EXPERIMENTS WITH THE FLATHEAD CATFISH ("PYLODICTIS OLIVARIS") IN PONDS*

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ABSTRACT

Experiments conducted from 1938 to 1941 indicated that large flathead catfish were predatory and in several cases eliminated the larger bluegills. In the 1962 experiments, 2- to 5-inch flatheads eliminated almost all the fathead minnows, while the larger flatheads (10") stocked in 1963 experiments apparently fed on larger bluegills in preference to fatheads. They eliminated all the large bluegills they could swallow except for a few in the 7-inch group and had left very few in the 4- to 6-inch groups. This apparently indicated a preference for larger fish as the flatheads increased in size, and suggests that the large flathead may compete with fishermen for fish of harvestable size.

These experiments indicate that flathead catfish of all sizes should be listed as a "C" (piscivorous) species in population analysis. The smallest fish would eat any other small enough to be swallowed. Where they could not swallow another of their own species, they often severly wounded them by biting.

The flathead catfish, *Pylodictis olivaris*, has been variously known as the yellow river cat, shovelnose cat, Mississippi cat, mud cat, goujon, pieded cat, Opelousas cat, Appaluchia cat, and Apaluca cat. It is present throughout the Mississippi drainage system and in certain rivers emptying into the Gulf of Mexico (Jordan and Everman, 1902; Harlan and Speaker, 1961; Eddy, 1957; McCoy, 1953). In Alabama, the flathead was found to make up from 0.5 to 11.5 per cent of the total weight of fish in rotenone samples from the Coosa, Black Warrior, Tombigbee, Tensaw, and Alabama Rivers and from 0 to 4.2 per cent of the weight of population samples in impoundments on these rivers (Swingle, 1954).

The food of the flathead was reported to be insects, crayfish, molluscs, and fish (Jordan and Everman, 1902; Harlan and Speaker, 1961). The author (1954) tentatively classed only those flatheads 16 inches or larger as primarily piscivorous ("C" group) because of uncertainty as to the exact nature of their feeding habits at various sizes. Brown and Dendy (1961) subsequently reported that in 22 flatheads taken by magneto shockers in the Alabama and Tensaw Rivers, stomach contents indicated a change in diet from invertebrates (crayfish, clams, and insects) to fish at the 11-inch group. This paucity of information emphasized need for research to determine the nature of feeding habits and classification of this fish for population analysis.

The earliest experiment at Auburn with the flathead catfish in ponds was in 1938, but research was hampered by inability to spawn this species. Snow (1959) and Sneed et al. (1961), who spawned this species at the Marion National Fish Hatchery of the Bureau of Sport Fisheries and Wildlife, furnished fingerlings for research conducted at Auburn in 1961-1963.

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Experiments on the Culture of Flathead Catfish in Ponds During 1938-1941

Flathead experiments conducted in 1938-1941 used catfish averaging over 4 pounds, which were obtained by commercial fishermen from Lake Martin, an impoundment on the Tallapoosa River.

Pond F.P. 238 was stocked per acre January 31, 1938, with 1,500 bluegill fingerlings weighing 15.58 pounds, 16 gizzard shad weighing 1.5 pounds, and 20 flathead catfish weighing 89.86 pounds. The pond was fertilized with 8-8-2 and was drained December 2, 1939 with the following recovery per acre:

Fish	*Number*	*Pounds*
Bluegills, 4"-5"	948	59.0
Bluegills, small	47,448	116.0
Gizzard shad, large	6	8.5
Flathead catfish	16	77.5
Minnows	—	24.86
Total		285.86

The population values were F/C = 2.67, AT = 30.9 and Y/C = 1.8. This was not a balanced population because of the low AT value. No bluegills larger than the 5-inch group survived, although the rate of stocking should have produced harvestable bluegills within 1 year. In view of more recent results, this would appear to have been caused by predation of the flatheads upon the larger sized bluegills. The flatheads increased in average size only from 4.49 to 4.84 pounds in the 2-year period, with a survival of 80 per cent.

A second experiment using these same flathead catfish was conducted in pond F.P. 240, which was stocked per acre December 15, 1939, with 8,186 large fingerling bluegills (4" + 5") weighing 376 pounds, 23,814 small fingerling bluegills (1" to 3") weighing 82 pounds, 16 gizzard shad weighing 1.6 pounds, 8 white crappie weighing 2.0 pounds, 92 largemouth bass weighing 22.2 pounds, and 16 flathead catfish weighing 77.5 pounds. The pond was fertilized and upon draining November 19, 1940, the following were recovered:

Fish	*Number*	*Pounds*
Bluegill, 5"	1,574	144.8
Bluegill, 2" to 4"	3,100	111.2
Gizzard shad	112	58.2
White crappie	160	38.2
Flathead catfish	16	92.4
Largemouth bass, large	76	67.6
Largemouth bass,, small	24	1.8
Yellow bullhead	6	1.6
Total		515.8

The population values were F/C = 2.2, AT = 42.2, and Y/C = 0.7. These values were in the balanced range. However, again there were no harvestable bluegills, few gizzard shad and relatively few crappie. While the bass may be responsible for control of shad and crappie, only the flatheads could have eaten the larger bluegills. In this pond the flat-

heads grew from an average of 4.84 to 5.77 pounds in 1 year, and were apparently piscivorous.

A third experiment was conducted in a 1.4-acre fertilized pond (FP-438), which was stocked March 24, 1938, with 10 brood bluegills weighing 4.4 pounds, plus 134 fingerling white crappie weighing 0.8 pound, and March 31, 1938, with 10 flathead catfish weighing 28.1 pounds. This pond was drained December 3, 1938, with the following recovery:

Fish	*Number*	*Pounds*
Flathead catfish, large	10	44.90
Flathead catfish, young (3")	1	—
White crappie, large	12	3.54
White crappie, fingerling	2,125	161.10
Bluegills, large	3	2.60
Bluegills, intermediate + small	6,285	98.90
Gambusia	4,721	10.90
Total		321.94

The population values were AT = 15.8, F/C = 5.65 and Y/C = 5.59. This was not a balanced population, possibly because of the low rate of stocking flatheads. They increased in average size from 2.81 to 4.49 pounds and produced 1 young fish. This rapid rate of growth was the result of the high Y/C ratio. These results appeared to indicate that the flathead was piscivorous in nature. A heavier rate of stocking or a longer experiment might have given a more definite answer as to their usefulness in ponds.

The next experiment, however, in which 8 flathead catfish weighing 46.2 pounds were stocked in a 0.12-acre pond from January 1 to September 29, 1941, gave a confusing indication. This pond was fertilized with inorganic fertilizer; although it contained no other fish, the flatheads increased in average size from 5.77 to 6.10 pounds. This appeared to indicate that even relatively large flatheads could grow on natural pond-produced foods without fish in their diet when stocked at the relatively high rate of 370 pounds of flatheads per acre. The only natural fish-food organisms known to be present were aquatic insects and tadpoles.

Experiments from 1961 *to* 1963

Fingerling Growth: When flathead catfish were spawned successfully at the Marion National Fish Hatchery of the U. S. Bureau of Sport Fisheries and Wildlife, the fry were reared to fingerlings in troughs with running water. When delivered to Auburn in August, they were found to have a light infestation of *Trichodina* and an unidentified bacterial infection that were controlled by treatment with formalin and acriflavine. A total of 6,400 weighing 9 pounds was stocked in a 0.25-acre pond and fed from August 17 to November 1 with a total of 65 pounds Auburn No. 2 fish feed and 199.5 pounds ground tilapia. Upon draining November 6, there were recovered 3,024 flatheads weighing 40.0 pounds, an increase in total weight of 344 per cent and a survival of 47.2 per cent. The S conversion for both feeds combined was 8.5.

Flathead Catfish - Flathead Minnow Combination: On December 19, 1961, flatheads in the 2- to 5-inch groups were stocked in 4 ponds at rates per acre of 1,000 or 2,000 together with 3,000 fathead minnows. The fish were fed Auburn No. 2 pellets fish feed to get maximum

growth. The minnows were added because it was not known whether flathead would grow satisfactorily upon pellets or whether they required fish. The ponds were seined monthly to determine abundance of the fathead minnows and the rates of growth of flathead catfish. The fathead minnows increased in abundance up to June at which time 200 to 500 were caught in a 15-foot sein haul. Subsequently, they rapidly decreased and had practically disappeared by August 10. During seining large flathead catfish were caught that were in the process of digesting other flatheads. One 14-inch flathead was taken August 10 with the tail of a partly digested 6-inch flathead protruding from its mouth. From these records it was apparent that the flathead was primarily piscivorous. Records of the populations recovered on draining (Table 1) emphasize their predatory nature since surviving fathead minnows varied from 18 to 93 pounds per acre, whereas rate of feeding used should have produced from 700 to 1,000 pounds. However, the net production of flathead catfish varied from 170 to 322 pounds per acre, indicating that these catfish also benefited possibly directly from the feed to a limited extent. With S conversions from 9.5 to 11.3, the utilization of feed was quite uneconomical and the fish showed little promise as a commercial species. Survival varied from 51.2 to 71.2 per cent.

Flathead Catfish - Bluegill - Fathead Minnow Combination: From the previous experiment, only flathead catfish in the 10-inch group were selected for tests in a combination with bluegills and flathead minnows. Bluegills stocked were in the upper half of the 4-inch group since the 10-inch flatheads appeared unable to eat this size. The ponds were

Table 1. Results With Flathead Catfish—Fathead Minnow Combinations

Item	Ponds, item per acre F-562	F-662	F-762	F-862
Stocked December 19, 1961				
Flathead catfish, number	1,000	2,000	1,000	2,000
pounds	15.6	30.8	23.2	46.0
Fathead minnow, number	3,000	3,000	3,000	3,000
pounds	5.6	5.8	7.6	8.0
Days in Experiment	322	322	253	170
Fed Auburn No. 2 pellets, pounds	3,404	3,404	3,308	1,756
Recovered on draining (Aug. 16-Nov. 6)				
Flathead Catfish, number	512	1,132	712	1,240
Per cent survival	51.3	56.6	71.2	62.0
Pounds	323.3	389.4	340.2	201.4
Net pounds	307.7	358.6	317.0	155.4
Fathead Minnows				
Number	4,723	3,616	7,419	4,560
Pounds	93.8	21.0	35.6	18.0
"S" Conversion, (net catfish only)	11.1	9.5	10.4	11.3
Ac	53.7	25.5	58.3	61.6
F/C	0.3	0.05	0.1	0.09
Y/C	0.3	0.05	0.1	0.09

stocked December 7, 1962, per acre with 1,500 bluegills plus 3,000 fathead minnows and either 100 or 200 flathead catfish. The fish were fed Auburn No. 2 pelleted fish feed to give fastest possible growth and high reproduction for bluegills and fathead minnows. A total of 2,800 pounds feed was used per acre and the experiments were terminated December 10-11, 1963. The detailed results are given in Table 2.

Survival of flatheads varied from 36 to 80 per cent with the highest and the lowest both occurring at the 100 per acre rate of stocking. It is

assumed that intraspecies predation was largely responsible. Reproduction of flatheads occurred in both ponds at the lower rate of stocking; where the survival of brood fish was low (36 per cent), the number of surviving young was high (84 per acre). Net production of flathead varied from 48 to 154 pounds per acre.

Survival of stocked bluegills was low, varying from 4 to 8 per cent. Practically all survivors were in the 8-inch group, which was too large for the flatheads to swallow. It is significant that 1 year after the original stocking, when 200 flatheads were stocked per acre, the total weight of all bluegills recovered was 13 to 16 pounds less than the weight originally stocked. At the stocking rate of 100 flatheads per acre, one pond showed a net increase of 11 pounds, and only the pond where survival of flatheads was lowest (36 per cent) was there a relatively high weight (162 pounds) of young bluegills.

The fathead minnows fared much better than the bluegills, with net increases in weight above the original weights stocked varying from 18.9 to 166.8 pounds per acre.

Discussion

The early experiments indicated in general that large flathead catfish were predatory and in several cases eliminated the larger bluegills. In the 1962 experiments, 2- to 5-inch flatheads eliminated almost all fathead minnows, whereas the larger flatheads (10-inch) stocked in 1963 experiments apparently fed on larger bluegills in preference to fatheads. They eliminated all large bluegills they could swallow except a few in the 7-inch group, and had left very few in the 4- to 6-inch groups.

Table 2. Results With A Flathead Catfish—Bluegill—Fathead Minnow Combination

Items per acre	F-563	F-763	F-663	F-863
Flathead Catfish				
Stocked, number (10")	100	100	200	200
Stocked, pounds	29.20	31.20	63.20	60.28
Recovered, number	80	36	132	108
Recovered, pounds	130.00	95.20	217.40	108.80
Per cent survival	80.0	36.0	66.0	54.0
Recovered, young, number	8	84	0	0
Recovered, young, pounds	1.60	20.80	0.00	0.00
Net total pounds	102.40	84.80	154.20	48.52
Bluegill				
Stocked, number (4")	1,500	1,500	1,500	1,500
Stocked, pounds	58.80	58.80	54.00	56.80
Recovered, number	84	124	64	108
Recovered, pounds	33.20	40.48	22.00	25.80
Per cent survival	5.6	8.26	4.26	7.2
Recovered, young, number	16,128	35,154	6,094	7,225
Recovered, young, pounds	36.60	162.00	18.30	14.73
Net total pounds	+11.00	+143.68	—13.70	—16.27
Fatheads				
Stocked, number	4,000	4,000	4,000	4,000
Stocked, pounds	13.60	14.80	13.20	14.00
Recovered, number	12,332	43,379	10,559	18,110
Recovered, pounds	64.90	181.61	32.11	132.41
Net pounds produced	51.30	166.81	18.91	118.41
Pounds feed added	2,800.00	2,800.00	2,800.00	2,800.00
Net total pounds fish produced	164.70	395.29	159.41	150.66
Days in experiment				
Dec. 7, 1962—Dec. 10, 1963	369	369	369	368
AT	61.3	27.5	82.6	47.4
F/C	1.02	3.3	0.33	1.60
S Conversion	17.0	7.1	17.6	18.6

This apparently indicated a preference for larger fish as the flatheads increased in size, and suggests that the large flathead may be expected to compete with fishermen for fish of harvestable size.

These experiments indicate that flathead catfish of all sizes should be listed as a "C" or piscivorous species in population analysis. The smallest fish would eat any other fish small enough to be swallowed. Where they could not swallow another of their own species, they often severely wounded them by biting. This resulted in severe sores, greatly weakened fish, and probably resulted in higher mortality.

Further experiments are in progress to more fully evaluate usefulness of the flathead catfish as a predator to supplement largemouth bass in bluegill-bass populations and to evaluate their usefulness for controlling overcrowded bluegill populations.

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EXPERIMENTS WITH WHITE CATFISH AS A SPORT FISH

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The range of white catfish, *Ictalurus catus* (Linnaeus), was originally in the Atlantic Coastal areas of the United States from Delaware to Florida. However, it has been introduced in many parts of the Middle West and even into Nevada and California. It has successfully adapted to a variety of different habitats but seems to prefer slower or standing waters, either fresh or brackish. This species has supported a commercial fishery in several areas and, in addition, has provided considerable sport fishing in certain large reservoirs where it was abundant. However, there are little data relating to the value of the white catfish as a sport fish for smaller ponds and lakes. This species was placed in experiments at the Auburn University Agricultural Experiment Station in 1958, and Prather and Swingle reported results on production and spawning in ponds (1960). It spawned readily in ponds, responded favorably to supplemental feeding, gave high production per acre, and the quality of the meat was considered equal to that of channel catfish. Therefore, it appeared to be a promising species