Pre- And Post-Impoundment Fish Populations in The Stilling Basin Below Wister Dam

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Among the favorite fishing sites at Oklahoma reservoirs are the waters below the dams. Eschmeyer and Miller (3) have emphasized the importance of tailwaters below TVA impoundments as productive fishing areas. As a measure in reducing erosion, the water flowing from some Oklahoma impoundments is slowed down in concrete stilling basins. Due to the dangers involved, fishing is prohibited in the stilling basin below Wister Dam. However, any collection of the fish population in the basin would contain fishes which have moved upstream during high water from the heavily fished downstream area, as well as fishes which have come down through the outlet tunnels from the impoundment above. Pre- and post-

[3] A normal clutch contains about 20,000 eggs; therefore, the sample is near 1/20 of a clutch (1).

[1] Oklahoma Biological Survey and Department of Zoology, University of Oklahoma.

impoundment fish collections were made in the stilling basin because of the accessibility to a large population of fish.

On August 12-13, 1949, as part of a pre-impoundment fishery survey of Wister Reservoir, most of the water was pumped from the stilling basin, and fishes were collected with small seines. The analysis of that population was reported by Hall (4). On September 7, 1951, at the conclusion of a post-impoundment survey[1], the fish population was sampled in a similar fashion. It is the purpose of this paper to report on those fishes taken in 1951 and to compare these data with those of the 1949 collection.

Pumping the water out of the basin and over a cofferdam of sandbags into the river below commenced at 11:00 A.M., and by 7:00 P.M. the water level was down to two feet, a depth shallow enough to permit the use of small seines. With the aid of floodlights, two crews seined the basin continuously for three and one-half hours, during which period the least depth of water was approximately eight inches. Seining was continued until the returns were negligible. Operations were halted when repeated seine hauls produced only a few small channel catfish, white crappie, and gizzard shad, fishes which had already been taken in large numbers. The authors are reasonably sure that the bulk of the population had been removed, to the extent that the remaining fishes would little affect the species composition, either by number or by weight.

A total of 1857 fishes were taken from the basin. Of these, 1843 had a combined weight of 595.6 pounds. One highfin sucker, which is rarely taken in Oklahoma waters, 11 adult chestnut lampreys, and two young American eels were preserved for museum specimens and were not weighed. White crappie, gizzard shad, largemouth black bass, channel catfish, and bluegill in that order were the five most numerous fishes in the collection, and together they constituted over 70 per cent of the total catch. Although black buffalo and carp were the seventh and eighth most numerous species, their combined weight made up 43.5 per cent of the total weight of all fish taken, because of the comparatively large average size of individuals. Tables I and II show comparisons between the 1949 and 1951 populations, as to numbers of fish and weights of fish respectively.

When the pre- and post-impoundment populations are compared, certain differences are evident. The total number of fish taken was decidedly greater in 1951 than in 1949, even though it is probable that a smaller proportion of the existent population was taken in 1951 than in 1949. In contrast to the increased numbers of fish in 1951, the total weight of the catch was 400 pounds less than in 1949. This is accounted for in part by the much smaller average size of coarse species (carp and buffalo) and by the appearance of large numbers of small game and pan fishes in the 1951 sample. Largemouth bass, white and black crappie, and black bullhead were absent in the 1949 collection, whereas in the post-impoundment sampling these species were numerous. Similar changes were noted by Hucske (5) in the pre- and post-impoundment sampling of Allatoona Reservoir, Georgia. The planting of large numbers of largemouth black bass in Wister Reservoir in 1950 would account for their presence in the basin. Periodic sampling of the reservoir during the first two years of impoundment produced evidence of very successful reproduction of the crappies and black bullhead during that time.

[1] Both the pre- and post-impoundment surveys were sponsored by the Oklahoma Game and Fish Council. Cooperating members included the Tulsa District, U. S. Corps of Engineers, the U. S. Fish and Wildlife Service, the Oklahoma Game and Fish Department, and the University of Oklahoma.

TABLE I

A Comparison of Numbers of Fish Removed from the Stilling Basin Below Wister Dam, August 12-15, 1949 and September 7, 1951

1949			1951		
Species[1]	Number of Fish	Percentage by Number	Species[1]	Number of Fish	Percentage by Number
Channel catfish	393	33.6	White crappie	428	23.2
Black buffalo	185	15.8	Gizzard shad	245	13.3
River carpsucker	125	10.7	Largemouth black bass	226	12.3
Freshwater drum	114	9.8	Channel catfish	203	11.0
Bluegill	105	8.9	Bluegill	200	10.9
Spotted black bass	96	8.2	Black bullhead	152	8.2
Gizzard shad	54	4.6	Black buffalo	101	5.5
Smallmouth buffalo	26	2.2	Carp	75	4.1
Longear sunfish	22	1.9	Black crappie	67	3.6
Green sunfish	19	1.6	Spotted black bass	49	2.7
Carp	16	1.4	River carpsucker	37	2.0
Warmouth	6	0.5	Longear sunfish	22	1.2
Bigmouth buffalo	4	0.3	Golden shiner	15	0.8
Flathead catfish	2	0.1	Bigmouth buffalo	11	0.6
Longnose gar	1	—	Green sunfish	8	0.4
			Freshwater drum	3	0.2
			Spotted sucker	1	—
Totals	1168	99.6		1843	100.0

[1] Common names used throughout this paper follow the standardized list of fish names of the American Fisheries Society (1).

TABLE II

A Comparison of Weights of Fish Removed from the Stilling Basin Below Wister Dam, August 12-13, 1949 and September 7, 1951

1949			1951		
SPECIES	WEIGHT (POUNDS)	PERCENTAGE BY WEIGHT	SPECIES	WEIGHT (POUNDS)	PERCENTAGE BY WEIGHT
Black buffalo	521.7	52.4	Carp	160.0	26.9
Channel catfish	163.8	16.5	Channel catfish	119.3	20.0
Carp	83.4	8.4	Black buffalo	98.9	16.6
River carpsucker	78.4	7.9	Largemouth black bass	41.4	7.0
Smallmouth buffalo	77.9	7.8	Black bullhead	39.0	6.5
Bigmouth buffalo	24.9	2.5	Bluegill	36.0	6.0
Freshwater drum	18.4	1.8	River carpsucker	29.5	5.0
Spotted black bass	14.2	1.4	White crappie	19.5	3.3
Gizzard shad	5.4	0.5	Bigmouth buffalo	17.5	2.9
Bluegill	4.3	0.4	Gizzard shad	15.3	2.6
Green sunfish	1.2	0.1	Black crappie	8.6	1.4
Flathead catfish	0.9	0.1	Spotted black bass	6.8	1.1
Longear sunfish	0.8	0.1	Longear sunfish	1.3	0.2
Warmouth	0.2	—	Golden shiner	0.8	0.1
Longnose gar	0.1	—	Green sunfish	0.8	0.1
			Freshwater drum	0.6	0.1
			Spotted sucker	0.3	—
Totals	996.8	99.9		595.6	99.8

The composition of the population has changed in other ways since 1949. Absent from the 1951 collection which were present in 1949 were smallmouth buffalo, flathead catfish, warmouth, and longnose gar. These species have always been present in the reservoir or the Poteau River, and apparently undetermined factors account for their presence or absence in the basin at any particular time. Furthermore, only three freshwater drum were collected in 1951, although in 1949 it was the fourth most numerous species. During periods of drawdown of the reservoir, the drum is common in the basin and in the river below where fishermen using crayfish for bait catch large numbers. This species preferably feeds on crayfish, snails, and freshwater mussels (2), and the smooth cement walls and floor of the stilling basin provide little habitat for these molluscan forms. Presumably, after the water is cut off, drum move downstream to find a habitat with more suitable feeding conditions.

Some similarities in pre- and post-impoundment populations are noted also. As in 1949, black buffalo, channel catfish, and carp contributed most of the total weight of the 1951 collection. However, carp replaced the black buffalo as the heaviest component. These three species constituted 77.3 per cent of the total weight in 1949 and 63.5 per cent in 1951. Bluegill ranked as the fifth most numerous fish in both collections, with the more numerous black buffalo, river carpsucker, and freshwater drum in 1949 being replaced by white crappie, gizzard shad, and largemouth black bass in 1951. Channel catfish, the most abundant fish in 1949, still ranked high numerically in the 1951 sample as the fourth most numerous species. The presence of the spotted black bass in the basin in both years is of considerable interest, inasmuch as this species is a native of local stream populations. Although commonly found in the streams entering the reservoir, it has not been collected or observed in the lake proper since the first year of impoundment. It can be accounted for in the basin only because of its preference for the river type of habitat.

With respect to each other, the game-pan fish and coarse fish populations have undergone certain changes during the first two years of impoundment. Coarse fishes dominated the populations by weight in both collections, but, whereas in 1949 they constituted 81.4 per cent of the total weight, in 1951 this majority had decreased to 54.5 per cent. During the same period the numerical dominance of game and pan fishes increased from 54.2 per cent in the pre-impoundment collection to 73.5 per cent in the post-impoundment sample. The appearance of large numbers of white crappie and largemouth black bass in the 1951 collection seems to have made the greatest contribution toward the growth of the game and pan fish population. The fact that there was a considerable decrease in the numbers of black buffalo, river carpsucker, and freshwater drum present in the basin in 1951 was apparently the main reason for the decline in the coarse fish population. However, not enough data are available from these collections to suggest that a corresponding increase or decrease in the abundance of the above named fishes occurred during the same period over the entire impoundment. Furthermore, it is doubtful whether the sample of the population of fishes collected below the dam in 1951 reflects accurately the proportion of game and pan fishes to coarse fishes in the reservoir. Spotted suckers and bowfin have been two of the more common coarse fishes in the lake since impoundment, but only a single specimen of the former and none of the latter was taken in the post-impoundment sample below the dam. Nevertheless, it is encouraging to note that of the five most numerous fishes collected from the stilling basin in 1951, four (white crappie, largemouth bass, channel catfish, and bluegill) are the most desirable from the point of view of angling. Since the greatest fishing pressure will probably be exerted against these species while coarse fishes will probably remain largely unharvested, the latter may be expected to increase in abundance in the later years of impoundment. This situation was produced in several TVA reservoirs (6).

Construction of the dam was still in progress at the time of the pre-impoundment investigation. Consequently, no definite conclusions could be drawn concerning the permanency of the stilling basin population. Now, after a two-year period of impoundment, the fact of a permanent fish population can probably be accepted—permanent meaning that there are fish in the stilling basin throughout the year. The population undoubtedly fluctuates upward with the spring spawning migration, and other changes are probably brought about by the opening of the outlet gates during periods of drawdown. The fish population of the basin would have to be sampled periodically throughout the year to determine exactly how it varies.

Although brief in extent, and lacking sufficient evidence for the formation of management recommendations, the post-impoundment collection of fish from the stilling basin below Wister Dam has confirmed some of the suppositions considered after the pre-impoundment collection (4). Also, the post-impoundment study has contributed to the scanty knowledge of early fish population trends in Oklahoma reservoirs. In 1949, it was presumed that the game and pan fishes would increase substantially soon after impoundment. This apparently is true. Furthermore, it seemed likely that the stilling basin population was a dynamic fish population and that the composition would be different, if sampled at any other time. The second collection does not present the desired evidence of periodic variation, but it does support the belief that variation in size, number, and species does occur. Most specifically, the comparable data obtained from the post-impoundment collection points out the fish population of these waters is progressing from that native to the river to one more commonly associated with Oklahoma impoundments.

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