

THE ANGLERS' CATCH AT LAKE CHAUTAUQUA NEAR HAVANA, ILLINOIS, WITH COMPARATIVE DATA ON HOOPNET SAMPLES

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The year 1942 was the third successive year in which a partial record was obtained of the hook-and-line catch at Lake Chautauqua, a wildlife refuge maintained by the U. S. Fish and Wildlife Service near Havana, Illinois. Lake Chautauqua is an abandoned drainage and levee district. The levees separate the refuge from the adjoining Illinois River except at flood stages. At ordinary levels the lake has an area of 3,200 acres and a maximum depth of about 5 feet. The lake is approximately 6 miles long and a mile wide.

Lake Chautauqua attracts more hook-and-line fishermen than any other lake along the Illinois River; nevertheless, the fishing cannot be ranked high. Large-mouth bass, bluegills, both black and white crappies, yellow perch, and yellow bass (*Morone interrupta*) are the principal kinds caught.

The census was conducted by the Illinois Natural History Survey with the cooperation of the U. S. Fish and Wildlife Service through Mr. Homer L. Bradley, refuge manager, and Mr. Milfred Smith, refuge patrolman.

The catch records were kept by the boat liverymen, that is, by men in the business of renting rowboats. The records kept by Mr. Frank Kuntz, caretaker at Bridgeman's livery, were nearly 100 per cent complete for 1941 and 1942 and because of their completeness are especially valuable for a study of seasonal trends in fishing. Bridgeman's record alone comprises the data for the present paper.

The Bridgeman record for 1940 covered only three months and no records were kept of people who failed to catch fish.

Bridgeman's livery is located on Haven's Slough at the northeast end of Lake Chautauqua. This part of the lake is protected from wind and supports rather dense growths of submerged

aquatic plants. Above Bridgeman's dock the slough widens out into an area of about 80 acres. Most of the fishermen renting boats at Bridgeman's stay within this small area. A considerable amount of still-fishing is done around dense stands of button bush, *Cephalanthus occidentalis*, which grows in water up to three feet in depth. A certain amount of still-fishing is also done in the shade of the partly submerged willows, as well as in open water. The proportion of all Chautauqua fishermen using this boat livery cannot easily be estimated. Besides the boat liveries on the lake proper, of which there were five in 1941 and two in 1942, there are two liveries at Liverpool and others at Havana. Boats from the latter towns are hauled over the levees on wooden rollers, or pull-overs. Numbers of private boats are also on the lake, but no estimate of their numbers is at hand.

The record cards were made out for parties rather than for individuals. The parties usually consisted of two persons each. The information entered on each card included number of fishermen in the party, number of hours spent, and number of each kind of fish brought to the dock. The boat yard attendants were not asked to separate the species of crappies, bullheads, or sunfish except for bluegills. No observations were made on lengths or weights.

The periods covered in this report include all of the year 1941 and from January 1 to September 6, 1942, except that no fishing was allowed during the 1941 duck shooting season, October 16–December 14. Bass fishing was closed both years from April 1 to May 31. Winter fishing was prohibited under the ice but was permitted where holes naturally remained open.

Kinds and Numbers Caught and Differences in the 1941 and 1942 Catch.—The species totals for the same periods of

1941 and 1942, i. e., January 1 to September 6, are shown in table 1. Number caught refers to the fish taken away from the lake. No record was kept of the fish thrown back. The late 1941 data are omitted from this list because of absence of corresponding data for 1942. There are certain striking differences in the catch for the two years. In 1942 there were a great many more bluegills and yellow bass with fewer crappies and fewer miscellaneous sunfish.

TABLE 1.—COMPARISON OF THE 1941 AND 1942 SEASONS WITH RESPECT TO KINDS AND NUMBERS OF FISH CAUGHT BY ANGLERS AT BRIDGEMAN'S BOAT LIVERY ON LAKE CHAUTAUQUA IN THE PERIOD JANUARY 1-SEPTEMBER 6

Kinds	1941	1942
Largemouth bass	426	450
Smallmouth bass	1	0
Bluegill	2,043	3,622
Other sunfish	400	306
Crappie	681	357
Yellow perch	1,002	1,110
Yellow bass	9	1,236
Sheepshead	55	4
Bullhead	56	75
Channel cat	13	0
Buffalo	0	1
Dogfish	3	2
Eel	0	1
Kind not shown	30	0
Total fish	4,719	7,164
Total fisherman-days	1,695	1,563
Av. catch per fisherman per day	2.8	4.6
Av. catch per fisherman per hour	0.7	1.0

Whereas only 9 yellow bass were recorded for 1941, 1,236 were recorded for 1942. Due to this increase the yellow bass ranked second in importance of all kinds caught in 1942. It is significant that the yellow bass was among the three most abundant kinds taken in hoopnet samples in 1940, 1941, and 1942, but had no importance in the hook-and-line catch until the last year. Lake Chautauqua may be considered unusual among Illinois waters for its large populations of both yellow bass and yellow perch.

Number of Zero Catches.—For the periods mentioned above, the percentage of boats returning with no fish averaged 40 per cent in 1941 and 41 per cent in 1942. During some of the poorer weeks in the middle of the summer zero catches ran as high as 50 per cent. Since there were usually in each boat two fishermen, only one of whom may have caught fish, the percentage of individuals failing to catch fish would be somewhat higher than the figures given for boats.

The Average Catch Per Fisherman-Day and Average Catch Per Hour.—For corresponding periods January 1 to September 6, the average daily catch was 2.8 fish per day in 1941 and 4.6 fish per day in 1942. The length of day averaged 4.1 hours in 1941 and 4.5 hours in 1942. The average 1941 catch, however, was larger, 3.6 fish per day, when the period September 17-December 31 is included.

The average catch per hour for the period January 1 to September 6 was 0.7 fish per hour in 1941 and 1.0 fish in 1942. For the entire 1941 season, January to December, the catch per hour was 0.9 fish.

The non-technical reader should bear in mind that these are averages of good and bad periods and of expert and inexperienced fishermen. Nevertheless, the legal creel limit of 10 bass, 25 of other fine fish of a single kind, or 35 in the aggregate of several kinds, was seldom obtained or even approached except during September and October, 1941, when many limits of bluegills were taken.

The following tabulation (table 2) shows how Lake Chautauqua compares with some other lakes both within and outside the State of Illinois, in terms of number of fish caught per hour. The figures for Rinaker Lake, Onized Lake, and Lake Glendale are from unpublished data. Rinaker Lake (14.3 acres) near Carlinville, Illinois, is an artificial lake 40 years old operated by a club with 75 members. The fishing record for the years 1932-39 has been analyzed by Dr. David H. Thompson of the Illinois Natural History Survey. The fishing began in March or April each year (except in 1932 when the record began in June) and ended in October or November. The largest number of fishermen-days for any of the 8 years was 642.

Onized Lake (2 acres) near Alton, Illinois, has been under the observation of Dr. George W. Bennett, also of the Illinois Natural History Survey. The record covers two years, 1939 and 1940, and takes in the months April to October.

Lake Glendale (82 acres) is a new lake in the Shawnee National Forest in southern Illinois near Dixon Springs. The record covers 2,754 man-days during the summer of 1942, which was the first year the lake was opened to fishing. The lake was completed in 1939, and stocked in April, 1940. Fishing in 1942 was permitted from May 15 to August 29.

TABLE 2.—OBSERVED AVERAGE CATCH PER HOUR IN FOUR ILLINOIS LAKES, AND CORRESPONDING DATA FROM LAKES IN OTHER STATES

State and lake	Length of record	Fish per hour (High and low yearly average)
Illinois—		
Glendale.....	1 year	0.4
Onized.....	2 years	0.4—0.8
Rinaker.....	8 years	1.0—2.1
Chautauqua.....	2 years	0.7—1.0
Michigan—		
Fife.....	4 years	1.0—1.7
Waterloo Area..... (12 lakes)	1 year	1.2
Whitmore Lake.....	5 years	
Largemouth bass.....		0.3—1.4
Bluegill.....		4.4—12.8
Bullhead.....		1.8—3.7
Wisconsin—		
Chequamegon Forest..... (5 lakes)	1 year	0.8
Waubesa*.....	1 year	1.9
Kegonsa*.....	1 year	1.2
Tennessee—		
Reelfoot.....	1 year	1.6
Norris.....	2 years	0.2—0.3
Wheeler.....	1 year	0.4
New York—		
Chautauqua Lake.....	5 days (July 1-5)	0.5

* The authors thought that all zero catches were probably not reported and that these figures were somewhat too high.

On all three of the above lakes the censuses were handled by full time caretakers who were charged with the responsibility of recording the results of all fishermen.

The catch rates for out-of-state waters were obtained from the papers of Eschmeyer (1939), Hazzard and Eschmeyer (1938), Eschmeyer and Tarzwell (1941), Elkins (1937), Frey, Pedracine, and Vike (1939), Moore (1938), and Troutman (1941).

The dates at which the various censuses begin and end differ considerably so that the catch per hour figures should only be taken as suggestive of the quality of fishing in different parts of the country. An hourly rate of 2 fish per hour seems to represent unusually good fishing and 3 fish per hour very exceptional fishing. Some of the lowest yields were found among lakes in which rates ran heavily to large game fish. This was true for Norris Reservoir (Tennessee), and for two of the five lakes in Chequamegon Forest (Wisconsin).

Seasonal Trends in the Numbers of People Fishing.—Marked variation from

week to week may be seen in tables 3 and 4 in numbers of people who fished at Lake Chautauqua. Both in 1941 and 1942 fishing was well under way by April, but the numbers of fishermen dropped off around the second or third week in July. Fishermen came in comparatively large numbers throughout September and into October until fishing was closed at the opening of the duck season. In 1941 the peak number of fishermen occurred during the week ending May 18 at the height of the crappie season, while in 1942 this peak occurred during the opening week of the bass season, June 1, which was also the second best week in 1941. It might be suggested that the decline in number of fishermen in July resulted from the discouragement of the bass fishermen or perhaps because the peak interest in fishing is reached by a certain group of fishermen at the opening of the bass season.

Seasonal Variation in the Anglers' Catch.—Seasonal variation in the catch per hour of the important species has been determined by dividing each week's catch by the total hours of fishing by all fishermen.

The catch-per-hour rates for weekly periods in 1941 and 1942 are shown in tables 3 and 4 and in figure 1.

On the basis of figure 1 the following conclusions are reached with respect to seasonal variations in fishing:

1. There are definite peaks in biting activity, but these peaks do not necessarily occur at the same time for all species.
2. The biting of a given species may show several conspicuous peaks during the same year.
3. The peaks may occur at quite different times in different years.
4. Periods of excellent fishing tend to be short, i.e., peaks are more inclined to have steep than gradually tapered slopes.

There was enough difference between periods of good fishing in 1941 and 1942 to make it impossible to define accurately the most likely time of the year for a good catch. The periods when fishing was better than ordinary, however, are defined below.

Largemouth bass.—Rather good catches of bass were made in January and February, 1941 (see table 2), but were not duplicated in corresponding months of

TABLE 3.—BRIDGEMAN'S LIVERY, 1941. NUMBERS OF FISH AND CATCH PER HOUR RATE BY WEEKS FOR MOST IMPORTANT SPECIES. THE CATCH PER HOUR RATE IS BASED ON TOTAL HOURS OF FISHING INCLUDING THOSE SPENT BY THE UNSUCCESSFUL FISHERMEN. THE YELLOW BASS WAS NOT ONE OF THE IMPORTANT HOOK-AND-LINE SPECIES IN 1941.

Week ending Sunday—	Number of fishermen	Total hours	Largemouth bass		Bluegill		Crappie		Yellow perch		
			Number	Catch per hour	Number	Catch per hour	Number	Catch per hour	Number	Catch per hour	
Jan. 5	4	Not recorded.	29	?							
" 12	6		54	?							
Feb. 16	1		7	?							
" 23	1		7	?							
Mar. 2	5		15	?							
" 9	2					17	?				
Apr. 6	23		92			14					
" 13	69		340			64	0.695	5	0.054	27	0.293
" 20	16		64			194	0.570	37	0.108	207	0.608
" 27	71		360			9	0.140	3	0.046	32	0.500
May 4	110	460			61	0.169	17	0.047	111	0.308	
" 11	38	154			90	0.195	138	0.300	94	0.204	
" 18	196	965			17	0.110	101	0.655	37	0.240	
" 25	101	380			249	0.258	167	0.173	116	0.120	
June 1	157	700	36	0.051	199	0.523	6	0.015	18	0.047	
" 8	139	486	63	0.130	258	0.368	2	0.003	21	0.030	
" 15	44	188	17	0.091	45	0.092					
" 22	106	236	33	0.139	67	0.356	1	0.005	2	0.010	
" 29	28	84	6	0.071	80	0.338	1	0.004	54	0.228	
July 6	102	374	38	0.101							
" 13	80	306	32	0.104	33	0.088					
" 20	101	390	15	0.038	90	0.294	35	0.114	33	0.107	
" 27	24	75	7	0.093	75	0.192	20	0.051	60	0.154	
Aug. 3	53	201	13	0.064	31	0.413			7	0.093	
" 10	10	502	2	0.004	66	0.328			30	0.149	
" 17	49	170	18	0.106	55	0.109	13	0.025	12	0.024	
" 24	50	210	12	0.057	25	0.147	1	0.005	33	0.194	
" 31	82	354	14	0.040	64	0.304	5	0.024	50	0.238	
Sept. 7	27	117	8	0.068	171	0.483	111	0.313	30	0.084	
" 14	86	437	13	0.029	79	0.675	18	0.153	21	0.179	
" 21	68	313	27	0.086	219	0.501	11	0.025	77	0.176	
" 28	40	184	2	0.011	171	0.546	4	0.012			
Oct. 5	64	290	18	0.062	400	2.174	6	0.032			
" 12	27	104	1	0.009	734	2.351	8	0.027	16	0.055	
Dec. 21	30	109	13	0.109	560	5.384			4	0.036	
" 28	12	48			159	1.458			2	0.041	
					90	1.875					

1942. There were no outstanding peaks during the summer and fall months in either year.

Crappie.—In Illinois the crappies are traditionally known as spring and fall biters. There were well defined peaks in May both years but no evidence was found for a fall peak. Perhaps the natural fall peak would come during the waterfowl season. The peak occurring in late August, 1941, was unexpected. The crappies underwent longer periods of complete biting inactivity than the other principal species.

Yellow Perch.—The peak month in 1941 was April, but in 1942 the peak occurred in late July and early August. There were four consecutive depression weeks starting late in May with exact correspondence in dates between the two years.

Yellow Bass.—The highest peak was reached in July with lesser peaks in April and June. This species practically re-

fused to bite in 1941 so that there were no outstanding peaks.

Bluegill.—The bluegill seems to be the most erratic species in its biting of any of the five observed. The best fishing occurred in late September and early October, 1941, when during one week bluegills were taken at the rate of 5.38 fish per hour; while in 1942 there were three moderately high peaks as follows: January, late April, and late May.

Comparison between the Anglers' Catch and the Hoopnet Catch.—The species composition observed in the anglers' catch at Lake Chautauqua has been found to be different from the composition of the hoopnet catches. Inasmuch as hoopnets are used in fisheries work for forecasting hook-and-line possibilities of lakes and also for determining management needs for hook-and-line fishing, it is important to know how great these discrepancies are.

From May 6 to May 14, 1942, hoopnets were set in the 80 acres most used by the fishermen who rent boats at Bridgeman's livery. Seventeen hoopnet catches were obtained at this time with 4 one-inch mesh (square measure) nets. The percentage representation of each species in these seventeen catches is shown in table 5. Also appearing in this table are the percentages of the same species caught by hook and line at Bridgeman's during the five weeks ending May 31. The catches of 405 fishermen are included in the latter figures. The most striking differences in the percentages were found among bluegills and crappies. Bluegills made up 78.5 per cent of the anglers' catch but only 17.8 per cent of the hoopnet catch. Crappies, on the other hand, made up 12.6 per cent of the anglers' catch but 61.4 per cent of the hoopnet catch. Fairly important differences of this type were found also in connection with yellow perch, bullheads, and sunfish. Certain other species, namely carp, dogfish, sheepshead and buffalo, were slightly more abundant in the hoopnets than was yellow perch, but were not caught at all in May by anglers. However, the number of fishermen using special carp baits is slight as compared with the number using worms, minnows, or artificial baits.

It should be mentioned that an unusually high percentage, probably at least 90 per cent, of the hoopnet catch was made up of fish large enough to be eaten.

During the two weeks ending May 17, which most nearly coincide with the hoopnet collection dates near Bridgeman's, hoopnet and anglers' catches fail to agree any more closely than for the five weeks shown in table 5. The percentage representation of the four principal species taken by hook during those two weeks were as follows: bluegills 31.8%, crappie 9.5%, yellow perch 55.5%, and yellow bass 3.1%. The hoopnet percentages for this period were bluegills 17.8%, crappie 61.4%, yellow perch 0.4%, and yellow bass 1.7%.

The same sort of discrepancies appear in table 6, where all the hoopnet catches made in 1942 are compared with all available 1942 hook-and-line data from the Bridgeman livery.

The hoopnet data for 1942 include, besides the 17 catches in the vicinity of Bridgeman's at the northeast corner of the lake, an additional 19 catches obtained between May 4 and 14 at scattered points between Bridgeman's and the other end of the lake, a distance of 6 miles. Another 6 catches were taken near the southwest end of the lake July 9-11.

TABLE 4.—BRIDGEMAN'S LIVERY, 1942. NUMBERS OF FISH AND CATCH PER HOUR RATE BY WEEKS. THE CATCH PER HOUR IS BASED ON TOTAL HOURS OF FISHING INCLUDING THOSE SPENT BY THE UNSUCCESSFUL FISHERMEN.

Week ending	Number of fishermen	Total hours	Largemouth bass		Bluegill		Crappie		Yellow perch		Yellow bass	
			Number	Catch per hour	Number	Catch per hour	Number	Catch per hour	Number	Catch per hour	Number	Catch per hour
Jan. 11	6	33	11	0.336	7	0.212			7	0.129		
" 18	14	54	4	0.074	94	1.730						
" 25	17	41	2	0.048	71	1.700	3	0.072	3	0.072		
Feb. 8	10	36			49	1.340	2	0.055				
Apr. 5	15	68			73	1.060			2	0.029		
" 19	17	77			35	0.450	2	0.026	8	0.010		
" 26	43	176			339	1.810	13	0.074	49	0.278	67	0.381
May 3	59	197			298	1.510	4	0.020	13	0.066	24	0.124
" 10	43	180			16	0.089	15	0.083	37	0.203	5	0.028
" 17	63	250			34	0.136			50	0.200		
" 24	114	473			850	1.800	169	0.356	13	0.029	30	0.064
" 31	126	563			771	1.370	130	0.230	41	0.073		
June 7	223	1350	169	0.125	411	0.304	17	0.013	66	0.049	36	0.026
" 14	101	414	47	0.117	16	0.039			24	0.058		
" 21	122	564	48	0.085	238	0.422			174	0.310		
" 28	91	418	32	0.077	85	0.204			66	0.158	198	0.474
July 5	115	519	34	0.065	38	0.073			86	0.171	47	0.091
" 12	70	296	41	0.138	58	0.196			63	0.213	85	0.267
" 19	58	265	37	0.140	4	0.015			75	0.283	35	0.134
" 26	56	248	1	0.004	6	0.024			63	0.254	328	1.340
Aug. 2	49	208	14	0.067	30	0.144			97	0.466	155	0.745
" 9	56	270	5	0.018	48	0.178			97	0.360	122	0.450
" 16	49	227			41	0.180			38	0.167	75	0.330
" 23	18	81							15	0.186	11	0.136
" 30	11	55	1	0.018					5	0.100	10	0.184
Sept. 6	14	56	1	0.018					15	0.268	8	0.143

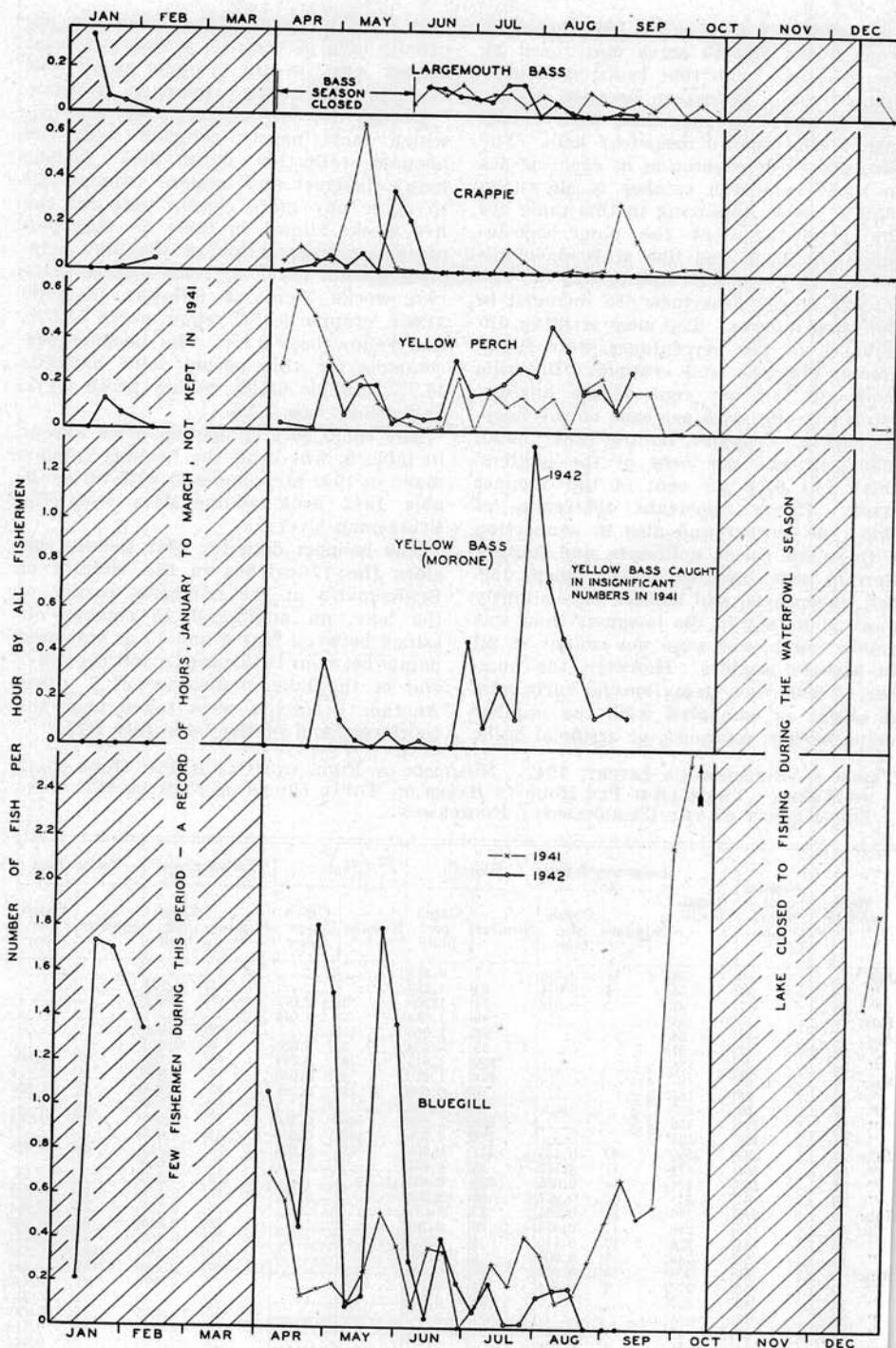


Fig. 1.—Average catch of various species per hour of fishing. Bridgeman's boat livery in 1941 and 1942. The weekly catch of each species is divided by the total hours of fishing during the week.

TABLE 5.—RELATIVE ABUNDANCE OF SPECIES IN HOOPNET CATCH AND ANGLERS' CATCH IN THE VICINITY OF BRIDGEMAN'S LIVERY DURING MAY, 1942

Species	Vicinity of Bridgeman's Livery, May, 1942			
	Angler's catch		Hoopnet catch	
	Per cent	Number	Per cent	Number
Bluegill.....	78.5	1969	17.8	123
Crappie (2 sp.)*.....	12.6	318	61.4	425
Yellow perch.....	6.1	154	.4	3
Yellow bass.....	2.4	59	1.7	12
Largemouth bass.....	Closed	season	2.0	15
Bullhead (3 sp.)*.....	0.3	7	6.1	42
Other sunfish (3 sp.)*.....			4.3	30
Carp.....			3.6	25
Dogfish (Amia).....		1	0.9	6
Sheepshead.....			0.9	6
Buffalo.....			0.6	4
Eel.....			0.3	2
Total.....	100.0	2,508	100.0	693

* Number of species found in hoopnets and possibly represented in the angler's catch.

TABLE 6.—RELATIVE ABUNDANCE OF SPECIES IN HOOPNET CATCH AND ANGLERS' CATCH. PERIOD OF THE ANGLERS' CATCH IN THE VICINITY OF BRIDGEMAN'S, JANUARY 1 TO SEPTEMBER 6. THE HOOPNETS WERE SET IN VARIOUS PARTS OF THE LAKE. MAY AND JULY HOOPNET CATCHES ARE COMBINED.

Species	1942 season			
	Angler's catch near Bridgeman's Jan. 1 to Sept. 6		Hoopnet catch from entire lake May and July	
	Per cent	Number	Per cent	Number
Bluegill.....	50.5	3,622	14.9	414
Yellow bass.....	17.3	1,236	23.5	656
Yellow perch.....	15.5	1,110	0.7	21
Largemouth bass.....	6.3	450	0.8	23
Crappie.....	5.0	357	52.4	1,458
Other sunfish.....	4.3	306	2.6	72
Bullhead.....	1.0	75	2.7	74
Sheepshead.....		4		2
Dogfish (Amia).....		2	0.4	11
Eel.....		1	0.3	8
Buffalo.....		1	0.2	7
Carp.....			1.3	35
Channel cat.....				1
Redhorse.....				1
Total.....	100.0	7,164	100.0	2,783

* The catch from one hoopnet set 21 hours was omitted from these totals because of the exceptionally large number of yellow bass (835) which it contained. This net also included 15 crappies and 1 or 2 individuals of other species, none of which are included in the above totals.

It is apparent that either one or both of the sampling techniques are selective. Otherwise, the percentages in tables 5 and 6 should agree. For some species, the two techniques may be selective in opposite directions. For example, bluegills may be comparatively difficult to catch in hoopnets but comparatively easy to catch on hook-and-line, thus distorting the bluegill figures with respect to those for other species. Also, the degree of selectivity for either hoopnets or hook-and-line might vary with the season of the year.

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