FISHING PRESSURE AND FISHING SUCCESS AT ARGYLE LAKE, McDONOUGH COUNTY, ILLINOIS, AS INDICATED BY CREEL CENSUS

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INTRODUCTION

As the purpose of expending money from sale of fishing licenses and from taxes on fisheries management is to provide better fishing for more fishermen, there should be an evaluation of these practices. It is recognized that each body of water presents its own management problems, and, therefore, must be treated individually in the solution of these problems. Evaluation of management problems on a particular body of water should be made with that particular body in mind. Studies of growth rate, species composition, available food, and habitat conditions can give much information concerning fisheries management, but they do not evaluate management directly in terms of fishing success. The creel census is a tool which can be used to this end.

A creel census was taken on Argyle Lake during the summer of 1954. This lake is an artificial impoundment, built and maintained by the Illinois Department of Conservation for public recreation. Argyle Lake is an eutrophic lake of 117 acres surface area and is surrounded by a well-wooded watershed of 3,800 acres. Fishes present at the time of this study were: largemouth bass, *Micropterus salmoides* (Lacépede); bluegill, *Lepomis macrochirus* Raf.; yellow bullhead, *Ameiurus natalis* (LeSueur); channel catfish, *Ictalurus punctatus* (Raf.); walleye pike *Stizostedion vitreum* (Mitchell); and green sunfish, *Lepomis cyanellus* Raf.. Fishing is mainly for bass and bluegill.

The angling success at the onset of this study appeared good as compared to similar lakes in central Illinois. Nevertheless, the bass and bluegill populations of Argyle Lake were beginning to show signs of overpopulation (unpubl., Ill. Dept. Cons.).

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METHODS

The census was taken for a total of 32 days during June, July, and August, 1954. An attempt was made to take the census on as many days as possible, and particularly on days when it was judged that the number of fishermen would be large. The method of sampling should probably be termed "haphazard" (Mottley and Embody, 1940). It is be-

lieved that the number and spacing of the census days, however, gave an adequate coverage of the entire season.

On week days there was little angling except during the period from about three hours before sunset to about one hour after it. Weekday censuses were consequently started between 4 and 6 p.m. and were not terminated until all fisherman finished. Thus most early afternoon anglers were counted as they completed their angling day. On week-end days the census period started about 9 a.m. because on these days more anglers began fishing at sunrise than on week days; most of their catches were recorded. Periodically a few anglers fished the entire evening for catfish and bullheads; an attempt was made to contact these anglers by boat and to record their catch.

State rental and privately owned boats were kept at one dock, adjacent to a boat house and parking lot. As the shore line was heavily wooded, access to the lake was difficult except by boat, and there were few bank fishermen. Angling data were usually recorded at the dock. It is estimated that on census days information was obtained from approximately 90% of the fishermen.

Data were recorded by the author on a printed card for each person. The data included: name; adult or child; sex; date; time fishing started; time fishing ended; method of fishing (fly fishing, bait casting, spinning, or still fishing); depth fished (surface, top to three feet, three to ten feet, or ten feet to bottom); and type and color of the most successful bait. (If artificial, its description was recorded by the investigator).

The card also contained space for weights and lengths of each angler's fishes, in tenths of pounds and inches, respectively, for up to 10 bass (legal limit) and 30 bluegills. The numbers caught and the average weight of channel catfish and bullheads were recorded.

Discussion

Fishing methods and success.— The daily fishing pressure in terms of fisherman-hours and the daily fishing success in terms of the number of bluegills, bass and "all species" (total bass, bluegills, and other species) of fishes caught, and the method and depth of angling, are in Table 1. Fishing success in terms of the catch per fisherman-hour is calculated from these totals and is shown in Table 2. Also shown in Table 2 are the percentages of unsuccessful fishermen.

Still-fishing was the most used method among anglers, followed by fly fishing, bait casting, and spinning, in decreasing order. The greatest number of still-fishermen preferred to angle on or near the lake bottom; however, the lowest catch per fisherman-hour was recorded from this depth. As Argyle Lake is relatively new (dam first closed in January, 1950), and as there are few lakes in this section of the state, many of the local fishermen were conditioned to river and creek fishing for catfish and rough species and continued to apply their bottom-fishing techniques on Argyle Lake. Few still-fishermen angled on or near the surface, although those who did enjoyed a relatively high

rate of catch. The over-all rate of catch for still-fishing for bass and bluegills was relatively low, but that for "all species" was high, for most of the catfish and bullheads were caught by this method.

Fly fishing produced the highest catch rate for bluegills and the second highest for bass. Most fly fishermen concentrated their efforts on surface fishing, using cork "poppers" for lures. Though few fly fishermen angled below the surface, the catch rates for depths to ten feet were nearly as high as those for surface fishing.

A small percentage of fly fishermen concentrating their effort on the surface were unsuccessful, while a higher percentage of unsuccessful effort was recorded in the area from just below the surface to a depth of three feet.

Few fisherman angled with spinning tackle; however, this method produced the highest bass catch rate of all methods, 0.37 bass per fisherman-hour. The use of "popper" or "noisy" surface lures was the most successful technique with spinning equipment.

The bass rate of catch for the bait casting method, 0.16 bass per fisherman-hour, was low compared with fly fishing and spinning methods. It was observed, however, that most of the large bass caught were taken by bait casters. As would be expected, very few bluegills were caught by bait casters.

The totals for all methods in Table 2 show that fishing pressure was more intense at the surface than at any depth below the surface. The catch rate at the surface was high compared with that at any depth below the surface.

The catch per fisherman-hour for all methods and depths was 1.18 for all species, 0.95 for bluegills, and 0.18 for bass. Fishing success on Argyle Lake appears good when compared with creel census data obtained on other lakes throughout the country (Carlander, 1953). Bennett and Durham (1951) described success on Ridge Lake, Illinois, as 0.14 bass per fisherman-hour. Recorded at Lake Chautauqua, Illinois, was a catch rate of 0.81 and 0.86 bluegills per fisherman- *day* and 0.14 and 0.09 bass per fisherman-*day* for two summers (Starrett and McNeil, 1952). In terms of the fisherman-day the catch rate for these species on Argyle Lake was 2.75 bluegills and 0.25 bass.

Distribution of catch among fishermen.—The data for individual fishermen were arranged in order of successful trips, which were determined by the number of bass, bluegills, and all species caught. The percentage of fishermen was plotted against the percentage of total catch of all fishermen for each species.

It was found that one-third of the fishes caught were taken by 5% of the fishermen, and one-half of the total catch was accounted for by only 20% of the total anglers. Forty-five percent of the fishermen were unsuccessful in taking any fishes. As bluegills composed a large share of the total catch, the plotted curve for this species lies close to the one just discussed, with the noted exception that 56% of the anglers were unsuccessful in catching this species. However, in the case of bass 5% of the anglers took 50% of the total catch, and 2% of the fishermen caught 27% of the bass. However,

TABLE 1.—Catch of Bass, Bluegills, and All Species, Argyle Lake, 1954.

	No. fishermen	Total hours	No. all species	No. bass	No. bluegills
All methods	717	2,079	2,445	371	1,946
surface	285	766	1,160	271	799
down to 3 ft.	144	447	463	43	398
3 to 10 ft.	139	433	576	52	517
below 10 ft.	149	423	246	5	160
Fly fishing	255	716	1,245	246	998
surface	2 2	641	1,113	238	875
down to 3 ft.	17	45	80	2	77
3 to 10 f	6	30	52	6	46
below 10 ft.	0	0	0	0	0
Bait casting	91	265	53	42	11
surface	38	97	19	19	0
down to 3 ft.	38	118	16	15	1
3 to 10 ft.	11	34	18	8	10
below 10 ft.	4	16	0	0	0
Spinning	26	68	43	25	18
surface	12	28	17	12	5
down to 3 ft.	9	18	8	7	1
3 to 10 ft.	5	22	18	6	12
below 10 ft.	0	0	0	0	0
Still-fishing	345	1,030	1,104	58	937
surface	3	10	11	2	9
down to 3 ft.	80	266	359	19	319
3 to 10 ft.	117	347	488	32	449
below 10 ft.	145	407	246	5	160

82% of the total anglers were unable to obtain bass.

This eccentricity among individual anglers may be influenced by two factors: 1) skill has an important bearing on success; and 2) fishermen selectively "fish for" a particular species and, therefore, are more successful in taking that species.

A comparison was made between the angling methods of unsuccessful fishermen and the most successful 10% of the anglers. The following was noted concerning bass fishing. The most successful fishermen did a great amount of fly casting, but little bait casting at the surface, compared with unsuccessful fishermen. Still-fishermen caught few bass at the surface, and the percentage of most successful bass fishermen using this method decreased with increase in depth.

The only significant difference between the methods of fishermen who were most successful or unsuccessful in taking bluegills, was noticed

TABLE 2.—Success in Fishing for Bass, Bluegills, and All Species, Argyle Lake, 1954.

	Fish per fisherman-hour			Per cent unsuccessful fishermen
	All species	Bass	Bluegills	
All methods	1.18	0.18	0.95	36
surface	1.50	0.35	1.03	28
down to 3 ft	1.04	0.10	0.89	38
3 to 10 ft	1.33	0.12	1.20	33
below 10 ft	0.58	0.01	0.38	51
Fly fishing	1.74	0.34	1.40	20
surface	1.74	0.37	1.35	22
down to 3 ft	1.79	0.05	1.71	59
3 to 10 ft	1.72	0.20	1.52	0
below 10 ft	0.0	0.0	0.0	0
Bait casting	0.21	0.16	0.04	69
surface	0.07	0.20	0.0	68
down to 3 ft	0.14	0.13	0.01	71
3 to 10 ft	0.52	0.24	0.29	55
below 10 ft	0.0	0.0	0.0	0
Spinning	0.63	0.37	0.25	27
surface	0.60	0.43	0.18	25
down to 3 ft	0.44	0.45	0.56	33
3 to 10 ft	0.83	0.28	0.55	20
below 10 ft	0.0	0.0	0.0	0
Still-fishing	1.11	0.06	0.93	39
surface	1.07	0.19	0.87	33
down to 3 ft	1.36	0.07	1.20	29
3 to 10 ft	1.41	0.09	1.30	33
below 10 ft	0.61	0.01	0.39	50

among still-fishermen, where the most successful anglers fished from just below the surface to a depth of ten feet.

With the above discussed exceptions, there were but small differences in the methods used by the most successful or unsuccessful anglers in taking fishes.

A comparison of fishing success with the number of trips per fisherman per year is given in Table 3. Fishermen were divided into those fishing once, twice, or three or more times per season. For each group, fishing pressure, catch, and unsuccessful fishermen are given in percentages and rates of catch in fishes per fisherman-hour. The catch rate is increased significantly with an increase in number of trips (Table 3). It is apparent that the success of individual fishermen is directly associated with experience. Bennett

TABLE 3.—Fishing Success and Number of Trips per Year by Fishermen, Argyle Lake, 1954 (in percentages).

	Three or more trips	Two trips	One trip
Of total fishermen	4.	7.3	88.0
Of total fisherman-hours	11.6	12.9	75.5
Of total catch			
all species	26.2	13.8	60.0
bass	24.4	18.9	56.7
bluegills	26.5	13.1	60.4
Catch per fisherman-hour			
all species	2.29	1.09	0.81
bass	0.23	0.17	0.09
bluegills	2.06	0.93	0.73
Of unsuccessful fishermen	12.5	20.0	45.9

and Durham (1951) showed this to be true on Ridge Lake, Illinois, where catch rates increased from 0.14 to 0.19 bass per fisherman-hour for fishermen making one to four trips and those making five or more trips, respectively. Which factor of this association is cause and which is effect, if that relationship exists, cannot be stated.

Seasonal pressure and yield estimates.—Values for daily fishing pressure in number of fisherman-hours were plotted and a curve, fitted to these by inspection, was extended to cover the periods from May 29, 1954, to September 10, 1954. At other seasons pressure became negligible. From the areas enclosed by the curves the fishing pressure for the summer season was calculated to be 9,550 fisherman-hours, or 81.5 fisherman-hours per acre. The average length of the fishing trip was found to be 2.8 hours, and this applied to the above figures gave 3,300 fisherman-days per year and 31.8 fisherman-days per acre per year. Bennett and Durham (1951) reported 105 and 155 man-hours of angling per acre on Ridge Lake for two fishing seasons; Starrett and McNeil (1952) reported 18.2 man-hours. The number of man-days of angling per acre per year for Argyle Lake (31.8) is about the average value found in 32 studies summarized by Carlander (1953).

An estimate of the numbers of fishes caught throughout the 1954 summer season on Argyle Lake was obtained for bluegills, bass, and all species by applying the mean catch per hour of these species (Table 2) to the above estimate of total fisherman-hours per year. It was found that (fish per acre per year values in parentheses) an estimated 9,040 (77.2) bluegill, 1,690 (14.9) bass, and 11,210 (96.0) fishes of all species were caught per year and per acre per year during the 1954 season

on Argyle Lake. The numbers of bullheads and catfish caught were calculated as 506 fish per year and 4.1 fish per acre per year.

Many fishes were returned to the water after capture by the fishermen. The percentage of fishes kept and actually taken from the lake were: bluegills, 34.1; bass, 62.5; bullheads and catfish, 95.5; and all species, 58.7. These percentages of the total catch of each species per year gave the following figures for the "take home" harvest in numbers of fishes per year (values per acre per year in parentheses): bluegills, 3,080 (26.3); bass, 1,055 (9.0); bullheads and catfish, 472 (4.0); and all species, 4,540 (39.3)

The estimated total harvest in pounds of fishes was calculated by multiplying the average weights for each species by the estimated catch per year. These average weights were: bass, 0.220 lbs.; bluegills, 0.139 lbs.; and bullheads and channel catfish, 0.785 lbs. Estimated total harvest in pounds of fishes taken from Argyle Lake in 1954 (values per acre per year in parentheses) are bluegills, 428 (3.7); bass, 228 (2.0); bullhead and catfish, 360 (3.2); and all species 1,016 (8.9) lbs. of fish per year.

According to a summarization (Carlander, 1953) of available data on annual yield of fishes in pounds per acre by angling in artificial lakes and ponds, the harvest of Argyle Lake, 8.9 lbs. per acre per year, was relatively low. If it may be assumed that Argyle Lake supports between 100 and 500 lbs. of fish per acre, then the total harvest of 8.9 lbs. per acre per year is 8.9 to 1.8% of the standing crop. It is the belief of the author that the yield to anglers could not be increased enough to impair materially the population of fishes or even to help control overpopulation. It is probable, however, that an angler education program on Argyle Lake would greatly increase the harvest and thereby make the lake a greater asset to the fishing public.

Summary

1. A creel census was taken on Argyle Lake, McDonough County, Illinois, during the summer of 1954. This lake is an artificial impoundment used for recreational purposes only.

2. Data were collected on the species, number of individuals, length and weight of fishes caught by fishermen, amount of time spent per fisherman, fishing method, and bait used. Census was taken on 32 haphazardly selected days of the 1954 fishing season. It is believed that the number and spacing of the census days gave adequate coverage of the entire season.

3. Still fishing was the most used method, followed by fly fishing, bait casting, and spinning, in decreasing order. a) Most still fishermen preferred to angle on or near the lake bottom; however, the lowest catch per fisherman-hour was recorded from this depth. b) Fly fishing produced the higest rate of catch for bluegills and the second highest for bass. Most fly fishermen concentrated on surface fishing. c) Few fishermen angled with spinning tackle; however, this method produced the higest catch rate of bass. d) The catch rate for bass using

bait casting was low, compared with fly fishing and spinning methods.

4. The catch per fisherman-hour for all methods and depths was 1.18 for "all species", 0.95 for bluegills, and 0.18 for bass. Fishing success on Argyle Lake appeared good when compared with creel census data obtained on other lakes throughout the country.

5. A large portion of the total catch was accounted for by a small percentage of the fishermen. Only small differences exist between the method used and depth fished by the unsuccessful fishermen and the most successful ten percent of the anglers. A comparison of fishing success and the number of fishing trips made per year by individual fishermen showed an association of success and experience.

6. Seasonal pressure was estimated at 81.5 fisherman-hours or 31.8 fisherman-days per acre per year.

7. An estimated 77.2 bluegills, 14.9 bass, 4.1 bullheads and catfish, and 96.0 fishes of all species were caught per acre per year during the 1954 season.

8. Total calculated harvest in pounds of fishes taken from the lake per acre per year is: bluegills, 3.7; bass, 2.0; bullheads and catfish, 3.2; and all species, 8.9 pounds.

9. This harvest was estimated to be 1.8 to 8.9% of Argyle Lake's standing crop.

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