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THE CATCH OF WIRE TRAPS IN OLD HICKORY RESERVOIR, TENNESSEE

By Norval F. Netsch[1]
Tennessee Game and Fish Commission
Nashville, Tennessee

ABSTRACT

One by two-inch mesh wire fish traps were fished for 5,135 trap days in Old Hickory Reservoir between August 1, 1963 and June 30, 1964. Of the 2,661 fish caught, 83.2 percent were commercial fish, 16.2 percent were sport fish and 0.6 percent "other" species. Carp (*Cyprinus carpio*) constituted 61.6 percent of the catch. Crappie (*Pomoxis* sp.) made up 12.0 percent of the total catch.

Deep baited sets had the highest catch rate (1.17 commercial fish per trap day) and also the highest percentage of commercial fish in the catch (98.7 percent). Unbaited traps had the lowest catch rate (0.06 commercial fish per trap day regardless of depth), with 56.5 percent and 76.9 percent of the catch consisting of sport fish in deep and shallow sets, respectively. The average size of the fish caught was small. It was concluded that wire traps could be legalized in Old Hickory Reservoir for local residents to catch fish for home consumption without adversely affecting sport fish populations.

INTRODUCTION

In 1962 and early 1963, local residents expressed considerable interest in legalizing the use of wire fish traps in Old Hickory Reservoir. While a limited commercial fishery existed (consisting mostly of part-time commercial fishermen), the main interest was from people who wanted an inexpensive method to catch fish for their own consumption.

Before making any recommendations, the Tennessee Game and Fish Commission felt it was necessary to determine possible effects of the traps on the sport fish population, and catch rates of commercial fish.

DESCRIPTION OF STUDY AREA AND METHODS

Old Hickory is a mainstream reservoir located on the Cumberland River in central Tennessee. The dam is at river mile 216.2 which is about 25 miles upstream from Nashville. The reservoir extends upstream for 100.8 miles, encompassing 22,500 acres at full pool elevation. It is relatively shallow (average depth 18.7 feet) with very little water level fluctuation.

Twenty-eight traps were constructed of 1 x 2-inch mesh welded wire. Each trap was 6 feet long, 2 feet in diameter, with one funnel tapered to a 6-inch opening. An 8 x 12 inch opening with a hinged wire door was cut in the side near the base to remove trapped fish. The wholesale cost of material was $4.23 per trap.

[1]Present address: South Central Reservoir Investigations, Bureau of Sport Fisheries and Wildlife, 113 South East Street, Fayetteville, Arkansas.

A local commercial fisherman was hired to build and assist in running the traps, and to occasionally run the traps and record the data without direct supervision. He was allowed to keep all commercial fish. Traps were run three times a week, except when prevented by high winds or ice. Cottonseed cake was used as bait in 1963, and stale bread and sour corn in 1964. The bait was tied in a burlap bag and secured inside the rear half of the trap.

The study location was in the Cairo Bend area between mile 244 and 249. During the period August 1 to December 31, 1963, and during May 1964, six stations were used. Three of these were permanent; the other three were moved periodically to a number of different locations within the study area. Traps were set in groups of four. Two were set in shallow water (less than one-half maximum depth in the area), and the other two were set in deep water (more than one-half maximum depth in the area). Pairs of traps were set within 25 feet of each other with one baited and one unbaited. The distance between the deep and shallow pairs was kept at a minimum, usually within 50 yards, depending upon the bottom topography. At one permanent station, four traps were set in the same manner, but with a replicate trap set within 10 feet of each one. Thus, a total of eight traps were set at this station. During June 1964, stations were not used and the commercial fisherman was allowed to bait and select the location of all traps.

The total length of each fish was recorded to the nearest inch. All fishes except the bullheads (*Ictalurus* sp.), buffaloes (*Ictiobus* sp.), and one unidentified redhorse (*Moxostoma* sp.) were identified to species. The common and scientific names of fishes (in text and tables) are those adopted by the American Fisheries Society (1960).

Sampling Effort

A total of 5,135 trap days was distributed almost equally between the deep and shallow sets (table 1). The minor differences in amount of effort between the type of sets were due to occasions when traps were hung on logs and could not be run, moving and resetting traps, and when traps were illegally run. Effort by month varied from 326 trap days in December to 888 in October. Traps were removed about mid-December and were not reset until May 1.

TABLE 1.

Distribution of effort in number of trap-days, Old Hickory Reservoir, Tennessee, August 1963 – June 1964.

Month	Type of Set						*Totals*
	Baited			*Unbaited*			
	Deep	*Shallow*	*Combined*	*Deep*	*Shallow*	*Combined*	
August	203	203	406	203	203	406	812
September	196	196	392	196	196	392	784
October	224	212	436	221	231	452	888
November	215	216	431	198	198	396	827
December	78	85	163	85	78	163	326
May	210	210	420	180	196	376	796
June	–	–	702*	–	–	–	702
Totals	1126	1122	2950	1083	1102	2185	5135

*During June, all traps were baited and set at various depths

RESULTS

Composition of the Catch

Carp (*Cyprinus carpio*) were by far the most numerous of the 17 species in the catch, making up 61.6 percent of the 2,661 fish caught (table 2). Crappie (*Pomoxis*

TABLE 2.

Number of fish caught in baited and unbaited wire traps set in shallow and deep water, Old Hickory Reservoir, Tennessee, August 1963-June 1964. Numbers in parenthesis represent percentages of catch by type of set.

*Species**	*Type of Set*						*Totals*
	Baited			*Unbaited*			
	Deep	*Shallow*	*Combined*	*Deep*	*Shallow*	*Combined*	
Commercial							
Carp	1138 (84.9)	452 (52.7)	1590 (72.3)	27 (18.4)	22 (7.0)	49 (10.6)	1639 (61.6)
Bullheads	67 (5.0)	153 (17.8)	220 (10.0)	16 (10.9)	24 (7.6)	40 (8.6)	260 (9.8)
Buffalo	95 (7.1)	132 (15.4)	227 (10.3)	7 (4.8)	5 (1.6)	12 (2.6)	239 (9.0)
Channel catfish	17 (1.3)	27 (3.1)	44 (2.0)	4 (2.7)	14 (4.4)	18 (3.9)	62 (2.3)
Drum	6 (0.4)	—	6 (0.3)	7 (4.8)	2 (0.6)	9 (1.9)	15 (0.6)
Subtotal	1323 (98.7)	764 (89.0)	2087 (94.9)	61 (41.5)	67 (21.2)	128 (27.6)	2215 (83.2)
Sport							
Crappie	12 (0.9)	62 (7.2)	74 (3.4)	50 (34.0)	195 (61.7)	245 (52.9)	319 (12.0)
Bluegill	3 (0.2)	27 (3.1)	30 (1.4)	26 (17.7)	38 (12.0)	64 (13.8)	94 (3.5)
White bass	—	—	—	6 (4.1)	5 (1.6)	11 (2.4)	11 (0.4)
Walleye	—	—	—	1 (0.7)	4 (1.3)	5 (1.1)	5 (0.2)
Sauger	—	—	—	—	1 (0.3)	1 (0.2)	1
Subtotal	15 (1.1)	89 (10.4)	104 (4.7)	83 (56.5)	243 (76.9)	326 (70.4)	430 (16.2)
Other							
Suckers	2 (0.1)	4 (0.5)	6 (0.3)	—	3 (0.9)	3 (0.6)	9 (0.3)
Gizzard shad	—	1 (0.1)	1	2 (1.4)	2 (0.6)	4 (0.9)	5 (0.2)
Miscellaneous	—	—	—	1 (0.7)	1 (0.3)	2 (0.4)	2 (0.1)
Subtotal	2 (0.1)	5 (0.6)	7 (0.3)	3 (2.0)	6 (1.9)	9 (1.9)	16 (0.6)
Total**	1340 (50.4)	858 (32.2)	2198 (82.6)	147 (5.6)	316 (11.9)	463 (17.4)	2661

*Bullheads and buffalo were not separated into individual species; all crappie were white except for 1; suckers include 5 spotted suckers, 3 white suckers and 1 unidentified redhorse; and miscellaneous includes 1 mooneye, and 1 skipjack herring.

**Numbers in parentheses in this row indicate percent of total number of fish caught in all sets combined.

sp.) ranked second, consisting of 12.0 percent of the total catch, with bullheads and buffalo next in order at 9.8 percent and 9.0 percent, respectively. Channel catfish (*Ictalurus punctatus*), the most popular of the commercial fish caught, made up only 2.3 percent. Bluegill (*Lepomis macrochirus*) which are sometimes caught in large numbers in wire traps (Cobb, 1954), made up 3.5 percent.

Commercial fish made up 83.2 percent of the catch, compared to 16.2 percent for sport fish and 0.6 percent "other" species.

There were considerable differences in catch by type of set. The baited deep traps caught commercial fish almost exclusively (98.7 percent), while unbaited shallow traps yielded a predominance of sport fish (76.9 percent).

The combined catches of all baited traps consisted of 94.9 percent commercial fish, 4.7 percent sport fish, 0.3 percent "other" species, and accounted for 82.6 percent of all fish caught. These traps caught all species represented in the commercial category, but only the crappie and bluegill in the sport fish category. The shallow baited traps caught a lower percentage of commercial fish than deep baited traps, but were particularly effective on bullheads, buffalo and channel catfish. Nearly 85 percent of the fish caught in deep baited traps were carp.

The catch of unbaited traps consisted of 70.4 percent sport fish, 27.6 percent commercial fish and 1.9 percent "other" species. Crappie made up over one-half of the total catch. White bass (*Roccus chrysops*), walleye (*Stizostedion vitreum vitreum*), and sauger (*Stizostedion canadense*) were captured only in unbaited traps.

Of the unbaited sets, deep traps caught few fish, but the catch comprised the highest percentage of commercial fish. Unbaited shallow traps caught the highest numbers of sport fish of any type set.

Inventory Data

Rotenone samples in three coves in 1962 revealed a mean standing crop of 292.0 pounds per acre (table 3). Of this, gizzard shad (*Dorosoma cepedianum*) made up 45.5 percent, the three buffaloes 22.0 percent and carp 13.0 percent. the commercial and "other" categories amounted to 89.1 percent and sport fish 10.8 percent of the total weight. Bluegill were the most abundant of the sport fish (4.7 percent) with largemouth bass (*Micropterus salmoides*), white crappie (*Pomoxis annularis*), and longear sunfish (*Lepomis megalotis*) contributing 1.6, 1.6 and 1.5 percent, respectively.

When these data are compared to the catch, it is readily apparent that wire traps are relatively ineffective in catching gizzard shad. Although it is difficult to make comparisons of weight and numerical data, the traps are apparently most selective for carp and bullheads in baited sets and for crappie and bluegill in unbaited sets.

Walleye and white sucker (*Catostomus commersoni*) were the only species taken in the wire traps that were not present in the population samples. Several species were present but not taken in the traps; however, the exact number cannot be determined due to the grouping of all bullheads and all buffaloes.

Sizes Caught

Although some large specimens were taken in the traps, carp and buffalo averaged less than 12 inches, bullheads less than 8 inches and channel catfish and drum less than 10 inches in total length (table 4). These sizes make the average catch marginal in desirability, with much of the catch well below the size that would normally be used as food. This may be due in part to size selectivity of the traps, but observations from other sampling methods also show relatively small average sizes of most commercial species in Old Hickory Reservoir. The average lengths of sport fish also appear to fall close to sizes taken by other methods.

Catch Rates

The catch rate varied greatly with type of set and by month. The number of commercial fish caught per trap day averaged 0.48 (table 5).

Baited deep traps were the most effective and the only sets that averaged more than one fish per trap day. Baited shallow sets were second in catch rate and averaged 0.68 commercial fish per trap day. The baited sets at various depths made by the commercial fisherman had the lowest catch rate of any baited traps. All baited sets combined averaged 0.79 commercial fish per trap day.

TABLE 3.
Fish inventory data from three rotenone samples in Old Hickory Reservoir in 1962*.

Species	*Pounds per acre*	*Percent of total weight*
Commercial		
Carp, *Cyprinus carpio*	38.0	13.0
Smallmouth buffalo, *Ictiobus bubalus*	42.9	14.7
Black buffalo, *Ictiobus niger*	12.1	4.1
Bigmouth buffalo, *Ictiobus cyprinellus*	9.3	3.2
Black bullhead, *Ictalurus melas*	0.9	0.3
Brown bullhead, *Ictalurus nebulosus*	0.2	0.1
Channel catfish, *Ictalurus punctatus*	1.7	0.6
Flathead catfish, *Pylodictis olivaris*	0.7	0.2
Drum, *Aplodinotus grunniens*	11.3	3.9
Quillback, *Carpiodes cryprinis*	0.5	0.2
Paddlefish, *Polyodon spathula*	1.5	0.5
Subtotal	119.1	40.8
Sport		
White crappie, *Pomoxis annularis*	4.6	1.6
Black crappie, *Pomoxis nigromaculatus*	0.1	t
Bluegill, *Lepomis macrochirus*	13.8	4.7
Green sunfish, *Lepomis cyanellus*	0.6	0.2
Longear sunfish, *Lepomis megalotis*	4.4	1.5
Warmouth, *Chaenobryttus gulosus*	2.5	0.9
Largemouth bass, *Micropterus salmoides*	4.8	1.6
White bass, *Roccus chrysops*	0.6	0.2
Sauger, *Stizostedion canadense*	0.4	0.1
Subtotal	31.8	10.8
Other		
Gizzard shad, *Dorosoma cepedianum*	132.9	45.5
Threadfin shad, *Dorosoma petenense*	0.9	0.3
Black redhorse, *Moxostoma duquesnei*	4.0	1.4
Spotted sucker, *Minytrema melanops*	0.8	0.3
Mooneye, *Hiodon tergisus*	0.1	t
Goldfish, *Carassius auratus*	0.7	0.2
Skipjack herring, *Alosa chrysochloris*	1.5	0.5
Assorted minnows, *Notropis* sp.	0.2	0.1
Subtotal	141.1	48.3
Total pounds per acre	292.0	

*From Tennessee Game & Fish Commission unpublished reports.

Unbaited traps caught commercial fish at the rate of 0.06 per trap day regardless of depth.

The lowest catch rates were in December when the water temperatures were the lowest; the highest were in September.

The catch rates of sport fish were low throughout the study (table 6). Unbaited shallow traps had a catch rate of 0.221 sport fish per trap day which was over two times higher than any other set. Baited deep traps caught the fewest sport fish with baited shallow and unbaited deep sets about equal.

TABLE 4.

Total lengths of fish caught in 1 x 2-inch mesh wire traps, Old Hickory Reservoir, Tennessee, August 1963 – June 1964.

Species	*Total length range (inches)*	*Average total length (inches)*
Carp	6 – 25	11.8
Buffalo	10 – 20	11.8
Bullheads	6 – 12	7.9
Channel catfish	6 – 14	9.7
Drum	8 – 13	9.5
Crappie	5 – 13	7.9
Bluegill	5 – 6	5.7
White bass	10 – 14	11.0
Walleye	11 – 17	12.8
Sauger	––	14.0
Gizzard shad	7 – 9	7.8
Spotted sucker	10 – 13	11.2
White sucker	11 – 15	12.7
Skipjack herring	––	17.0

TABLE 5.

Average number of commercial fish* caught per trap day, Old Hickory Reservoir.

Type of set	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*	*May*	*June*	*Average*
Baited								
Deep	1.33	2.40	1.50	0.60	.00	0.54	––	1.17
Shallow	0.67	0.91	1.00	0.66	0.05	0.44	––	0.68
Fisherman's sets	––	––	––	––	––	––	0.36	0.36
All baited	1.00	1.66	1.26	0.63	0.02	0.49	0.36	0.79
Unbaited								
Deep	0.04	0.06	0.03	0.08	.00	0.11	––	0.06
Shallow	0.14	0.05	0.02	0.02	0.00	0.11	––	0.06
All unbaited	0.09	0.06	0.02	0.05	.00	0.11	––	0.06
All sets combined	0.55	0.86	0.63	0.35	0.01	0.31	0.36	0.48

*The species in the commercial group are those listed in table 2.

DISCUSSION

A similar evaluation of 2-inch mesh wire traps by Baker (1963) in Ohio waters showed catches to be composed of 92 percent rough fish. The "Georgia Wire Trap" caught 93.5 to 99.0 percent rough fish in three reservoirs (Kirkland, 1960). The results of both studies, where all traps were baited, are very close to the 94.9 percent commercial fish taken in the baited traps in this study. The fact that wire traps caught a high percentage of commercial fish, with about three-fourths of these consisting of carp, indicates they could be used to increase the harvest of these fish in Old Hickory Reservoir.

Quite different species compositions were reported for wire traps by Carter (1954) and Davis and Posey (1960), where numbers of commercial fish accounted for only 2.0 and 3.5 percent of the total catch, respectively. However, neither report mentioned the use of bait, which could account for at least part of the difference. A large difference in the composition of the catch of baited and unbaited traps was quite evident in this study.

TABLE 6.
Average number of sport fish* caught per trap day, Old Hickory Reservoir.

Type of set	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Dec.*	*May*	*June*	*Average*
Baited								
Deep	0.015	0.005	0.018	0.014	.00	0.019	—	0.013
Shallow	0.113	0.235	0.033	0.014	0.024	0.038	—	0.079
Fisherman's sets	—	—	—	—	—	—	0.085	0.085
All baited	0.064	0.120	0.025	0.014	0.012	0.029	0.085	0.056
Unbaited								
Deep	0.099	0.112	0.109	0.061	0.012	0.122	—	0.077
Shallow	0.153	0.495	0.234	0.116	0.090	0.158	—	0.221
All unbaited	0.081	0.304	0.173	0.088	0.049	0.141	—	0.149
All sets combined	0.073	0.212	0.100	0.050	0.031	0.082	0.085	0.095

*The species in the sport group are those listed in table 2.

The least favorable characteristics of wire traps in Old Hickory Reservoir were the low catch rates and the small average size of fish caught. If the results of this study are truly indicative of what a fisherman would catch, less than one relatively small fish (generally a carp) per trap day could be expected in baited traps at various depths. The more desirable species (buffalo and channel catfish) would account for only about 12 percent of the total catch, and would be of an undesirable size.

While the above statements are based on averages, some individual traps in certain locations consistently had a much higher catch rate. These were not always in the same type of habitat, but after a time, the more observant fishermen should catch fish at a much higher rate than the average.

Running the traps more frequently should also increase the catch rate. There appeared to be no relationship between the number of days set and size of catch which would indicate some loss of fish through escapement. This is known to exist in other types of entrapment gear (Hansen, 1944 and Patriarche, 1967) and could therefore be expected in wire traps.

Other methods might also affect the catch. The swinging door in the "Georgia Wire Trap" tends to make the catch even more selective toward commercial fish (Kirkland, 1960). Although the present study was not designed to compare baits, the kind and even the method of using the bait appear to influence the catch (Cobb, 1954). Local commercial fishermen have described the use of burlap around the trap and sometimes placing a mature female inside to catch catfish during the spawning period. These and undoubtedly other techniques could probably greatly increase the catch and influence the composition of the catch of wire traps.

Of the 2,661 fish caught during this sutdy, only one fish, a white crappie, was dead in the trap. However, it was not uncommon to find carp and buffalo with abraded areas on the head. This seemed to be more common in the larger catches. Few of the sport fish captured were injured and it is believed that there was little mortality of either the sport or commercial fish released.

Based on the results of this and other studies and discussions with commercial fishermen, it is my conclusion that wire traps of the design used in this study or the type with the swinging door feature of the "Georgia Wire Trap" could be legalized in Old Hickory Reservoir without endangering sport fish populations. This type of gear, due to its low cost and simplicity, might become popular with local residents as a means of catching fish for personal use. It is doubtful that full-time commercial fishermen would utilize wire traps to any large extent because of the relatively low catch rate and small average size of fish caught.

Their use on a small scale would contribute to the harvest of several species of commercial fish (primarily carp), and should be less objectionable to the sportsmen than most other types of commercial gear. Some sport fish would be taken, but could be released with very low mortality.

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