FISH POPULATION OF THE STILLING BASIN BELOW WISTER DAM

GORDON E. HALL, University of Oklahoma, Norman

This study was made on August 12-13, 1949 in connection with a pre-impoundment survey of Wister Reservoir, sponsored by the Oklahoma Game and Fish Council[1]. During the greater part of the summer the de-watering tunnels in the dam were left open because of construction work on the dam. At the time of this survey however, the gates had been closed for a week, leaving a pool of water approximately 100 feet long, 60 feet wide, and 12 feet deep, which was connected with other pools of water further downstream by a shallow stream.

Earlier in the spring, large schools of buffalo and carp had been observed swimming up into the basin, and, at this time, large fish of several species were observed swimming near the surface of this quiet pool. Attempts to seine this area proved unsuccessful, not only because of the deep water and the almost vertical concrete walls, but also because of the presence of two rows of concrete baffles, ten feet and five feet in height, across the center of the basin. A stepped-end sill below the outlet tunnels was an advantage in seining, but it was necessary for the water to be very low for this to be of any use.

In order that our survey crew might study the species composition and the age and growth of the fishes of this area, the Corps of Engineers kindly arranged for the basin to be pumped out. The downstream end of the stilling basin was shut off from the rest of the stream by a wall of sandbags which prevented the escape of fishes as the water receded. A pump with a capacity

[1]Cooperating members of this council include the Tulsa District, Corps of Engineers; U. S. Fish & Wildlife Service; Oklahoma Game & Fish Dept.; University of Oklahoma; and Oklahoma A. & M. College.

of 4000 gallons per hour, installed just above the sandbags, pumped the water out into the stream below.

On August 12, pumping began about 11:00 A.M., and the water in the basin was down to a depth of eight inches by 6:00 P.M. Collecting by means of dip nets and by hand began at this time and continued until dark. Then the gates were opened and the basin allowed to refill, but not to overflow. In this short period, 204 fish weighing 629 pounds were collected. Of these fish, 149 were black and smallmouth buffalo, weighing 486 pounds. This was 77.8% of the total weight. These buffalo, plus 11 carp weighing 81.5 pounds and four bigmouth buffalo weighing 25 pounds, made up 95 per cent of the total weight of the first day's collection.

The next morning pumping commenced again at 7:00 A.M., and by 2:00 P.M. the water level had again dropped to a depth of eight inches. This time the basin was extensively seined by three crews, each using 20 foot, ¼ inch square mesh minnow seines. The seines were dragged either straight up against the vertical wall, pocketing the fish, or out over the stepped-end sill. The seining was continued for three hours until no more fish were captured at any point. It is believed that very few fish remained in the basin when seining operations were halted the second day. Possibly a few minnows as well as a few small specimens of species already taken, escaped the seines, but this procedure was probably 95% effective in removing fish from the basin. After the fish were removed the basin was immediately filled and allowed to overflow into the stream below.

The weight of the 964 fish collected the second day was 367.8 pounds. Apparently most of the larger specimens had been captured the first day. However, the majority of the second day's collection were channel catfish, spotted bass, and bluegill, fishes which are not easily caught by hand or with dip nets. This would explain their absence from the first day's collection.

The total number of fish collected from this basin was 1168, and the total weight was 996.8 pounds. The few minnows collected were preserved, and their weight is not included in the above figure. Species, numbers, weights, and per cents by weight and number for the total collection are recorded in Table I.

TABLE I

Fish Removed from Stilling Basin Below Wister Dam on August 12-13, 1949

Species[1]	Number of Fish	Percentage by Number	Weight (pounds)	Percentage by Weight
Black buffalo	185	15.8	521.7	52.4
Channel catfish	393	33.6	163.8	16.5
Carp	16	1.4	83.4	8.4
Carpsucker	125	10.7	78.4	7.9
Smallmouth buffalo	26	2.2	77.9	7.8
Bigmouth buffalo	4	0.3	24.9	2.5
Drum	114	9.8	18.4	1.8
Spotted bass	96	8.2	14.2	1.4
Gizzard shad	54	4.6	5.4	0.5
Bluegill	105	8.9	4.3	0.4
Green sunfish	19	1.6	1.2	0.1
Flathead catfish	2	0.1	0.9	0.1
Longear sunfish	22	1.9	0.8	0.1
Warmouth	6	0.5	0.2	
Longnose gar	1		0.1	
Totals	1168	99.6	996.8	99.9

[1]Common names of fishes used in this report follow the standardized list of fish names of the American Fisheries Society (1948).

Of the 1168 fish taken from this pool, about two-fifths were channel catfish and spotted bass both of which are classified as game fishes under the laws of Oklahoma. However, only 80 of the 393 catfish and three of the 96 spotted bass were of legal length (10 inches), and their combined total weight amounted to only 18 per cent of the total weight of all fish. The fact that game fish were a minor part of this population is further emphasized by the species composition as shown in Table I. Over 80 per cent by weight of all fish taken were coarse fish, with the black buffalo outweighing all of the other fishes combined.

The species composition as found in this area below the dam might indicate that coarse fish would make up the major percentage of those fish moving up into the reservoir during high water, and, since this is a flood-control dam, such movement is possible during periods of high water when the outlet gates are open for prolonged periods of time. By the use of hoop-nets, gill-nets, and rotenone throughout the summer, it was found that the species composition in other parts of the reservoir corresponded closely to that found below the dam. Although game fish seem to be in the minority at this time, the species composition will undoubtedly change with the changing conditions after impoundment. However, the present situation is not altogether an undesirable one. Many of the coarse species, such as buffalo, carp, drum, carpsucker, and flathead catfish are very nutritious. Furthermore, by the use of a simple creel census and by personal observation this summer, it was learned that many of the people in this region of Oklahoma not only like to catch these particular species but actually prefer them as food.

The removal of 1168 fish weighing 996.8 pounds from such a small pool (less than ⅛ of a surface acre) presupposes two possibilities as to their presence: (1) that a sufficient food supply was available to support such a population: (2) that the population was a dynamic or constantly changing one. At this time there is little evidence to support the first supposition. It seems likely that the plankton food supply in the basin would be constantly replenished from the lake above when the water is flowing through the gates and that forage fish would constantly enter the basin from the river below. Of the fish taken in this study, 206 or 18.3 per cent were of suitable size to serve as food for adult catfish and bass (shad, bluegill, green and longear sunfish, and warmouth). The plankton in this area was not examined, and to what extent food for both game and coarse fish is continuously available is not known.

The other, and more likely alternative has some support from workers at other impoundments. At TVA impoundments for example, it has been noted that migrations of fish to the tailwaters may be of sufficient magnitude to alter decidedly the composition of the fish population (3). Certain species too are known to be very abundant in the tailwaters at times, and are poorly represented in these areas at other times (7). Furthermore, by the use of marked fish, it has been shown that fish do not tend to remain constantly in the same area, but rather to move up or downstream, sometimes for great distances (6, 8). Thus a similar survey in this same area during the spring spawning runs, or at any other period, might show the species composition to be decidedly different from that noted in Table I.

This study has shown that a large population of fish existed immediately below Wister Dam in August, long after the spring spawning when the population could reasonably be expected to be much larger due to arrested upstream migration. Whether a population of similar size or larger would be found in this same area at all times of the year is not now known. However, it is a well-known fact that the tailwaters immediately below large dams are productive fishing areas. Eschmeyer and Miller (4), studied the extent of fishing in tailwaters below nine TVA dams, and estimated the nine tailwaters to yield over 1.5 million pounds of fish per year. Furthermore, from a study of fish spawning below Norris Dam, Eschmeyer and Smith (5) concluded that

fish tend to be abundant in such tailwater areas, even though most warm water species do not reproduce there. Nevertheless, conditions existing below these TVA dams may not be similar to conditions below Oklahoma impoundments, and comparisons between them cannot safely be made until more information is available. Neither can conclusions as to abundance of fish below Wister Dam, or any other Oklahoma impoundment, be based on this one study alone. Collections on the following day, week, or month might have proved that the population varies periodically as to size, number and even species. More information is needed about the species composition in stilling basins and tailwaters at different times of the year, the movements of fish in and out of these areas, the amount of available food contained therein, and the amount of food brought into them from the lakes above. As far as is known, no such studies besides the one discussed here have been made in Oklahoma.

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