There are indications that shellcrackers do not provide enough forage to promote good bass growth in manageable ponds. However, it was also noted that very few ponds stocked with bass-shellcracker combinations became overpopulated with shellcrackers. Since the overpopulation by the forage species seems to be the number one problem in shallow ponds, bass-shellcracker combinations may be the answer in this type of pond. This is definitely worthy of more investigation.

ACKNOWLEDGMENT

The author acknowledges with appreciation all persons, who in any way, contributed to the success of this study.

LITERATURE CITED

Smith, William A., Kirkwood, James B. and John F. Hall. 1955. A Survey of the Success of Various Stocking Rates and Ratios of Bass and Bluegill in Kentucky Farm Ponds. Ky. Dept. of Fish and Wildl. Bull. No. 16, 42 pp.

HISTORY OF FISH AND FISHING IN NORRIS A TVA TRIBUTARY RESERVOIR

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ABSTRACT

Norris Reservoir, the first TVA tributary reservoir, completed in 1936, has a spillway surface area of 34,200 acres. Earliest fish inventory records in the basin indicate 17 indigenous families of fishes represented by 40 genera and 65 species. Four families, Petromyzonidae, Anguillidae, Cyprinodontidae, and Cottidae, were unable to cope with the reservoir environment. Several genera and species of Cyprinidae and Percidae likewise did not survive. Game and commercial species generally have prospered in the reservoir.

A 14-year creel census on Norris shows considerable annual variation in catch but no trend to support the historical idea that reservoirs become "biological deserts."

Harvesting or fishing mortality studies over a 14-year period show an average tag return ratio of 17.2 percent. Year to year variation from the mean indicates that the obvious increase in fishing pressure since 1940 has not increased the relative rate of harvest. Variation in harvest rate by species is also shown. The Norris data show that the offer of prizes has little influence on tag returns.

Redistribution of species within a reservoir is also indicated by tag returns. Sauger and walleye in Norris travelled 0-150 miles, black basses and crappie 0 to 35 miles.

INTRODUCTION

Fisheries problems in the impounded waters of California, the Southeastern states, and in the large impoundments of the Missouri River were discussed at length in 1957 by Kimsey, Parsons, and Shields, respectively.

According to Parsons, reservoir surface area in the Southeast totals 2,009,000 acres (spillway levels). Of this total the TVA system accounts for 600,000 acres, or about 30 percent.

In approaching the history of fish and fishing in TVA reservoirs, we shall refer only to Norris, the oldest tributary reservoir in the system. Data on other TVA reservoirs is extensive but including it would go far beyond the proprieties for a panel paper. Besides, Norris is a representative tributary reservoir. Its statutory purpose, like that of all TVA reservoirs, is to provide for navigation, flood control, power, and national defense.

NORRIS FISH

Norris Dam, a tributary multipurpose installation, closed on March 4, 1936, is now 22 years old. At spillway level its surface acreage is 34,200. Its annual minimum elevation is usually reached by January 1 when the flood season is just beginning and when the greatest amount of flood storage space is needed. The level rises gradually during the flood season until the end of March and thereafter rather steeply so that the reservoir may reach its highest level by May or June 1.

Since the TVA Fish and Game Branch (originally the Biological Readjustment Division) was not organized until early 1936, fish collections in the Clinch River and tributaries occurred simultaneously with the filling of the reservoir.

Early Inventory

Table I indicates the number of indigenous families, genera, and species present in the Clinch River and tributaries before impoundment and at present. Individuals of all species were subjected to a reservoir environment following the closure of the gates. While this list may be incomplete, it is representative of the fishes in the area and serves as a qualitative guide for evaluating the development of populations within the reservoir following closure of the dam. It includes 17 families, 40 genera, and 65 species. Four of the 17 native families of fish do not now exist in the reservoir; 18 of the original genera have failed to survive; 30 of 65 indigenous species either are no longer present or are taken only rarely.

TABLE I *

FAMILIES AND GENERA AND NUMBER SPECIES FISH PRESENT IN NORRIS RESERVOIR BASIN IN 1936 AND 1937 AND NUMBER SPECIES SUCCESSFUL IN THE RESERVOIR IN 1958

Family	*Genera*	*No. Species Collected*	*No. Species Now Present*
Petromyzonidae	*Entosphenus*	1	0
Polyodontidae	*Polyodon*	1	1
Lepisosteidae	*Lepisosteus*	1	1
Hiodontidae	*Hiodon*	1	1
Clupeidae	*Dorosoma*	1	1
Salmonidae	*Salmo*	1	1 †
Catostomidae	*Catostomus*	1	1
	Carpiodes	1	1
	Cycleptus	1	1
	Hypentelium	1	1
	Moxostoma	5	5
Cyprinidae	*Campostoma*	1	0
	Cyprinus	1	1
	Erimystax	2	0
	Hybopsis	1	0
	Nocomis	1	0
	Notropis	12	2
	Phenacobius	1	0
	Rhinichthys	1	0
Ictaluridae	*Ictalurus*	3	2
	Pylodictis	1	1
	Noturus	1	0
Anguillidae	*Anguilla*	1	0
Cyprinodontidae	*Fundulus*	1	0
Percidae	*Catonotus*	2	0
	Cottogaster	1	0
	Doration	1	0
	Etheostoma	1	0
	Hadropterus	1	0

* From unpublished reports and file material.

† Rainbow, rock bass, and spotted bass are now rarely taken.

TABLE I *—*Continued*

FAMILIES AND GENERA AND NUMBER SPECIES FISH PRESENT IN NORRIS RESERVOIR BASIN IN 1936 AND 1937 AND NUMBER SPECIES SUCCESSFUL IN THE RESERVOIR IN 1958

Family	*Genera*	*No. Species Collected*	*No. Species Now Present*
	Percina	1	1
	Poecilichthys	4	0
	Stizostedion	2	2
	Ulocentra	1	0
Centrarchidae	*Ambloplites*	1	1†
	Lepomis	2	1
	Micropterus	3	3 †
Atherinidae	*Labidesthes*	1	1
Sciaenidae	*Aplodinotus*	1	1
Cottidae	*Cottus*	1	0
TOTAL—17	40	65	30

Evaluation of Relative Degree of Success in Reservoirs

Petromyzonidae. A single species, *Entosphenus lamottenii,* the brook lamprey, did not survive.

Polyodontidae. The spoonbill responded favorably but the prohibition of commercial fishing in Norris precludes its utilization.

Lepisosteidae. A single species, the longnose gar, sustains a small population in the reservoir.

Hiodontidae. The mooneye persists in relatively small numbers.

Clupeidae. The gizzard shad, extremely successful, has accounted for 50 percent of the number of fish and 67 percent of the weight of all population samples since 1949.

Salmonidae. The rainbow was originally collected in a small tributary where it was evidently stocked. Only a few isolated tributaries to Norris are suitable for trout and probably account for the occasional capture of this species in the reservoir.

Catostomidae. Of the five genera and nine species originally present, all have survived impoundment. Anglers, of course, seldom seek these fish and they are unexploited commercially.

Cyprinidae. Twenty species of minnows in eight genera were present in the Norris basin. Only the carp and the bullhead minnow have sustained relatively small but persistent populations. Small numbers of a few other species, apparently transient from small tributary streams, are occasionally present.

Ictaluridae. Three genera and five species of *Ictalurus, Pylodictis,* and *Noturus* were originally present. A small unimportant yellow bullhead population and larger populations of channel and flathead catfish exist.

Anguillidae. The single catadromus species was completely blocked out of tributary reservoirs.

Cyprinodontidae. Now nonexistent.

Percidae. Of 14 species originally present, only 3 have survived impoundment and are important in the fishery. Walleye and sauger provide excellent fishing and the logperch serves as forage.

Centrarchidae. Of six species in the early inventories only smallmouth and largemouth bass and bluegills contribute to the Norris fishery.

Atherinidae. The brook silversides has maintained its population in appreciable numbers.

Sciaenidae. The freshwater drum, now abundant but undersized, contributes little to the fishery.

Cottidae. Did not survive the reservoir environment.

In addition to the above fishes, the following have been introducd or have an unknown origin. All are now contributing substantially to the fishery.

White crappie—introduced in 1953-54.

Black crappie—appeared sometime before 1940 but its origin is uncertain.

White bass—thought to be introduced in 1949.

NORRIS FISHING

Creel Census

The earliest creel census work on Norris was initiated during the latter part of 1938, two and one-half years following the closure of Norris Dam. Average catches are shown in Table II and graphically illustrated in Figure 1. The composition of catches is presented in Table III.

The censuses in 1938, 1939, and 1940 did not cover April and May since these months comprised the customary 59-day closed season in Tennessee at that time. In 1944, during the year-round fishing experiment on Norris, the census was conducted during April, May, June, July, August, September, and October. Thereafter it covered only the months of March, April, May, and June. In all cases census information is based on samples of variable size as shown in Table II.

TABLE II

AVERAGE CATCH PER TRIP, NORRIS RESERVOIR CREEL CENSUS, 1938-54

Year	*Catch*		*No. Trips in Census*
	Number	*Weight (Lbs.)*	
1938[1]	1.8	. .	3,499
1939[2]	1.2	. .	7,392
1940	1.2	1.7[3]	9,628
1944[4]	2.5	4.5	9,085
1944[5]	2.3	2.1	9,010
1945[6]	3.4	3.4	9,544
1946[7]	2.1	2.0	12,150
1947[7]	1.9	2.7	6,734
1948	1.5	1.9	4,003
1949	1.8	1.6	4,639
1950	2.4	2.4	4,583
1951	2.6	3.1	3,105
1952	1.6	1.7	4,719
1953	1.8	1.5	4,723
1954	2.5	1.8	662

1 August, September, October, November—number only. Eschmeyer and Tarzwell (1939).

2 June, July, August, September, October, November—number only. Eschmeyer and Tarzwell (1939).

3 Weight computed from average weight per fish of 1.4 pounds. Eschmeyer (1942).

4 April and May. Eschmeyer and Manges (1945).

5 May through October. Eschmeyer and Manges (1945).

6 April, May and June. Eschmeyer, Manges and Haslbauer (1946); Eschmeyer, Manges, Haslbauer (1947).

7 1948-54 from unpublished data.

Figure 1. Average catch per trip. March, April, May and June, Norris Reservoir, 1938-1954.

1/ April & May

2/ May through October

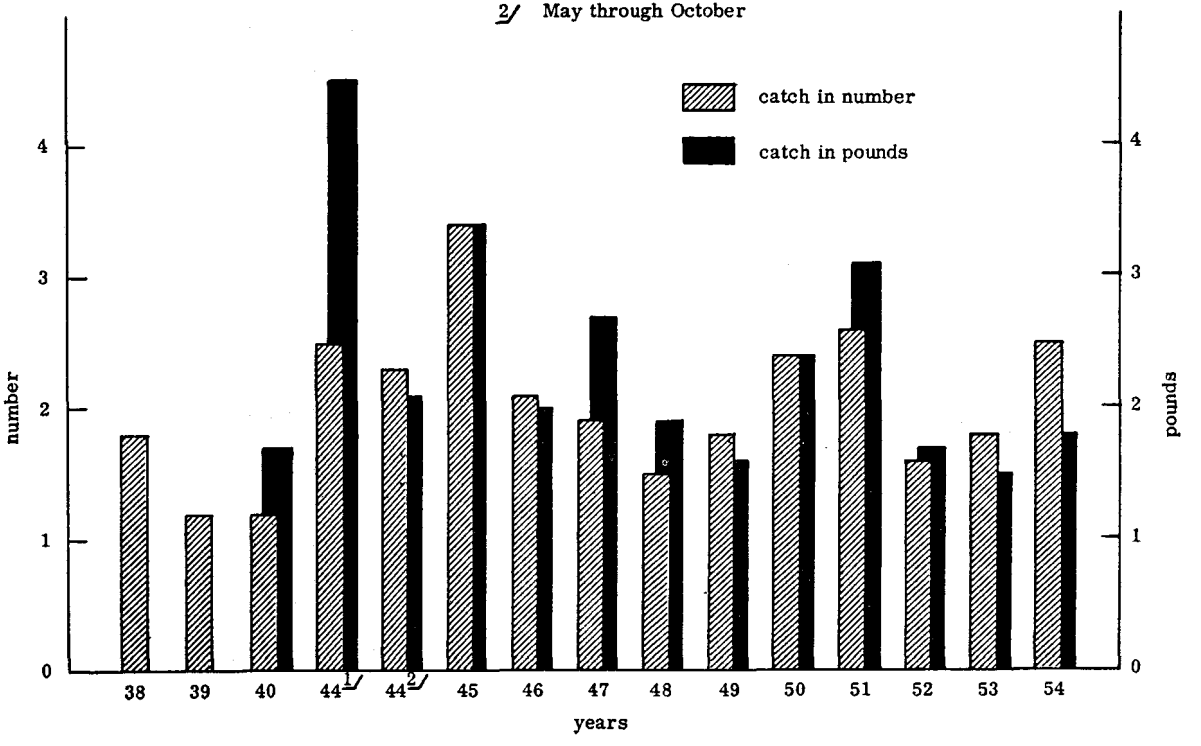

TABLE III

PERCENTAGE COMPOSITION OF CATCH, NORRIS RESERVOIR, 1938-54

Year	L'mouth Bass	S'mouth Bass	Spotted Bass	Crappie	Walleye	Sauger	White Bass [1]	Bluegill	Other [2]
1938	39	24	–[3]	–	3	–	–	30	4
1939	50	24	6	1	9	2	–	6	2
1940	38	29	3	8	9	3	–	8	3
1944	33	13	3	43	3	4	–	1	1
1944	9	5	1	74	2	3	–	5	1
1945	8[4]	4	–	80	3	3	–	1	1
1946	12[5]	7	–	65	8	4	–	2	1
1947	17	9	–	50	6	8	–	8	3
1948	10	8	–	45	14	16	–	4	5
1949	9	11	–	58	12	6	–	3	4
1950	21	21	–	26	16	14	–	2	3
1951	16	29	–	40	9	4	1	2	1
1952	12	26	–	41	8	1	5	3	3
1953	4	15	–	48[6]	14	1	4	4	3
1954	9	17	–	61	3	–	5	2	3

1 White bass introduced in 1949.
2 Includes carp, catfish, drum, suckers, etc.
3 Many spotted bass probably included with largemouth bass and smallmouth bass because of improper identification.
4 Spotted and largemouth combined.
5 Probably includes some spotted bass.
6 White crappie introduced as adults during winter 1953-54.

In general, we interpret the data in Table II to mean that the quality of fishing in Norris, and possibly in other reservoirs, may vary considerably from year to year without indicating any specific trend. In fact, during the past three or four years (no census) the consensus of many dock operators and fishermen is that fishing in Norris has been as good or better than it ever was before.

Wiebe (1958) states that impoundment of Norris and other TVA reservoirs brought stability, increased depth, and reduced turbidity. This in turn increased fish production not only quantitatively but qualitatively. It created a habitat acceptable to black bass, crappie, walleye, sauger, and white bass where formerly the fish population consisted mainly of suckers, sunfish, bullheads, and carp.

We do not have preimpoundment catch records for Norris but we are doubtful that its composition would have approached that shown in Table III. Eschmeyer (1940) stated that during its first five years of impoundment the relative abundance of fish of various species changed many times.

The original black bass population in Clinch River was chiefly smallmouth and spotted. In early 1939 there-year-olds predominated for both these species but almost no largemouth were taken that were born in 1936, the first year of impoundment (Eschmeyer, 1940). There was some confusion in identifying the spotted bass by creel census operators and thus its percentage composition is relatively low in Table III.

At present spotted bass are scarce and few are taken either by angling or in population studies. Largemouth and smallmouth are the predominant black basses and their populations have retained approximately equal vigor although for any given year either one may dominate the other.

The original crappie population was entirely black and remained so until 1953 when white crappie were introduced. Table III shows that crappie became a dominant part of the catch in 1944 and still is.

Walleye have contributed a great deal to the sport fishery in Norris. In fact, Norris is one of the few TVA reservoirs that sustain a fishable population of this species. However, as in many other waters, it is noticeably erratic in producing strong year classes and this probably accounts at least in part, for its variability in the percentage composition table.

Sauger have also maintained a sizeable population in Norris and at times make up a sizeable portion of the catch. The sauger population also seems to alternately build up and deteriorate.

Bluegills have noticeably declined since the earliest records but they still reproduce consistently and prolifically, grow slowly, and contribute appreciably to the fishery.

White bass were not present until 1949 but they now support a tremendous early spring upstream fishery. At times, usually during summer and fall, this species provides excellent reservoir fishing.

The rock bass, a popular and abundant fish in warmwater streams in Tennessee, is insignificant in the creel census. After the first two or three years of impoundment it virtually disappeared. This species has followed this pattern in all TVA tributary reservoirs.

HARVESTING

Fish tagging studies to determine fishing mortality and extent of movement have been conducted annually on Norris for 14 years. The results of these studies have kept us informed on both the relative rate of harvest and the degree to which a species will disperse within a reservoir (see Tables IV, V, and VI, also Figures 2 and 3).

TABLE IV

SUMMARY OF NORRIS TAGGING EXPERIMENTS, 1940-1958

	Sauger			*Walleye*			*L'mouth Bass*			*S'mouth Bass*			*Spotted Bass*		
Year	*NT*[1]	*NR*[2]	*PR*[3]	*NT*	*NR*	*PR*	*NT*	*NR*	*PR*	*NT*	*NR*	*PR*	*NT*	*NR*	*PR*
1940	23	7	20.3	28	4	14.1	662	122	18.5	187	23	14.9	75	30	39.9
1946	328	20	4.9	--	--	--	--	--	--	--	--	--	--	--	--
1947	250	46	18.3	100	16	5.0	115	24	20.9	11	3	18.2	2	--	--
1948	284	59	19.7	89	33	23.6	19	1	5.3	6	1	16.6	1	--	--
1949	484	162	33.5	238	80	33.6	25	8	32.0	34	9	26.5	17	5	29.4
1950	341	82	24.0	61	19	31.1	597	106	17.8	3	2	66.6	8	0	0.0
1951	736	161	21.8	78	16	20.5	143	37	25.9	50	17	34.0	6	0	0.0
1952	323	73	22.6	110	12	10.9	24	8	33.3	12	5	41.7	0	0	0.0
1953	337	55	16.3	114	20	17.5	2	0	0.0	3	0	0.0	0	0	0.0
1954	125	33	26.4	43	8	18.6	9	1	11.1	2	0	0.0	0	0	0.0
1955	169	45	26.6	91	18	19.7	9	0	0.0	1	0	0.0	1	1	100.0
1956	152	34	22.3	58	13	22.4	65	8	12.3	9	1	11.1	3	0	0.0
1957	182	43	23.6	194	38	19.5	42	6	14.3	11	3	27.2	1	0	0.0
1958[4]	299	73	24.4	136	35	25.7	16	2	18.2	11	2	18.2	2	0	0.0
TOTAL	4,033	893	22.1	1,340	312	23.2	1,728	323	18.7	340	66	19.4	116	36	31.0

1 Number tagged.
2 Number recovered.
3 Percentage recovered.
4 Returns incomplete.

TABLE IV—*Continued*

SUMMARY OF NORRIS TAGGING EXPERIMENTS, 1940-1958

	Black Crappie			*White Crappie*			*Rock Bass*			*White Bass*[5]			*Total*		
Year	*NT*	*NR*	*PR*	*NT*	*NR*	*PR*	*NT*	*NR*	*PR*	*NT*	*NR*	*PR*	*NT*	*NR*	*PR*
1940	32	6	18.8	--	--	--	3	1	33.3	--	--	--	1,010	193	19.1
1946	--	--	--	--	--	--	--	--	--	--	--	--	328	20	6.1
1947	27	1	3.7	--	--	--	--	--	--	--	--	--	505	90	17.8
1948	8	3	25.0	205	--	--	--	--	--	--	--	--	612	97	15.8
1949	154	20	13.0	--	--	--	--	--	--	--	--	--	952	284	29.8
1950	8	1	12.5	--	--	--	--	--	--	--	--	--	1,018	210	20.6
1951	94	0	0.0	--	--	--	--	--	--	27	0	0.0	1,134	231	20.3
1952	66	7	10.6	--	--	--	1	0	0.0	31	1	3.2	567	106	18.7
1953	50	8	16.0	--	--	--	--	--	--	32	2	6.3	538	85	15.8
1954	272	34	12.5	687	6	0.9	--	--	--	69	3	4.3	1,207	85	7.0
1955	36	6	16.7	0	0	0.0	--	--	--	83	8	9.6	390	78	20.0
1956	306	31	10.1	35	4	11.4	--	--	--	135	7	5.2	763	98	12.8
1957	70	7	10.0	16	3	18.8	--	--	--	126	7	5.5	642	107	16.7
1958	11	3	27.2	9	0	0.0	--	--	--	489	61	12.5	973	176	18.1
TOTAL	1,134	127	11.2	952	13	1.3	4	1	25.0	992	89	9.0	10639	1860	17.2

5 Introduced in 1949.

TABLE V

SUMMARY OF TOTAL RESULTS OF TAGGING EXPERIMENTS BY YEARS
NORRIS RESERVOIR, 1940-1958

Year	*Number Fish Tagged*	*Number Tags Returned*	*Percent Tags Returned*
1940	1,010	193	19.1
1946	328	20	6.1
1947	505	90	17.8
1948	612	97	15.8
1949	952	284	29.8
1950	1,018	210	20.6
SUBTOTAL	4,425	894	20.2
1951	1,134	231	20.3
1952	567	106	18.7
1953	538	85	15.8
1954	1,207	85	7.0
1955	390	78	20.0
1956	763	98	12.8
1957	642	107	16.7
1958*	973	176	18.1
SUBTOTAL	6,214	966	15.5
TOTAL	10,639	1,860	17.2

* Incomplete returns.

TABLE VI

SPECIES SUMMARY OF TOTAL TAG RETURNS BY SPECIES
NORRIS RESERVOIR, 1940-1958

Species	*Number Tagged*	*Number Tags Returned*	*Percent Tags Returned*
Sauger	4,033	893	22.1
Walleye	1,340	312	23.2
Largemouth Bass	1,728	323	18.7
Smallmouth Bass	340	66	19.4
Spotted Bass	116	36	31.0
White Bass	992	89	9.0
Black Crappie	1,134	127	11.2
White Crappie	952	13	1.3
Rock Bass	4	1	25.0
TOTAL	10,639	1,860	17.2

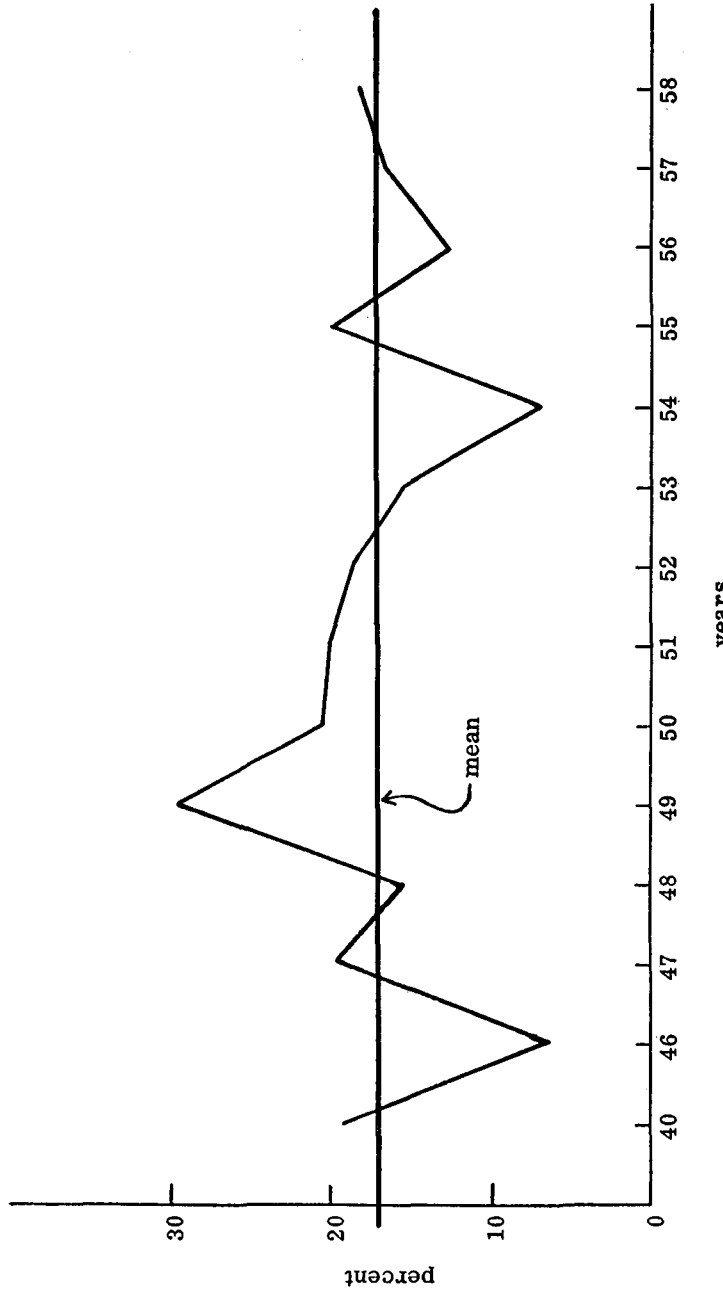

Figure 2. Summary of percentage of tag returns by years, Norris Reservoir, 1940-1958.

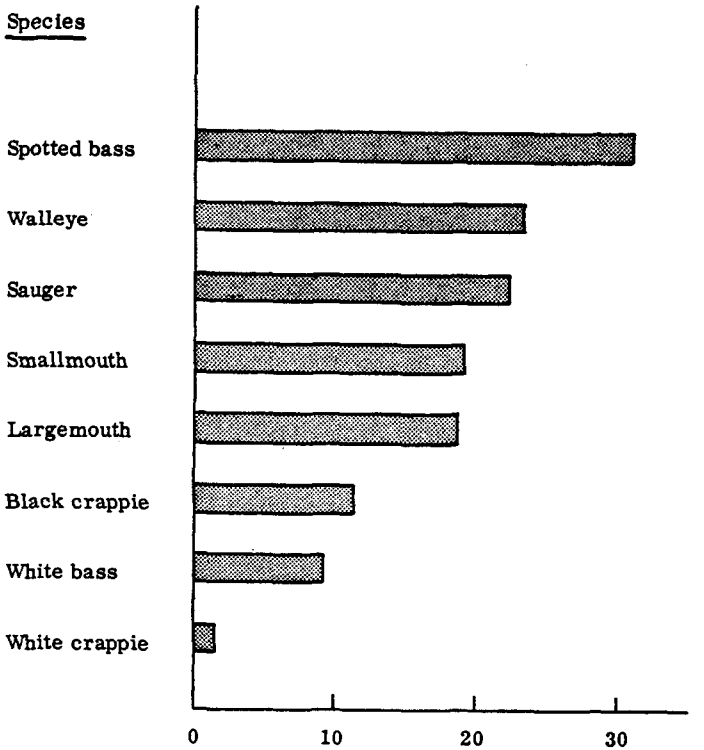

Figure 3. Percentage harvest by species in Norris Reservoir, 1940–1958.

Most of the fish used in these experiments were taken in gill nets in mid-winter. A few were caught by hook and line and some were transplanted from another reservoir. No evaluation of the possible effects that might be attributed to the different means of procuring fish is attempted.

The Number 3 Monel metal strap tags were used almost exclusively. This year (1958) a dangler tag anchored beneath the dorsal fin with monofilament polyethylene was used in conjunction with the strap tag. The number of fish tagged this year was 973 fish—866 (89 percent) with dangler tags and 107 (11 percent) with strap jaw tags.

So far, 164 dangler (19.4 percent) and 8 strap tags (7.5 percent) have been returned. We hope to do further work on comparing the efficiency of different types of tags.

Table IV is a general summary of the number of fish tagged each year by species, the number of tags recovered annually, and the ratio of tags recovered. This table indicates that the sauger tag recovery ranges from 4.9 to 33.5 percent and averages 22.1 percent. Walleye tag recovery ranged from 5.0 to 33.6 percent and averaged 23.2 percent. The largemouth range was from zero to 33.3 percent, with an average of 18.7 percent. Smallmouth ranged from 0.0 to 66.6 percent and averaged 19.4 percent (a relatively small sample).

The limited spotted bass data indicate a rather high average rate of harvest—31.0 percent.

White bass did not appear in the catch until 1951. From then on the harvest rate ranged from 0.0 to 12.5 percent and averaged 9.0 percent.

Black crappie harvest ratios have ranged from 0.0 to 27.2 percent, the average being 11.2 percent. Comparable figures on the white crappie, which was not present until 1954, show a range from 0.9 to 18.8 percent, with an average of 1.3 percent.

Only a few rock bass were tagged; they are listed only to make the table complete.

Table V is divided into two sections. From 1940 through 1950, sportsmen's clubs and dock operators cooperated by providing moderate prizes for the return of tags. As the table shows, the rate of tag returns for this period ranged from 6.1 to 29.8 percent. The mean was 20.2 percent.

During the second period, 1951 through 1958, no prizes or other rewards were offered for tags, except for a 1½ month interval during July and August, 1958. For this brief period a Knoxville TV station offered $10.00 prizes for tags recovered during this period. Although 38 tags were returned during this period, only 20 were 1957-58 tags; 15 were 1956-57 tags. Overall, the tag recoveries for 1951-1958 ranged from 7.0 to 20.3 percent and averaged 15.5 percent, 4.7 percent less than during the earlier period when prizes were used as a stimulus. Since 1950 the number of crappie in the tagged populations has increased approximately four-fold. Since the harvest rate on crappie in Norris is rather low, it seems that the 4.7 percent difference in tag returns might be ascribed to the inclusion of larger numbers of crappie in our tagging experiments as well as to the influence of prizes and rewards.

In some situations a tag return contest which offers a moderate reward for the return of tags may be advisable. In Norris and perhaps in many similar instances close contact with dock operators during the tagging operations and throughout the fishing season will substantially improve the return of tags. The widespread use of posters, contacts with sportsmen and sportsmen clubs, plus newspaper, radio, or TV notices should reduce the necessity for a contest-type fishing mortality study. Persuading dock operators (and Norris dock operators probably understand reservoir fisheries problems better than any similar group in the United States) and fishermen to return tags voluntarily should be the ultimate aim of the fisheries biologist in such studies.

Table V summarizes average fishing mortality for all species. Of 10,639 tags placed on fish, 1,860 have been returned for an average of 17.2 percent.

Table VI is a summary of Norris tagging experiments by species. The rate of harvest was highest for spotted bass, with rock bass (and this sample included only four fish), walleye, sauger, smallmouth, largemouth, black crappie, white bass, and white crappie following in that order. To some extent these data support the contention of Manges that a harvestability differential exists in fish, *i. e.,* the larger predator or game species are more easily taken than crappie.

The exploitation rates expressed here are, we believe, reliable and fairly well represent the relative rate of harvest of fishes in Norris Reservoir. Unfortunately, we only have limited estimates of natural mortality to complement the annual mortality rate. The only natural mortality rates on Norris fish are those determined by Hassler on sauger. These rates varied from 0.48 for fish between one and two years old to 0.89 for sauger between six and seven years old. Obviously such information is needed for other species before we can fully appreciate the value of our exploitation rates.

Additional information from tagging includes the redistribution of species from time to time within the reservoir. Manges (1950) shows that average minimum distances and range of distances travelled by various species in Norris are about as follows:

Sauger range 0-150 miles, average 19.1
Walleye range 0-50 miles, average 11.6
Largemouth bass range 0-35 miles, average 4.0
Smallmouth bass range 0-10 miles, average 1.2
Spotted bass range, 0-25 miles, average 3.6
Black crappie range 0-20 miles, average 5.4

These data indicate that most species of game fish are decidely either migratory or nomadic or both. At any rate, they move considerably, and in the case of Norris, cross state lines. Many Norris Reservoir fish move into tributaries and provide fishing far beyond the confines of the reservoir.

SUMMARY

A list of families, genera, and species of fish present before and after impoundment is provided, along with a relative tolerance for reservoir conditions.

Creel census data for 14 years is reviewed, providing information on the average number and weight of fish caught and the percentage composition of the catch.

Harvesting or tagging data for 14 years is also reviewed and discussed.

LITERATURE CITED

Eschmeyer, R. W. 1942. The Catch, Abundance, and Migration of Game Fishes in Norris Reservoir, Tennessee, 1940. Journ. Tenn. Acad. Sci., Vol. 17, No. 1, January, 1942.

———————— and D. E. Manges. 1945. Effect of a Year-Round Open Season on Fishing in Norris Reservoir. Journ. Tenn. Acad. Sci., Vol. 20, No. 1, January, 1945.

————————, D. E. Manges and O. F. Haslbauer. 1946. Spring Fishing on Several TVA Reservoirs, 1945. Journ. Tenn. Acad. Sci., Vol. 21, No. 1, January, 1946.

————————, D. E. Manges and O. F. Haslbauer. 1947. Trends in Fishing on TVA Storage Waters. Journ. Tenn. Acad. Sci., Vol. 22, No. 1, January, 1947.

———————— and Clarence M. Tarzwell. 1941. An Analysis of Fishing in the TVA Impoundments During 1939. Journ. Wild. Mgt., Vol. 5, No. 1, January, 1941.

Hassler, W. W. 1953. Age and Growth of the Sauger, *Stizostedion canadense canadense* (Smith) in Norris Reservoir, Tennessee. Ph.D. Thesis.

Kimsey, J. B. 1957. Fisheries Problems in Impounded Waters of California and the Lower Colorado River. Trans. Amer. Fish. Soc., Vol. 87, pp. 319-332.

Manges, D. E. 1950. Fish Tagging Studies in the TVA Storage Reservoirs, 1947-49. Journ. Tenn. Acad. Sci., Vol. 25, No. 2, April, 1950.

————————. 1951. Is There a Harvestability Differential in Fish? Trans. Amer. Fish. Soc., Vol. 80 (1950), 1951, pp. 46-49.

Parsons, John W. 1957. Fishery Management Problems and Possibilities on Large Southeastern Impoundments. Trans. Amer. Fish. Soc., Vol. 87, pp. 333-355.

Shields, James T. 1957. Fish Management Problems of Large Impoundments on the Missouri River. Trans. Amer. Fish. Soc., Vol. 87, pp. 356-362.

Wiebe, A. H. 1958. The Effects of Impoundments Upon the Biota of the Tennessee River System. Paper submitted September, 1958, to the International Union for the Conservation of Nature and Natural Resources, 6th Assembly, 7th Technical Session, Athens, Greece.