Fish Populations of Four Ponds and Two Lakes Two Years After Rehabilitation by Rotenone Treatment[1] [2]

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For a number of years anglers and fishery biologists alike have wondered why, after an indeterminate period of time, some ponds and small lakes run their course as good fishing spots and became "just another fishing hole." Over the years, many management practices have been applied in attempts to postpone this unhappy event. Among the remedies which have been tried are: various stocking combinations of a number of species of fish; fertilization of the body of water with different types and combinations of fertilizers; restriction of fishing to protect the existing desirable individuals; and the constant restocking of desirable fish to maintain numbers of harvestable size. Seldom have these efforts had any apparent effect on the inevitable arrival of poor fishing.

The purpose of this study was to further the development of techniques that could possibly postpone this apparently unavoidable event and to provide a clearer understanding of the causes leading to the conditions of poor fishing, as well as to learn what conditions tend to produce good fishing. Some form of fish management which could either maintain or restore good fishing was also sought.

Because of the sportfishery potential of the ever-increasing number of ponds and small lakes and a steadily growing demand placed on them by anglers, better information with which to plan for their management is sorely needed. Prompted by this necessity, a three-year period of study on 42 ponds was conducted by the Fishery Research Laboratory under the direction of Robert M. Jenkins who published a summary of his findings in 1958.

This initial study presented invaluable information on standing crops in unmanaged ponds. During field operations of the earlier study, fish populations were removed with rotenone. All ponds were then restocked. This procedure provided an excellent opportunity for continued study of fish populations in which successional changes could be observed as they occurred, by making annual inventories. The theory that maximum harvestable crops of fish may be expected on a sustained basis only from communities of a successional type rather than from a climax type has been generally adopted in management practice in the State since 1953 (Jenkins 1959). Through the use of rotenone to reduce population size artificial succession has been created to produce better populations of desirable-sized fish.

Periodic re-examination was planned for several of these ponds. It was hoped that by comparing the various stages of successional development to be found each year, a better understanding of the population dynamics operating to create unbalanced populations and poor angling, would be realized.

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This study reports the results from inventories of new populations in four ponds and two lakes which had been treated with rotenone and restocked (Table I).

Methods and Materials

Since the results of the re-examination must be comparable to the original information the methods and materials of necessity are those used in the study conducted previously. Only one pond was re-examined with the aid of rotenone, the other five were sampled by means of the short-term simultaneous mark-and-recapture method.

In analyzing the standing crop in ponds per acre the estimated population of the various species and in their density per acre were calculated. Length frequency, average total length, length range and weights provided the basic data from which computations were made to provide the summary which is presented as standing crop of each species in the various bodies of water.

Following the 1956 examination all the ponds and lakes were stocked with species which appeared to be suited to the particular situation (Table III).

During the 1956 study, fourteen species and hybrid sunfishes collected in the ponds and lakes were: largemouth bass, *Micropterus salmoides;* bluegill, *Lepomis macrochirus;* white crappie, *Pomoxis annularis;* black crappie, *P. nigromaculatus;* channel catfish, *Ictalurus punctatus;* black bullhead, *Ictalurus melas;* yellow bullhead, *Ictalurus natalis;* redear sunfish, *Lepomis microlophus;* warmouth, *Chaenobryttus coronarius;* green sunfish, *Lepomis cyanellus;* longear sunfish, *Lepomis megalotis;* carp, *Cyprinus carpio;* gizzard shad, *Dorosoma cepedianum;* black buffalo, *Ictiobus niger;* and various hybrids involving bluegill, redear, green sunfish and warmouth parentage.

The average standing crop in the four pounds and two lakes at the time of treatment was 522 pounds per acre. The range was 327 to 1,106 and in the case of the larger standing crop, 828 pounds were accounted for by carp, gizzard shad, and stunted white crappie. In the case of the smaller, the 312 pounds consisted of stunted white crappie and sunted black bullhead catfish (Table II). In all cases the bulk of the weight was due to either undersized bluegill and crappie or an abundance of rough fish.

The average standing crop in pounds per acre at the time of treatment was: largemouth bass, 35 pounds; bluegill, 190 pounds; white crappie, 79 pounds; channel catfish less than 4 pounds; black bullheads, 19 pounds; yellow bullheads, 1 pound. An average standing crop of 70 pounds per acre was estimated for redear, warmouth, green and longear sunfish. There were 12 pounds of carp per acre in the Mahan pond and 261 pounds per acre in Camp Classen Lake at the time of the 1956 examination; none were found in either of these lakes two years later. There were 491 pounds of gizzard shad per acre in Classen Lake before treatment and none were found two years later.

The average standing crop for all six bodies of water two years after treatment was 120 pounds per acre, ranging from 65 to 140. The average standing crop in pounds per acre was: largemouth bass, 15; bluegill, 46; white crappie, 30; channel catfish, 4.21; black bullhead catfish, 16; yellow bullhead catfish, 0.5. The redear, warmouth, green and longear sunfish totaled 14 pounds per acre for all bodies of water.

The 1958 estimate of largemouth bass for all ponds was considered

low, however, ponds stocked with bass were already furnishing angling for this species, and the owners were reluctant to have the pond re-examined by the use of rotenone.

The yearly inventory of these ponds provides an index to the changes occurring in populations of similar composition and suggest management practices for bodies of water in southern Oklahoma.

Estimated Standing Crop

Franklin Pond

During the recent drought this pond dried up completely and the owner removed much of its accumulated sediment. This alteration of the pond's bottom resulted in a greater storage space and a steeper gradient along its margins. Fish were stocked during the fall of 1957 and during the torrential rains of that year, black bullhead catfish and white crappie were added by way of runoff water which came from upstream pond overflows.

At the time of the 1956 examination this pond had a standing crop of 346 pounds per acre, of which 180 pounds were bluegill and 120 pounds divided among redear, green, and longear sunfish and warmouth. Largemouth bass accounted for 41 pounds, crappie 4 and channel catfish 1 pound. The examination in 1958 showed the standing crop to be 120 pounds per acre. There were 77 pounds of bluegill, 16 pounds of black bullheads, 17 pounds of warmouth and about 11 pounds of white crappie. Although the trapping operations of 1958 showed only a trace of largemouth bass, three individuals that measured 15.3, 14.2, and 8.2 inch in length were caught by anglers while the traps were in the pond.

The Johnson Pond did not reflect the drastic action of the drought, but maintained its water levels reasonably well through the period. The stocking with largemouth bass, following the rotenoning of 1956, resulted in a relatively high bass population in 1958. These fish had an average length of 9 inches and an average weight of 0.4 pound. There were 24 pounds per acre at the time of examination in 1956 and 42 pounds in the 1958 sample. All species of sunfish were in excellent condition. White crappie which were washed in by the heavy rains of 1957 from the Franklin Pond, which is immediately above this one, accounted for the greatest poundage per acre of any species in the lake.

The Laughridge Pond was selected because of its extremely high turbidity and notoriously poor angling. The species composition in 1956 consisted of bluegill, white crappie, black bullhead catfish and small sunfish; all individuals were small and underweight. In the examination of 1958 the only sunfish present were small bluegill, which accounted for only about 1.4 pounds per acre, and white crappie which accounted for about 10.7 pounds per acre. The black bullheads were in much better condition, accounting for about 39 pounds per acre. The channel catfish after two years of growth accounted for 16.6 pounds per acre. This pond was the only one in which rotenone sampling was permitted following trapping.

Mahan Pond

The standing crop of this pond as indicated by the examination of 1956 was 521 pounds per acre. Bluegill, longear, warmouth, redear, green sunfish, carp and stunted crappie accounted for 88 percent of the weight, with largemouth bass and channel catfish accounting for the remaining 12 percent. In the examination of 1958 there were no carp and only a trace of longear sunfish. Other species, including bluegill, warmouth, redear, green sunfish, largemouth bass and crappie, accounted for 57 pounds per acre.

Table I. Name, location, size, turbidity, MO alkalinity and pH of ponds for the observations 1956 and 1958.

Name of Pond	Sect Township Range	County	Area in Acres	Turbidity ppm		MO Alkalinity		pH	
				1956	1958	1956	1958	1956	1958
Franklin	18,4S,2E	Carter	.75	19	8	92	110	7.4	7.6
Johnson	18,4S,2E	Carter	1.82	8	6	110	103	7.3	7.4
Laughridge	33,4S,2E	Carter	3.00	130	230	36	61	7.3	7.0
Mahan	11,4S,2E	Carter	4.57	43	9	95	95	7.6	7.1
North Rod and Gun	18,4S,2E	Carter	8.50	19	4	66	98	8.0	7.1
Camp Classen	24,1S,1E	Murray	18.00	10*	4	—	187	—	7.6

* Estimated

Table II. Standing crop in pounds per acre.

	FRANKLIN		JOHNSON		LAUGHRIDGE		MAHAN		NORTH ROD AND GUN		CLASSEN	
	1956[1*]	1958[2]	1956[1]	1958[2]	1956[1]	1958[2]	1956[1]	1958[2]	1956[1]	1958[2]	1956[1]	1958[2]
Total Pounds	346.	120.	472.0	231.	327.	68.	521.	65.	360.	139.7	1,106	101.1
Largemouth Bass	41.	T	24.0	41.7	—	—	42.0	2.3	23.	15.7	49.0	5.1
Bluegill	180.	76.5	407.0	36.9	3.0	1.4	194.0	45.7	185.	104.5	175.0	8.6
Crappies	4.	10.6	34.0	148.2	205.0	10.7	77.0	9.1	57.	—	97.0	—
Channel Catfish	1.	T	—	—	—	16.6	19.0	T	—	—	3.0	6.3
Black Bullhead	—	15.8	—	—	107.0	39.1	—	—	—	—	9.0	43.1
Yellow Bullhead	—	—	—	—	—		—	—	—	—	6.0	.3
Redear Sunfish		T		—				1.6		6.8	6.0	23.1
Warmouth	120.	17.1	7.0	3.0				1.6		1.1	6.0	7.0
Green Sunfish		—		1.3	12.0		177.0	4.6	94.	10.1	2.0	6.5
Longear Sunfish		T		—				T		—	—	1.0
Carp	—	—		—	—		12.	—	—	—	261.0	—
Gizzard Shad	—	—	T	—	—			—	—	—	491.0	—
Buffalo	—	—		—	—			—	1.	—	1.0	—
Hybrid Sunfish	—	—		—	—			T	—	1.4	—	—

[1] Rotenoned
[2] Estimated by Trap Method
* Pond drained and allowed to stand dry
"T" Less than .5 pound

Table III. Number of trap lifts, number of traps, date of stocking, species stocked and number stocked.

Name of Pond	Number of Trap Lifts	Number of Traps	Date of Stocking	Species Stocked	Number Stocked
Franklin	40	5	11/11/57	Largemouth Bass	350
Johnson	72	12	7/27/56	Largemouth Bass	300
Laughridge	50	10	7/27/56	Channel Catfish	1000
Mahan	90	9	7/27/56	Largemouth Bass	1000
				Channel Catfish	1000
North Rod and Gun	135	9	7/17/56	Largemouth Bass	1500
				Redear	300 Adult
Camp Classen	189	27	10/15/56	Largemouth Bass	3600
				Channel Catfish	3600
				Redear	1800

Since largemouth bass and channel catfish were being caught by anglers at the time of the 1958 sampling it is thought that both of these species actually were more abundant than is indicated by the 1958 data.

North Rod and Gun Club Lake

In 1956 a standing crop of 360 pounds per acre was established, of which, 337 pounds were divided among the bluegill, crappie, small sunfish and the weight of one buffalo fish. The remaining 23 pounds consisted of largemouth bass.

Two years later only 18 pounds of small sunfish, 105 pounds of bluegill and no rough fish were noted. Largemouth bass accounted for 11.2 percent of the total poundage as compared to 6.3 precent previous to treatment.

This lake overflowed its spillway in 1957 and fish were observed to come upstream into the lake. Subsequent studies on this lake may, therefore, show a somewhat different population than that of the 1956 or 1958 studies.

Camp Classen Lake

The carp population in this body of water prior to the time of treatment with rotenone is considered the most significant single point in this report. All specimens were in excellent condition and were of considerable size, with a standing crop of 261 pounds per acre. Gizzard shad added an additional 491 pounds per acre, elevating the total standing crop of rough fish to 752 pounds per acre — 67 percent of the total for the lake.

The standing crop in the lake two years after rotenone treatment showed that black bullheads, redear and bluegill sunfish accounted for 74 percent of the weight. The remaining 26 pounds per acre of standing crop was divided among the bass, channel catfish, the smaller sunfishes and a small population of yellow bullheads.

Conclusions

It is concluded that: (1) in southern Oklahoma two years is the maximum length of time that ponds should be closed to angling after rehabilitation.

(2) A program of pond rehabilitation should take into account adjacent waters in which unwanted fish species exist.

(3) The use of emulsifiable rotenone in the elimination of unwanted populations is practicable in small bodies of water.

It is recommended that high mineral turbidities be reduced before stocking of fish is attempted and that angling be permitted on ponds as soon as tests show fish growth acceptable to pond owners.

Literature Cited

Jenkins, Robert M. 1958. The standing crop of fish in Oklahoma ponds. Proc. Okla. Acad. Sci., 38(1957): 157-172.

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