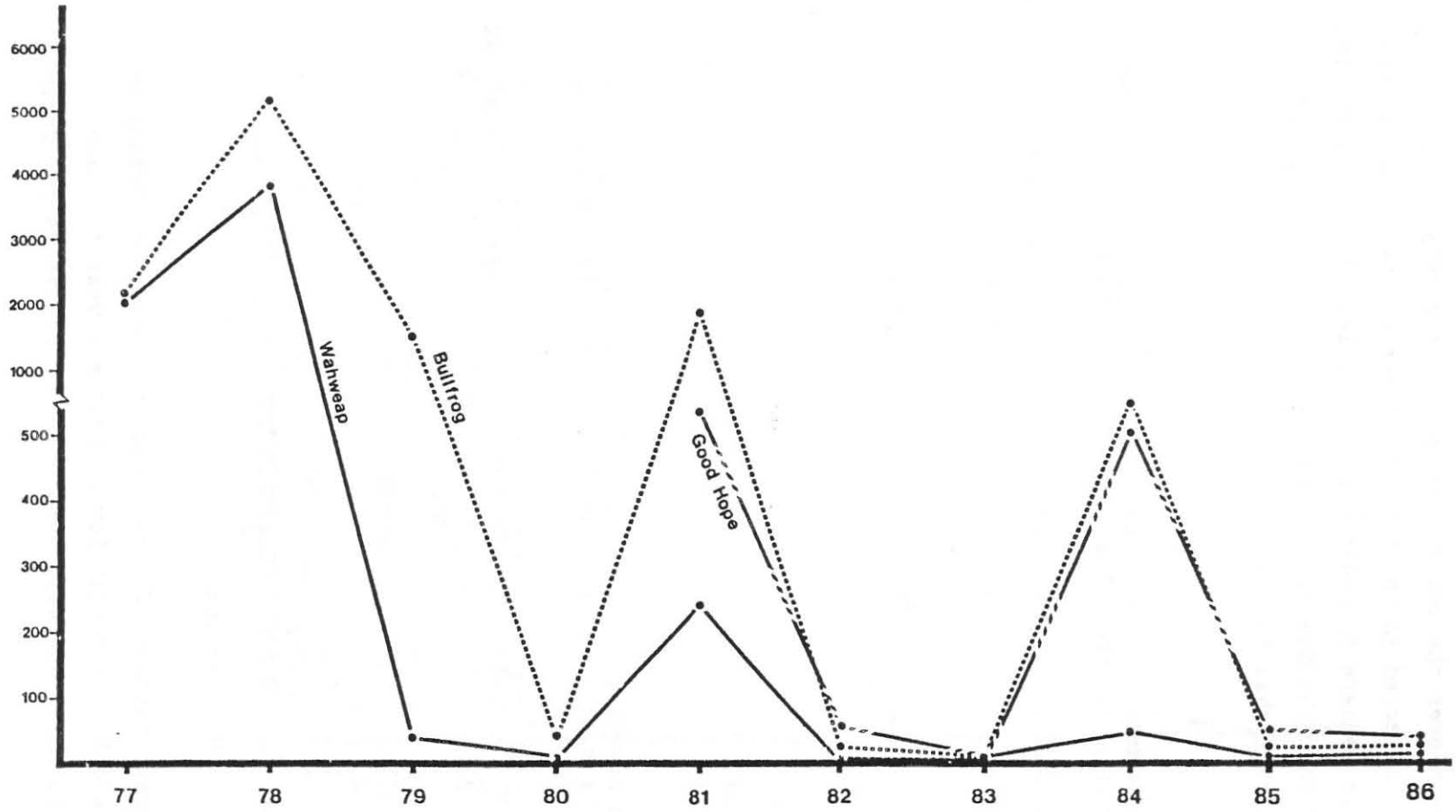

Figure 4. Mean number of threadfin shad collected per trawl tow, July-September, Lake Powell, 1977-1986.

each sample period also reflected the lack of shad in the open water zone.

There is some evidence that the threadfin shad populations at Lake Powell may be cyclic (Gustaveson et al. 1985). Since 1977, trawl catches have exhibited three distinct, but decreasing, peaks occurring at three year intervals; 1978, 1981 and 1984 (Figure 4). The two years between each peak have been characterized by very low shad recruitment in most areas of the lake. The extremely low numbers of shad collected during 1986 represent a continuation of this three year cycle and could project an improved shad year in 1987 if the pattern continues.

MEASUREMENT OF FISHERY HARVEST, PRESSURE AND SUCCESS

JOB II

No work was scheduled for this job during 1986. The next scheduled creel census will occur in 1989.

INDEX TO ANNUAL FISH POPULATION TRENDS

JOB III

ANNUAL NETTING

METHODS

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

Samples of largemouth bass (Micropterus salmoides), walleye (Morone saxatilis), and striped bass were used to quantify food habits by percent occurrence.

RESULTS AND DISCUSSION

A total of 173 fish was collected in 80 net-days. Catch rate was highest at the Rincon followed by the San Juan, Good Hope Bay, and Padre Bay, respectively (Table 3). Total catch rate for all species and stations combined (2.16 fish/net day) was much lower than 1985 (6.16 fish/net day).

Table 3. Catch rates (fish/net day) during annual gillnetting, Lake Powell, March 1986.

Species	Good Hope Bay	Rincon	San Juan	Padre Bay	Total[a]	% of Catch
Striped bass	0.90	0.85	0.55	0.50	0.70	32.4
Walleye	0.65	0.90	0.80	0.45	0.70	32.4
Largemouth bass	0.10	0.35	0.60	0.15	0.30	13.9
Carp	0.25	0.35	0.10	0.20	0.22	10.4
Channel catfish	0.15	0.20	0.15	0.15	0.16	7.5
Yellow bullhead	0.05	0.15	0.00	0.00	0.05	2.4
Bluegill	0.00	0.05	0.00	0.00	0.01	0.5
Green sunfish	0.00	0.00	0.00	0.05	0.01	0.5
Total	2.10	2.85	2.20	1.50	2.16	--.-

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

Mean catch rate for both largemouth bass and walleye decreased in 1986 (Figure 5). While the largemouth bass catch rate has decreased for the past eight years, the reduction has slowed and the population seems to be stabilizing. Following a peak in 1981, walleye appear to be following a similar trend.

While striped bass were the most frequently sampled fish in 1986, their catch rate was much lower than last year. Striped bass have experienced expanding populations in recent years.

Quantifying food habits of striped bass was difficult as 72 percent of the stomachs examined were empty (Table 4). Due to the low numbers of threadfin shad in 1986 (Job I), striped bass displayed more diverse feeding habits than previously seen. Plankton was a primary forage item along with threadfin shad and crayfish (Orconectes virilis). Empty stomachs were also frequent in walleye (64 %). Threadfin shad were the most commonly consumed food item of walleye. Largemouth bass commonly consumed crayfish. All three predators consumed centrarchid species to a lesser extent.

Table 4. Percent occurrence of food items in striped bass, largemouth bass and walleye stomach collected in gill nets, Lake Powell, 1986. (Percentage based only on number of stomachs containing food.)

	Striped bass	Largemouth bass	Walleye
Sample size (n)	54	24	56
Empty stomachs	39 (72%)	3(12%)	36 (64%)
Stomachs with food	15	21	20
Food Items			
Crayfish	27%	66%	0%
Threadfin shad	20%	4%	23%
Plankton	47%	0%	0%
Green sunfish	6%	4%	6%
Bluegill	0%	4%	0%
Unknown fish	0%	22%	71%

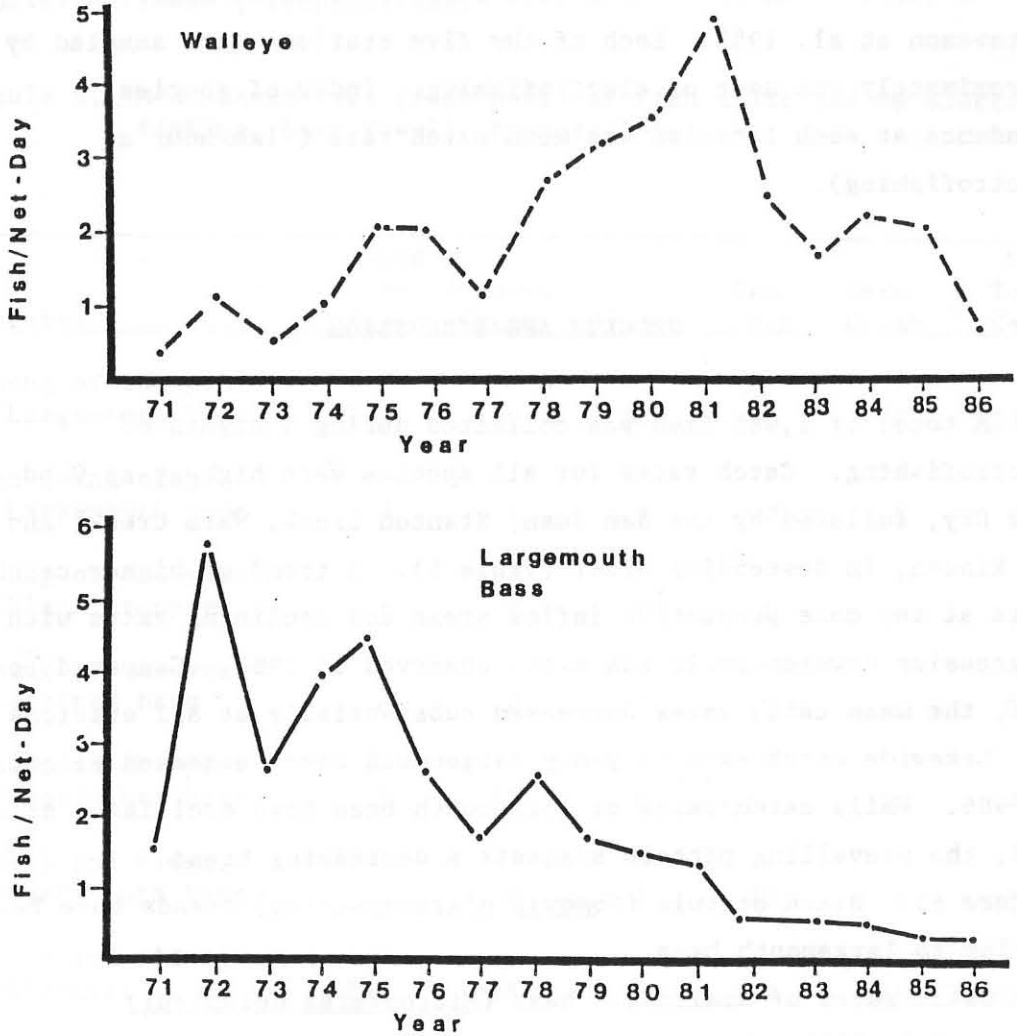

Figure 5. Catch rates (fish/net day) for walleye and largemouth bass annual netting, Lake Powell, 1971-86.

ELECTROFISHING

METHODS

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

RESULTS AND DISCUSSION

A total of 1,965 fish was collected during 5 nights of electrofishing. Catch rates for all species were highest at Good Hope Bay, followed by the San Juan, Stanton Creek, Warm Creek, and the Rincon, in descending order (Table 5). A trend of higher catch rates at the more productive inflow areas and declining rates with progression downreservoir was again observed in 1986. Compared to 1985, the mean catch rates decreased substantially at all stations.

Lakewide catch rate of y-o-y largemouth bass decreased slightly in 1986. While catch rates of largemouth bass have oscillated since 1978, the prevailing pattern suggests a decreasing trend (Figure 6). Black crappie (Pomoxis nigromaculatus) trends have been similar to largemouth bass.

Catch rates of smallmouth bass (Micropterus dolomieui) increased in 1986. Most of the increased abundance was attributed to natural reproduction realized in Stanton Creek (See Job V). Average size of smallmouth bass at Stanton Creek (L=91 mm, N=45) was less than largemouth bass (L=99 mm, N=44).

Following record catch rates in 1985, y-o-y striped bass electrofishing catch decreased drastically in 1986. Catch rates of striped bass were the lowest since they were first sampled by

electrofishing in 1980. However, record numbers of y-o-y striped bass were sampled during fall netting (see Job IV). The extent of striped bass recruitment in 1986 is presently unclear.

Average lengths of y-o-y largemouth bass, striped bass, and smallmouth bass collected in 1986 were 98 mm (N=225), 99 mm (N=5), and 89 mm (N=56), respectively.

Table 5. Mean catch rate (fish/hour) of fish collected by electrofishing, Lake Powell, August, 1986.

Species	Good Hope Bay	Stanton Creek	Rincon	San Juan	Warm Creek	% of Total Catch
Young-of-the-year Largemouth bass	150	130	42	13	61	20.1
Age I and older Largemouth bass	4	1	7	0	1	0.7
Young-of-the-year Black crappie	6	1	0	0	4	0.6
Young-of-the-year Striped bass	4	0	1	0	0	0.2
Young-of-the-year Smallmouth bass	1	81	0	0	10	4.7
Age I and older Smallmouth bass	2	0	2	17	0	1.1
Y-o-y and older Bluegill	195	58	103	79	225	33.6
Y-o-y and older Green sunfish	117	114	159	306	23	36.6
Y-o-y and older Channel catfish	17	3	10	10	7	2.4
All species	496	388	325	425	331	100.0

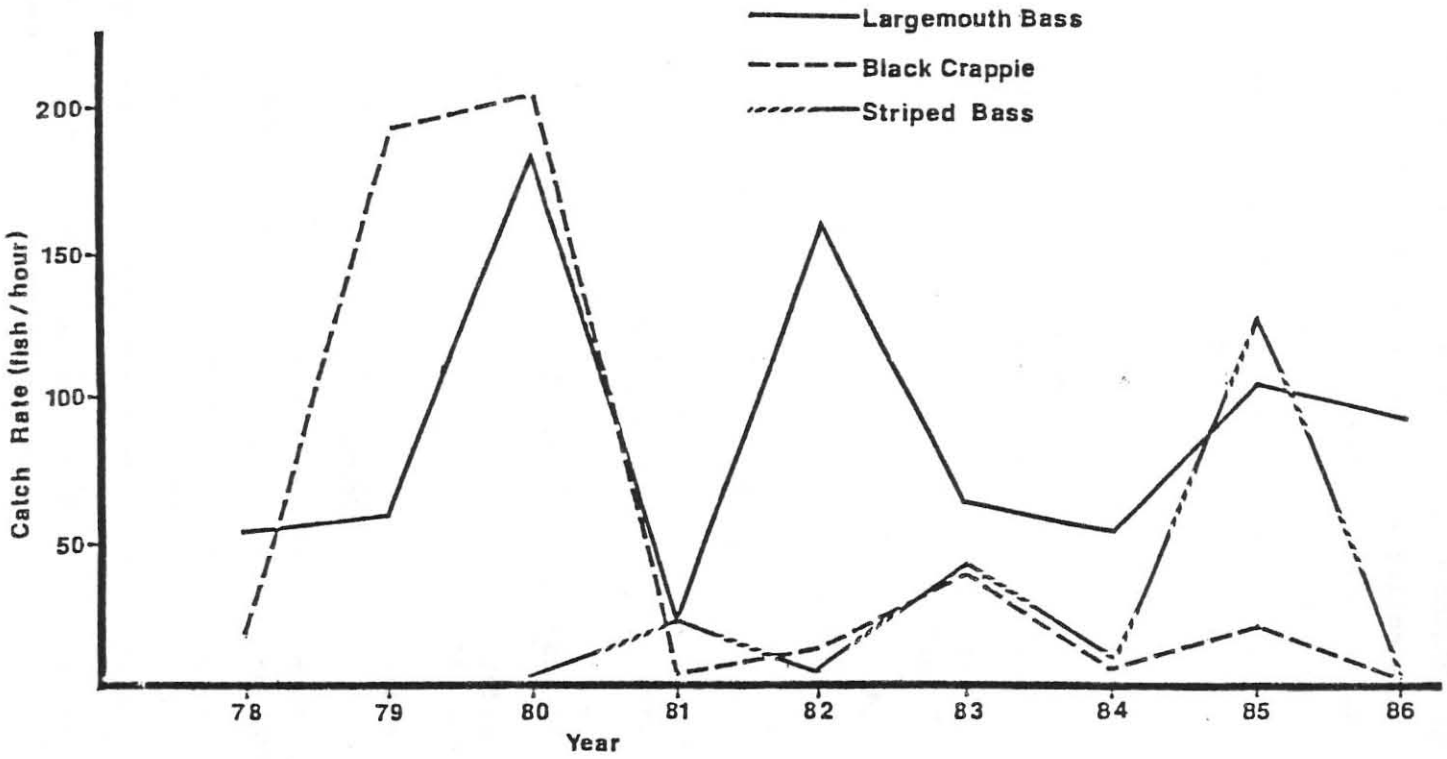

Figure 6. Mean catch rates (fish/hour) for largemouth bass, black crappie and striped bass collected by electrofishing, Lake Powell, August-September, 1978-86.

STRIPED BASS POPULATION DEVELOPMENT

JOB IV

METHODS

Biological information was obtained from striped bass by various sampling techniques. 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

Striped bass reproduction was documented for the eighth consecutive year. Male striped bass were ripe by 19 April 1986. Some spawning was thought to have occurred during mild spring weather on 21-23 April 1986, but a severe cold weather front terminated spawning activity. No other spawning activity was detected during May. Ripe males and females were not found after 1 June 1986.

Successful spawning did occur as indicated by collection of two y-o-y striped bass in four seine hauls in Wahweap Bay on 13 June 1986. One y-o-y striped bass was caught in a total of six seine hauls in Good Hope Bay in July. No other y-o-y striped bass were collected in 22 additional seine hauls at other lake areas.

Very few y-o-y striped bass were collected during the electrofishing survey (Job III): 4 fish/hr were collected in Good Hope Bay, 1 fish/hr at the Rincon and no fish were collected at the other stations. A significant year class was produced, however, as shown by annual fall gill netting results. A total of 92 y-o-y striped bass was captured in small mesh experimental gill nets: 30

y-o-y in Good Hope Bay, 29 at the Rincon, 1 on the San Juan, and 32 at Wahweap. Y-o-y collection averaged 1.5 fish/1000 sq. ft. gill net/ 12 hour set over the entire lake (Figure 7). During the same survey, yearling striped bass averaged 1.91 fish/1000 sq ft/12 hour which is similar to the number of yearlings collected in 1985.

The physical condition of fish sampled in 1986 was slightly better than seen in 1985. Juvenile fish (under 500 mm TL) averaged 1.17 K factor while adults averaged 0.94 K factor (Figure 8). The slight increase in condition was probably the result of fish with the poorest condition being eliminated from the population. Fish sampled in 1985 averaged 555 mm TL. During the spring of 1986 fish sampled averaged 497 mm. By November 1986 the average TL had decreased to 423 mm. Fish longer than 500 mm became increasingly scarce as time passed. Most of these larger fish were eliminated from the population by angler harvest or apparent starvation.

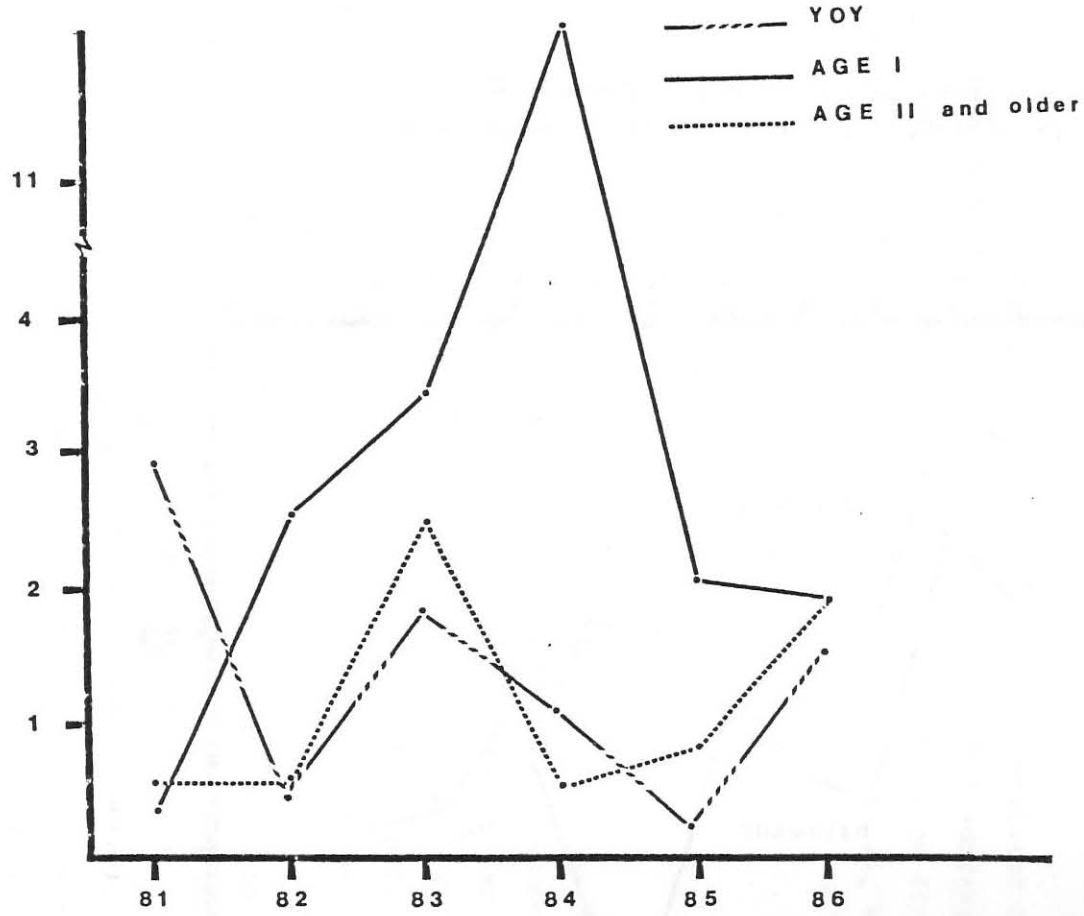

Figure 7. Average number of striped bass caught in fall gillnet sampling at four stations on Lake Powell, expressed as fish caught per 1000 square feet of net per 12 hour set, 1981-1986

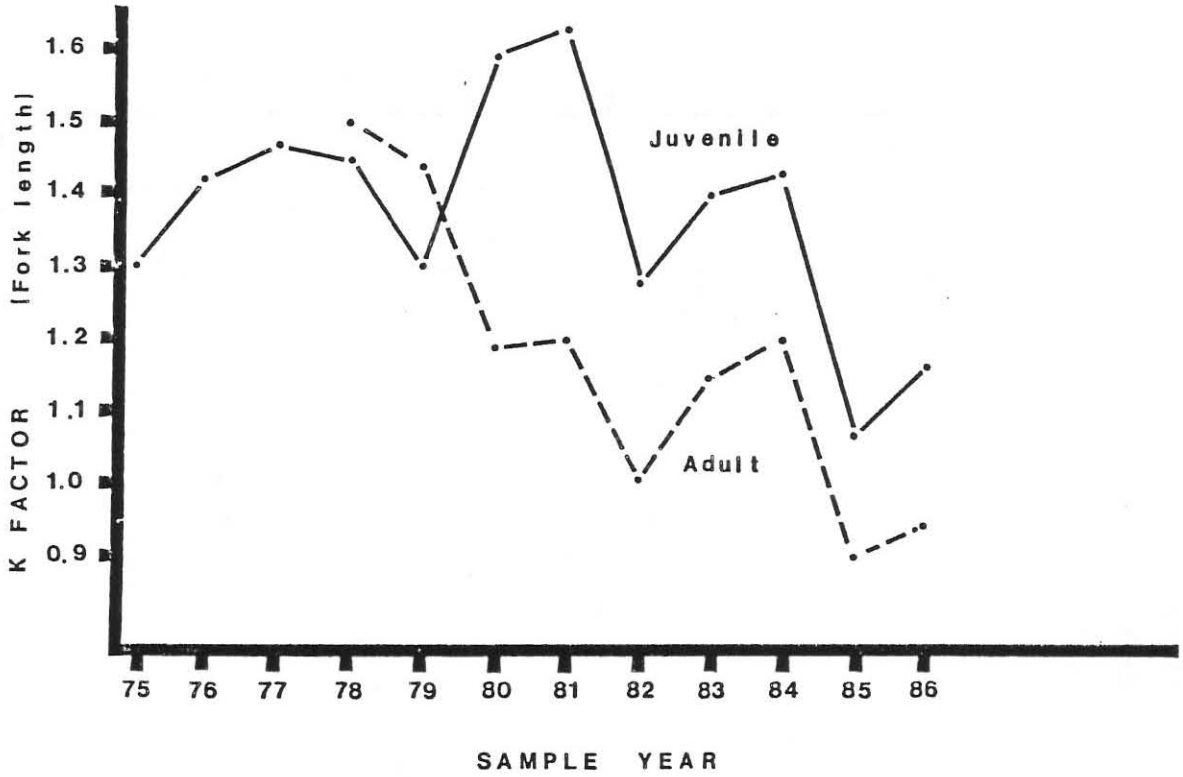

Figure 8. Year-end (November) average condition factor (K) of adult and juvenile striped bass, Lake Powell, 1975-1986.

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.

RESULTS AND DISCUSSION

A total of 27,017 fingerling smallmouth bass was stocked in Lake Powell during 1986 (Table 6). New release sites include the upper end of the San Juan Arm (Piute Farms) and the Escalante River. Since 1982, when smallmouth bass were first stocked in Lake Powell, a total of 165,095 fish has been stocked in 10 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 satelite 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 (Gustaveson et al. 1986). During 1986 a total of 23 active nests was located by divers. The first black fry were observed on a nest in Crosby Canyon (Warm Creek Bay) on 20 May. They were already at the swim-up stage and judged to be approximately 3 weeks old, making the spawning date around 29 April. On 21 May, 11 active nests were located around the government docks at Wahweap Marina with development ranging from

fresh spawned eggs to black fry. An additional 8 nests with fry were also located near the gravel bar at Wahweap on 4 June. All nests were in 2-12 feet of water with most located near a rock, cliff or some type of structure.

Table 6. Smallmouth bass stocking history, Lake Powell, 1982-86.

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
Total	165,095	-----	Lake Powell	-------

For the first time, active smallmouth bass nests were located at an upper lake station . On 3-4 June 1986, 4 nests with swim-up fry were located in the Bullfrog area at Stanton Creek. The adults which produced these spawns were first stocked in Stanton Creek as fingerling in 1984 (Gustaveson et al. 1985). Thus, it appears to take only 2 years for a smallmouth bass in Lake Powell to attain spawning maturity.

Subsequent snorkeling conducted on 29-30 July at Crosby Canyon and Wahweap found y-o-y smallmouth bass at all nest sites. Snorkeling on 7 August likewise revealed large numbers (487) of y-o-y bass observed around the Stanton Creek sites.

A total of 113 smallmouth bass was collected during the September electrofishing survey (Table 7). Most of the y-o-y fish were collected at Stanton Creek (81) and Warm Creek (10) stations where smallmouth bass nests had been previously located. The one exception was a y-o-y fish collected at Good Hope Bay. Since no adult smallmouth bass have been planted at Good Hope, this fish is believed to have resulted from successful spawning by adult smallmouth bass that were stocked at Hite in 1985 (Gustaveson et al. 1986).

Table 7. Mean catch rate (fish/hour)[a] of young-of-the-year smallmouth bass collected by electrofishing, Lake Powell, 1982-86 (1+ and older fish denoted by brackets).

Year	Good Hope Bay	Stanton Creek	Rincon	San Juan	Warm Creek	Total y-o-y & 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

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

Preliminary data seems to indicate that smallmouth at Lake Powell exhibit only slightly lower growth rates and condition indices than largemouth bass. The average length of y-o-y smallmouth bass collected during electrofishing was only 9mm less than for largemouth bass (Job III). Condition factors (K) recorded for smallmouth bass (1.5) and largemouth bass (1.6) during 1986 were also quite similar.

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 y-o-y prefer points with gravel or rocks, whereas y-o-y 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.

1986 SMALLMOUTH BASS CULTURE SUMMARY

WAHWEAP WARMWATER CULTURE FACILITY, BIG WATER, UTAH

(Not an element of F-46-R)

INTRODUCTION

A total of 260,553 smallmouth bass fry were produced at the Wahweap Warmwater Facility during 1986 (Table 8). Of these, 63,522 (22.8%) survived to fingerling size and harvest. An additional 800 fingerling were seined from the brood ponds at the D.I. Ranch bringing the total harvest for the culture operation to 64,322 (Table 8).

Table 8. Smallmouth bass production at the Wahweap Facility, 1986.

Pond #	No. of fry stocked	No. of fing. harvested	% survival	size of fing.	pounds harvested
1 & 2	5,323	5,323	----	1238/lb	4.3
3	81,300	12,758	15.7	567/lb	22.5
4	57,020	3,506	6.1	377/lb	9.3
5	86,050	37,305	43.4	442/lb	84.4
6	30,860	4,630	15.0	309/lb	15.0
D.I. Ranch	800	800	----	200/lb	4.0
Total	261,353	64,322	22.8 (Ponds 3-6)		----

A total of 37,305 (84.4 lbs.) fingerling smallmouth bass were stocked by air into Rockport Reservoir on 3 July 1986. The remaining 1986 production (27,017) was stocked into Lake Powell (Job V). Neither the culture or stocking of smallmouth bass was funded by Federal Aid.

BROOD FISH

On 28 June 1985, a total of 126 adult brood fish were stocked into the lower pond at the D.I. Ranch. On 5 July, an additional 74 brood fish were placed in the upper pond at the D.I. Ranch bringing the total to 200 fish available for 1986.

The fish overwintered well and on 8 April 1986 a combination of electrofishing and gillnetting was used to recover 135 adults (27 upper pond, 108 lower pond) from the D.I. Ranch ponds. Only a single fish was lost during transport, which left 134 smallmouth brood fish to be used for the 1986 culture season.

After the 1986 culture season, 110 brood fish were stocked into the lower pond and 38 fish into the upper pond at the D.I. Ranch. An additional 75 adult smallmouth bass were transported from Flaming Gorge on 2 June 1986 and stocked into the lower pond to "freshen" our existing brood stock for the 1987 season.

Forage was provided at both the overwintering ponds at the D.I. Ranch and the spawning ponds at Big Water during 1986. The following forage was provided (RBT=rainbow trout Salmo gairdneri):

Date of stocking	Location	Forage Provided
4 Feb. 1986	D.I. Ranch ponds	21,046 RBT (350/lb)
21 April 1986	Ponds 1&2, Wahweap	9,853 RBT (131/lb)
9 July 1986	D.I. Ranch ponds	20,124 RBT (94/lb)
17 Sept. 1986	D.I. Ranch ponds	18,500 Albino RBT (37/lb)

To help maintain optimum body condition of our brood fish, forage will continue to be provided for brood fish in 1987. 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
January 1987	20,000
April 1987	10,000
July 1987	20,000
Sept.-Oct. 1987	20,000

More adult brood fish will be needed for culture operations in 1987. We can probably expect to collect at least 100 fish from the D.I. Ranch ponds in the spring of 1987. Hopefully, we can again supplement these fish with some bass collected in the BASS tournament held during early June at Flaming Gorge. The addition of new fish each year to our present stock not only acts to "freshen" our old stock, but also helps replace brood fish lost during normal culture operations and transport.

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