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# CATCH OF COMMERCIAL AND GAME FISH WITH FOUR-FOOT TRAP NETS OF VARIOUS MESH SIZES[1] [2]

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## ABSTRACT

The catch of commercial and game fish with 4-foot trap nets having minimum mesh sizes of 0.5, 2, and 3-inch, square measure, were compared. A small trap net having 0.5-inch webbing in the crib has been used for many years to sample fish from Oklahoma reservoirs. Various investigators have indicated that this gear has potential as a commercial fishing device. However, large catches of game fish, especially white crappie, was a serious detriment to this potential. Two designs of large mesh trap nets were therefore developed to determine if by enlarging the mesh size of the standard design, the catch rate of game fish would decline while the catch rate of commercial fish would remain constant.

An investigation was conducted on Keystone Reservoir during 1971 and 1972. The results indicated that the large mesh trap nets did take significantly fewer game fish. The catch of commercial fish was also reduced, but to a lesser extent, as the mesh size increased. However, this reduction was not deemed significant when considering the advantages of a smaller game fish catch.

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## INTRODUCTION

The commercial fishery of Oklahoma is now limited to gill nets having a minimum mesh size of 3-inch, square measure, that may be fished under controlled conditions in selected reservoirs. However, an attempt is being made by the Oklahoma Department of Wildlife Conservation to modernize this fishery by offering the commercial fishermen a wider variety of gear types. A small trap net, which can be handled by a two man crew, in a small craft is one of the gear types given priority under this program.

Large trap nets have been utilized in the commercial fishery of the Great Lakes since 1895. Accounts of this early fishery and a description of the gear and handling procedures have been given by Langlois, 1954. The Bureau of Commercial Fisheries, 1965, have reported on the use of large trap nets in northern reservoirs of the Missouri River. Hargis, 1967 and Grinstead, 1968 have investigated the potential of large trap nets as commercial fishing devices in southern reservoirs. These reports have indicated that large trap nets can be highly efficient for a particular species of fish. However, the high cost of the gear, the necessity of a large vessel and a large inventory of plant equipment has limited the use of these trap nets in reservoirs.

A smaller version of the Great Lakes trap net was first designed for use in lakes and reservoirs by Crowe, 1950. Houser, 1957 modified this design and utilized the net in a rough fish evaluation study on Fort Gibson Reservoir, Oklahoma. Summers, 1958, summarized the results of this investigation and indicated that this smaller gear did have potential as a commercial fishing device. This 4-foot trap net, as designed by Houser, has since become accepted as the standard trap net for conducting fishery surveys in Oklahoma reservoirs. Although this design of trap net has proven to be efficient and easy to handle by a two man crew in a small craft, the potential of this gear as a commercial fishing device is limited due to large catches of game fish, especially white crappie.

This investigation was therefore designed to determine if by enlarging the mesh size of this design of trap net to 2 or 3-inch, square measure, the catch rate of game fish would decline while the catch of commercial fish would remain somewhat constant. The investigation was conducted on Keystone Reservoir during the fall and winter of 1971 and the spring and summer of 1972.

## METHODS AND MATERIALS

The 4-foot trap nets used in this investigation consisted of four compoenets; a single crib, a heart, two wings and a lead, as illustrated in figure 1. The crib and heart were completely enclosed. Fish entered the heart through a 6-inch slot adjacent to the lead. A funnel with a 6-inch square opening extended from the heart into the crib. All webbing was knotted number 12 nylon, hung on a one-third basis. Main lines were ¼-inch braided nylon. All top main lines had number 2 hard plastic floats on 2-foot centers and all bottom lines had number 8 leads on 8-inch centers. The lead was 150 feet long and 3.5 feet deep. The wings extended for 22 feet beyond the heart and were 3.5 feet deep. The heart was 12 feet wide at the mouth, and measured 13.5 feet from wings to crib. The crib was 8 feet long, 4 feet wide, and 3.5 feet deep. The standard net had 0.5-inch square measure, webbing in the crib and funnel, and 1.25 inch webbing in the heart, wings, and lead. The larger mesh trap nets were constructed of 2 or 3-inch, nylong webbing throughout. All other measurements, including the funnel opening, were identical for the three designs of trap nets.

Six trap nets were fished in Keystone Reservoir during a one year period. One each of the three trap net designs were fished for two week periods during each of four seasons of the year in the Arkansas and Cimmarron arms of the 26,500 acre reservoir. Trap nets were set perpendicular to the shoreline, with the crib in

water less than 20-feet deep. To obtain unbiased data, an effort was made to disregard the mesh size of the trap net when selecting the site for each trap net set. During the two week sets, all nets were lifted daily except week-ends.

The catch of trap nets was divided into three categories i.e., game fish, industrial-size commercial fish, and marketable-size commercial fish. Those fish taken during this investigation that are recognized by Oklahoma statutes as being game fish were; channel catfish, striped bass, bluegill, largemouth bass, white crappie, black crappie and walleye. Marketable-size commercial fish were those commonly sold in local fish markets for human consumption. This group included flathead catfish and white bass greater than 10 inches in total length and buffalo, carp, carpsucker, freshwater drum and spotted gar over 12 inches in total length. Fishes of these species that were less than 12 inches and all other commercial species regardless of size were recorded as industrial-size commercial fish. Total length, in inches, was recorded of all fish collected with this gear. Numbers of individuals collected during the investigation was the measurement used to compare the catch. Field notes were also taken on the extent of gilling in the heart, wings, and lead of the various nets.

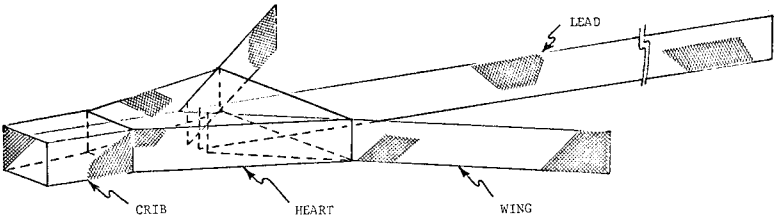


Figure 1. Configuration of a standard four-foot trap net fished in Keystone Reservoir, 1971-72.

## RESULTS

The standard trap net took the greatest number of game fish during this investigation. These two nets harvested 1,976 game fish, of which 1,376 (69.6 percent) were white crappie. Channel catfish were also taken in significant numbers. A catch of 534 channel catfish represented 26.9 percent of the total game fish in these nets. The number of game fish harvested by the 2-inch mesh nets was reduced to only 110 fish with white crappie and channel catfish again being the dominant species i.e., 71 and 37 fish, respectively. Six large striped bass, (mean total length of 25.7 inches) were the only game fish taken with the two 3-inch mesh trap nets during the investigation.

The catch of industrial-size commercial fish followed a similar pattern. The greatest number of industrial-size fish were harvested with the standard nets. Freshwater drum were the dominant species in this group. A catch of 1,934 freshwater drum represented 62.9 percent of the 3.073 industrial-size fish harvested with the standard nets. Industrial-size carp and river carpsucker were also taken in large numbers i.e., 513 and 463 fish respectively. Only 34 industrial-size fish were harvested with the two 2-inch mesh trap nets. River carpsucker was the dominant species accounting for 20 of the 34 fish in this catch. No industrial-size fish were harvested during this investigation with the 3-inch mesh trap nets.

The catch of marketable-size commercial fish did not follow the same pattern as did game and industrial-size commercial fish, (Figure 2). Total catch of marketable-size commercial fish was almost the same in the 2-inch trap nets as it

was in the standard net. The standard net harvested 567 marketable-size commercial fish while the 2-inch took 493. Carp was by far the most common marketable-size commercial fish taken with the standard trap net i.e., 435 carp represented 76.7 percent of the marketable-size commercial fish taken with the standard gear. River carpsucker was again the dominant marketable-size commercial fish taken with the 2-inch mesh trap net. A total of 182 river carpsucker was taken with these nets. However, large catches of carp (168), smallmouth buffalo (75), and bigmouth buffalo (35) were also made with this gear. The number of marketable-size commercial fish harvested with the 3-inch mesh trap net declined to 87. However, the dominant species in this catch were the bigmouth buffalo and flathead catfish, the two most sought after commercial fish in Oklahoma reservoirs.

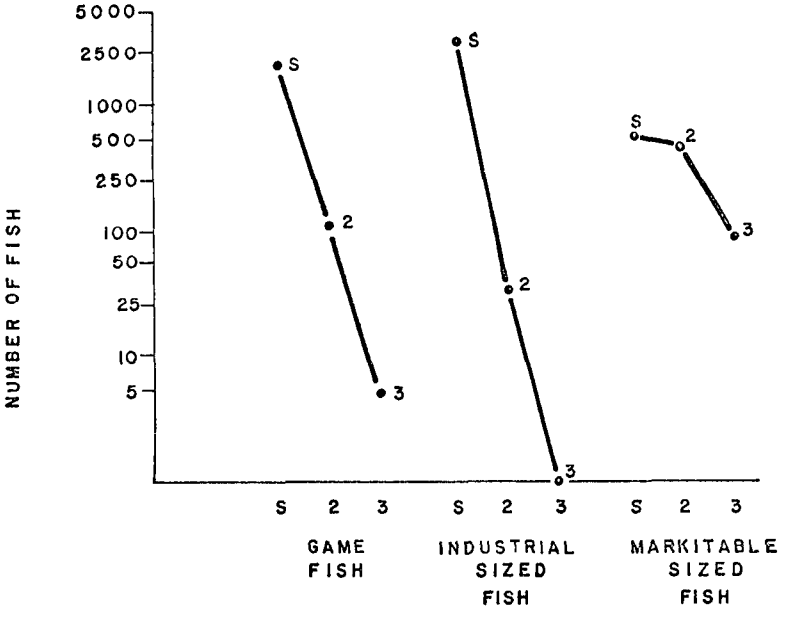


Figure 2. Catch rates of game and commercial fish from Standard (S), two-inch (2), and three-inch (3) mesh trap nets fished in Keystone Reservoir, 1971-72.

Data collected during this investigation and presented in Table 1 indicate the 3-inch mesh trap net was selective for the marketable-size bigmouth buffalo. Only four bigmouth buffalo, with a mean total length of 21.68 inches were taken with the standard trap net. The number increased to 35 bigmouth buffalo having a mean total length of 22.27 inches with the 2-inch mesh gear, and increased to 64 bigmouth buffalo with a mean total length of 21.97 inches with the 3-inch mesh trap net.

The catch of flathead catfish with the three designs were similar. The catch varied from 11 to 15 to 12 with the standard, 2-inch, and 3-inch mesh trap nets, respectively. The potential of the 3-inch mesh trap net as a commercial fishing gear for Oklahoma reservoirs was enhanced by the large catches of these two species.

Table 1. Total number and mean total length of fish taken with three designs of trap nets in Keystone Reservoir, 1971-1972.

| Species | Standard Trap Net | | Two-inch Trap Net | | Three-inch Trap Net | |
|---|---|---|---|---|---|---|
| | No. | XTL | No. | XTL | No. | XTL |
| Game Fish | | | | | | |
| Channel catfish, *Ictalurus punctatus* | 534 | 9.91 | 37 | 18.67 | | |
| Striped bass, *Morone saxatilis* | 4 | 17.35 | | | 6 | 25.66 |
| Bluegill, *Lepomis macrochirus* | 45 | 5.47 | | | | |
| Largemouth bass, *Micropterus salmoides* | | | 1 | 19.10 | | |
| White crappie, *Pomoxis annularis* | 1376 | 7.04 | 71 | 11.80 | | |
| Black crappie, *Pomoxis nigromaculatus* | 17 | 6.71 | | | | |
| Walleye, *Stizostedion vitreum* | | | 1 | 25.60 | | |
| Industrial-Size Commercial Fish | | | | | | |
| Gizzard shad, *Dorosoma cepedianum* | 68 | 6.45 | 1 | 13.80 | | |
| Carp, *Cyprinus carpio* | 513 | 10.60 | 3 | 11.67 | | |
| River carpsucker. *Carpiodes carpio* | 463 | 9.33 | 20 | 11.67 | | |
| Smallmouth buffalo, *Ictiobus bubalus* | 9 | 11.30 | 10 | 11.49 | | |
| Black bullhead, *Ictalurus melas* | 8 | 7.74 | | | | |
| Yellow bullhead, *Ictalurus natalis* | 3 | 8.60 | | | | |
| Flathead catfish, *Pylodictis olivaris* | 2 | 7.45 | | | | |
| White bass, *Morone chrysops* | 73 | 7.62 | | | | |
| Freshwater drum, *Aplodinotus grunniens* | 1934 | 6.63 | | | | |
| Marketable-Size Commercial Fish | | | | | | |
| Spotted gar, *Lepisosteus oculatus* | | | 1 | 28.40 | | |
| Carp. *Cyprius carpio* | 435 | 14.53 | 168 | 14.41 | 3 | 21.37 |
| River carpsucker, *Carpiodes carpio* | 92 | 12.64 | 182 | 12.96 | 1 | 19.50 |
| Smallmouth buffalo, *Ictiobus bubalus* | 15 | 14.09 | 75 | 13.72 | 5 | 19.00 |
| Bigmouth buffalo, *Ictiobus cyprinellus* | 4 | 21.68 | 35 | 22.27 | 64 | 21.95 |
| River redhorse, *Moxostoma carinatum* | 1 | 16.10 | | | | |
| Flathead catfish, *Pylodictus olivaris* | 11 | 20.47 | 15 | 25.59 | 12 | 27.00 |
| White bass, *Morone chrysops* | 4 | 11.55 | 10 | 14.16 | 1 | 16.30 |
| Freshwater drum, *Aplodinotus grunniens* | 5 | 13.90 | 7 | 13.66 | 1 | 16.20 |

Smallmouth buffalo, which are considerably smaller than the bigmouth buffalo, appeared to be taken most efficiently with the 2-inch mesh trap nets. A total of 75 smallmouth buffalo were harvested with the 2-inch nets, while only 15 were taken with the standard nets. Since the mean total lengths of the smallmouth buffalo taken with these gear were not significantly different, both designs of gear were assumed to be taking fish from the same size groups, indicating that the 2-inch mesh trap net was in fact more efficient in the harvest of marketable-size fish of this species. The smallmouth buffalo harvested with the 3-inch mesh trap net were considerably larger, indicating that the larger mesh net would not hold the smaller fish, and was therefore not as efficient in the harvest of this species.

A similar trend was noted in the catch of river carpsucker. The mean total length of marketable-size river carpsucker from the standard net was 12.64 inches, while that of the 2-inch mesh nets was 12.96 inches. However, the 2-inch mesh trap nets took 182 river carpsucker while the standard nets took only 92.

The standard trap nets appeared to be selective for the smaller marketable-size carp even though similar sized carp were taken in the 2-inch mesh trap nets. The standard nets harvested 435 marketable-size carp, with a mean total length of 14.53 inches, whereas the 2-inch net harvested only 168 carp with a mean total length of 14.41 inches. Obviously the larger mesh would hold the 14 inch carp but they would not enter the net as frequently as they did in the standard trap net.

The only other species of commercial fish which was considered significant was freshwater drum. This was the dominant species in the catch of the standard trap net, even outnumbering white crappie. The mean total length of the bulk of these fish was 6.63 inches. It is obvious that this size of freshwater drum could not be captured in a 2 or 3-inch mesh trap net. The 2-inch mesh net did take seven freshwater drum which had a mean total length of 13.66 inches, and the 3-inch mesh net took one that measured 16.20 inches.

## DISCUSSION

These data indicate that a larger mesh size in the crib of a trap net not only influences the catch by allowing the smaller individuals to escape through the webbing, but appears to be more selective for particular species. Bigmouth buffalo were taken in significantly greater numbers as the mesh size of trap net increased. The number of bigmouth buffalo increased from 4 with the standard trap net, to 35 with the 2-inch mesh net, to 64 with the 3-inch mesh net. Marketable-size smallmouth buffalo also increased as the mesh size increased to 2-inch, but these fish were apparently too small to be held in the 3-inch webbing so the catch dropped sharply with the 3-inch mesh trap nets. The catch of other species remained constant, regardless of the mesh size, while the smaller game fish and industrial-size commercial fish were taken in significantly fewer numbers, presumably as a direct function of escape through the webbing. This reduction was so thorough that six large striped bass were the only game fish taken with the 3-inch mesh trap nets.

It was anticipated that numerous game fish might gill in the larger mesh trap nets. Although a few fish were gilled, especially in the heart section, the number was no greater than that observed in the heart and lead of the standard nets. However during another investigation designed to harvest spawning striped bass, the 3-inch net did gill a considerable number of large striped bass, primarily in the lead.

## CONCLUSION

The results of this investigation indicate that the large mesh trap nets do have advantages over the smaller mesh trap net and do have a potential in the commercial fishery of Oklahoma reservoirs. A 3-inch mesh trap net can be recommended for use in Oklahoma reservoirs that do not have populations of striped bass but do have large populations of bigmouth buffalo and flathead catfish. Two-inch mesh trap nets can be recommended in reservoirs where smallmouth buffalo and river carpsucker are abundant and where the catch of moderate number of game fish is not a serious problem. Standard trap nets can be recommended only when large numbers of industrial-size fish are needed and when large catches of game fish are not a problem.

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