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*Iowa State Conservation Commission*

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# Fish Population in Five Missouri River Ox-bow Lakes

BILL D. WELKER<sup>1</sup>

*Abstract:* Fish populations in five Missouri River ox-bow lakes were investigated during 1963 and 1964. This was a joint project of the Iowa Conservation Commission; Nebraska Game, Forestation and Parks Commission, and the United States Fish and Wildlife Service. Gizzard shad were the most abundant fish. Shad, freshwater drum, and carpsucker composed over 60% of all fish caught in four lakes. Crappie were the most numerous game fish comprising between 29% and 81% of the game fish caught in the various ox-bows. Channel catfish, White bass and bluegill were abundant in most lakes. Indigenous populations including northern pike, sauger, wall-eye, largemouth bass, yellow perch, flathead catfish, paddlefish, bullheads, orangespotted sunfish and green sunfish were also present.

## INTRODUCTION

The Iowa Conservation Commission; Nebraska Game, Forestation and Parks Commission and United States Fish and Wildlife Service conducted investigations of fish populations at five Missouri River ox-bow lakes during 1963 and 1964. These lakes were formed by channelization and flood control work by the United States Army Corps of Engineers. Sixteen such lakes, between 10 and 800 surface acres, have been created along 192 miles of the Missouri River separating Iowa and Nebraska. Although species of fish statutorily classified as rough fish numerically dominate all the lakes, several species of game fish are also present.

Data in this paper are historically significant since they represent the first published information on fish population in ox-bow lakes along this part of the Missouri River drainage.

## DESCRIPTION OF AREAS

Most of the lakes have typical long and narrow shapes of ox-bow basins. The largest, Desoto Bend, was formed from a 7.5-mile bend in the Missouri River channel and has approximately 800 surface acres. It was completely separated from the river at the upper and lower ends by earth levees in 1960. Water level control structures were built in both levees. Three of the lakes, Omadi (200 acres), Snyder Bend (500 acres), and Decatur Bend (600 acres), open directly into the river channel at their lower end. Rock and wooden piling structures separate them from the channel at their upper end. These structures

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are pervious to water, but impervious to fish. The remaining lake, Decatur (375 acres), was completely separated from the river in 1955 by rock and wooden piling structures. However, subsequent high water levels in the river breached these structures, permitting free flow of river water into lake during part of the year. All of the lakes contain wooden pile-dikes. These are remnants of bank stabilization work begun several years ago in the main river channel.

Deep-water areas are generally found near these wooden pile-dikes. Depths of 15 to 25 feet are common. Maximum depth of 34 feet was recorded at DeSoto Bend. Siltation has reduced deep water areas in some sections of these lakes to less than 5 feet. Several water areas have been eliminated by siltation.

Most bottom soils in shallow water are a firm sandy mixture and contain relatively little aquatic life. Soils in deep water areas are a silt mixture and contain various species of aquatic insect larvae. The family *Tendipedidae* numerically comprises the largest single group of larvae. Aquatic vegetation is limited almost entirely to emergent cattails and bullrushes. Large dense stands of these plants are found at Decatur Lake.

Limited limnology work was conducted in Decatur and Decatur Bend Lakes during 1962. Total alkalinity, using phenolphthalein and methyl-orange indicators, ranged between 230 and 280 parts per million calcium carbonate. None of these lakes thermally stratify during the summer.

Stocking with white bass *Roccus chrysops*, largemouth bass *Micropterus salmoides*, walleye *Stizostedion vitreum*, northern pike *Esox lucius*, and channel catfish *Ictalurus punctatus*, has been conducted in all five lakes. There is little evidence that stocking has affected any year class except the walleye and channel catfish planting in De Soto Bend.

#### METHODS OF COLLECTION

Fish were collected with 150-foot experimental gill nets, 250-foot trammel nets, frame nets, and a 100-foot bag seine with one-quarter-inch mesh. The data recorded at each lake in 1963 are based on fish caught with 18 gill nets, 2 trammel nets, 6 frame nets, and 14 seine hauls. Each net was fished approximately 18 hours, and seine hauls were conducted along 100-foot sections of shore during both daylight and evening hours. Data recorded at each lake during 1964 were collected with 18 gill nets, 4 trammel nets, 8 frame nets, and 32 seine hauls.

All fish collected were counted and most of the game fish were weighed and measured. A sub-sample of all non-game fish was also weighed and measured. Those fish readily identified to species were placed into groups according to common name. The remainder were placed into groups which include closely

related species: carpsucker, redhorse, gar, bullhead, crappie, and small cyprinids, excluding carp. Scales, vertebrae or pectoral spines were removed from each group of fish for age and growth study.

#### RESULTS AND DISCUSSION

Survey dates differed at each lake. De Soto Bend was surveyed between May 20 and May 28 each year while the remaining lakes were surveyed after July 14 both years. Both surveys at De Soto Bend were too early to sample reproductive success.

Fish identified to species were white crappie *Pomoxis annularis*, black crappie *Pomoxis nigromaculatus*, channel catfish *Ictalurus punctatus*, flathead catfish *Pylodictis olivaris*, Paddlefish *Polyodon spathula*, white bass *Roccus chrysops*, walleye *Stizostedion vitreum vitreum*, sauger *Stizostedion canadense*, largemouth bass *Micropterus salmoides*, bluegill *Lepomis macrochirus*, yellow perch *Perca flavescens*, northern pike *Esox lucius*, green sunfish *Lepomis cyanellus*, Orangespotted sunfish *Lepomis humilis*, gizzard shad *Dorosoma cepedianum*, freshwater drum *Aplodinotus grunniens*, shortnose gar *Lepisosteus platostomus*, carp *Cyprinus carpio*, bigmouth buffalo *Ictiobus cyprinellus*, smallmouth buffalo *Ictiobus bubalus*, and goldeye *Hiodon alosoides*.

The number and total length range of fish caught during the surveys are listed in Tables 1 and 2.

*Gizzard shad.* Gizzard shad were the most abundant fish taken at each lake except De Soto Bend both years. Undoubtedly shad would also have been the most numerous fish in this survey if young-of-the-year had been caught. Large schools of young-of-the-year are easily observed in all of the lakes after mid-July. Over 1,000 adult, sub-adult and young-of-the-year shad per hour have been observed at De Soto Bend in July using electro-fishing gear. Total lengths recorded at all lakes both years ranged between 2.0 and 16.7 inches.

*Freshwater drum.* These fish were the third most abundant among all fish caught during the 1963 survey and second most abundant in 1964. The largest drum were taken both years from the lakes closed to the river.

*Carp sucker.* Carpsuckers were numerous at all lakes, although fewer were taken in the lakes closed to the river than in the lakes open to the river during 1963. They ranked fourth in abundance among all fish caught during the 1963 survey and third during 1964.

*Crappie.* Crappie were the most numerous game fish taken from all lakes. They comprised between 29% (Decatur Bend)

Table 1. Total number and length range of fish caught at five Missouri River ox-bow lakes in 1963

Game fish	De Soto Bend		Decatur		Decatur Bend		Snyder Bend		Omadi	
	No.	TL* range	No.	TL range	No.	TL range	No.	TL range	No.	TL range
Crappie**	949	5.0-10.2	438	1.5-11.5	80	2.0-11.5	92	2.0-12.2	285	3.0-11.0
Channel catfish	70	2.6-25.0	61	1.7-24.2	40	3.7-15.2	59	3.5-18.0	54	4.0-20.1
Flathead catfish		-	3	19.5-22.0		-	2	19.2-30.0		-
Paddlefish		-	3	45.0-56.0	1	53.0-	1	29.0-	4	37.0-44.0
White bass	24	5.0-13.8	69	2.8-11.5	52	3.0-10.0	35	3.5-11.2	20	1.8- 9.9
Walleye	10	5.2-22.5	26	3.2-23.0	9	8.9-11.7		-	2	4.0-10.2
Sauger	10	13.8-21.9	23	3.5-16.8	22	6.0-15.5	85	5.7-20.5	26	4.0-15.8
Largemouth bass	9	3.5- 5.4	3	2.5- 8.0	11	3.2-13.2	2	16.5-17.0	2	2.0- 7.9
Bluegill	81	3.5- 6.0	10	1.5- 6.0	44	1.5- 6.5	9	2.0- 4.0	47	2.0- 6.7
Bullhead	1	7.3-		-	2	7.7- 8.5	2	7.7- 8.5	7	3.3- 8.5
Yellow perch	8	4.5- 7.0	1	5.2-	1	4.0-		-	5	2.5- 6.0
Northern pike	1	18.5-	9	16.0-23.5	3	15.0-21.9	9	17.5-21.0	12	13.1-19.0
Green sunfish	1	1.5-		-	4	1.5- 2.0		-		-
Orangespotted sunfish		-		-		-	3	2.0- 2.7		-
Non-game fish										
Gizzard shad	432	5.5-14.9	1375	2.0-15.2	514	2.5-16.7	1143	3.0-15.5	1951	2.0-15.1
Freshwater drum	14	4.5-18.5	260	2.0-14.5	43	2.0-13.5	87	3.0-16.0	606	2.0-15.5
Carp sucker	56	6.7-19.1	89	4.5-18.5	156	2.0-15.0	262	2.5-16.5	158	2.0-17.4
Gar	6	25.2-28.5	121	10.2-29.0	97	10.2-23.0	60	15.7-19.5	114	13.0-22.0
Carp	20	12.4-28.2	20	3.0-23.7	56	3.5-22.5	78	4.0-24.5	57	6.7-24.0
Bigmouth buffalo	21	17.5-29.1	9	16.0-25.0	9	3.0-18.5	27	15.5-24.0	26	7.7-24.5
Smallmouth buffalo	1	17.5-	15	12.0-26.0	11	9.0-22.0		-	1	14.7-
Goldeye	2	12.4-15.3	17	8.0-10.0	104	8.5-16.9	54	10.5-16.3	66	9.0-15.7
Redhorse		-	5	7.7-13.0	8	6.5-11.0	3	7.0-12.0	16	6.0-12.0
Small cyprinids	332	- 4.0	87	- 4.0	16	- 4.0	91	- 4.0	34	- 4.0
Total	2048		2644		1283		2102		3493	

\* Total length in inches.  
 \* Both black and white crappe.

Table 2. Total number and length range of fish caught at five Missouri River ox-bow lakes in 1964

	No. TL range		No. TL range		Decatur Bend		Snyder Bend		Omadi	
	De Soto Bend		Decatur		No.	TL range	No.	TL range	No.	TL range
Game fish										
Crappie*	616	2.5-11.5	119	3.8-12.0	248	3.0-11.6	123	3.0-11.4	275	3.0-11.1
Channel catfish	446	2.5-29.5	28	9.5-25.1	91	4.9-16.5	45	7.5-16.5	39	8.9-19.0
Flathead catfish	21	14.0-31.0	1	19.6-	-	-	-	-	2	21.5-26.1
Paddlefish	1	43.0-	1	46.3-	-	-	-	-	-	-
White bass	1	6.5-	86	5.4-13.7	89	3.0-12.5	119	3.0-13.6	111	2.0- 9.5
Walleye	6	6.0-22.5	19	20.3-26.9	21	8.3-17.5	2	6.5- 7.5	2	11.0-12.2
Sauger	11	4.5-23.0	24	4.0-23.2	3	9.5-10.0	36	5.0-11.3	7	4.5-10.5
Largemouth bass	9	4.0- 5.1	4	6.0-15.5	3	6.5- 8.0	-	-	-	-
Bluegill	112	4.6- 6.5	18	2.5- 6.8	57	3.0- 4.8	-	-	1	4.6-
Bullhead	9	2.5- 8.2	6	6.7- 9.5	8	5.2- 9.1	-	-	1	8.9-
Yellow perch	1	5.2-	2	4.0- 4.5	3	5.0- 7.5	2	3.0- 5.1	-	-
Northern pike	-	-	33	16.5-27.0	7	19.0-28.3	1	20.1-	1	16.8-
Orangespotted sunfish	18	1.5- 3.4	-	-	-	-	-	-	-	-
None-game fish										
Gizzard shad	186	4.5-16.5	2755	3.0-14.1	1069	3.0-16.3	1320	2.0-16.7	2266	3.0-15.6
Freshwater drum	97	2.5-18.2	356	3.0-24.5	143	3.0-14.0	392	2.0-14.7	668	3.0-15.4
Carp	122	6.4-17.5	357	5.8-18.0	297	4.0-18.0	257	3.0-14.2	390	4.0-21.0
Gar	1	23.0	57	11.5-27.2	153	13.5-27.5	114	17.5-26.5	132	13.5-25.5
Carp	61	4.7-29.0	39	8.5-24.0	56	8.0-25.5	57	10.2-23.1	75	4.0-22.0
Bigmouth buffalo	19	16.6-28.5	59	16.9-25.0	52	14.8-28.3	62	14.9-28.7	30	14.1-24.3
Smallmouth buffalo	20	18.0-22.5	2	14.7-16.0	8	11.5-16.5	3	17.1-18.0	-	-
Goldeye	-	-	3	11.2-11.6	61	8.9-16.7	34	11.3-16.0	41	11.0-16.0
Redhorse	-	-	7	6.9-13.2	13	6.7-13.6	11	3.0-12.7	5	10.0-12.2
Small cyprinids	403	- 4.0	17	- 4.0	80	- 4.0	12	- 4.0	-	-
Total	2160		3990		2462		2590		4046	

\* Both black and white crappie.

and 81% (De Soto Bend) of all game fish caught at each lake during the 1963 survey. In 1964 they made up between 34% (Decatur) and 62% (Omadi) of all game fish collected. White crappie and black crappie were caught in a ratio of approximately 10:1. This ratio is understandable since the lakes are fairly turbid during part of the year and white crappie are adapted to turbid water conditions.

Maximum total lengths of crappie collected from all lakes varied between 10.2 and 12.2 inches during the 1963 survey and between 11.1 and 12.0 inches during the 1964 survey. Mean observed total lengths for the 1-, 2-, and 3-year old crappie caught in DeSoto Bend during 1964 were 4.8, 6.7, and 7.2 inches, respectively. Total lengths of age group 111 crappie taken from the other lakes during 1964 ranged between 8.5 and 11.4 inches. Few crappie older than age group 111 were caught in any lake. Only four crappie in a sample of 174 collected from Decatur Lake in 1962 were from age group IV. None of the sample were older (Welker, 1962).

*Channel catfish.* These fish were abundant in all lakes. More than three times as many channel catfish were caught in De Soto Bend during 1964 than in any other lake either year. This most likely reflects the large number stocked in De Soto Bend since 1960. Approximately 160,000 fingerlings were planted in this lake prior to 1964.

Total lengths of channel catfish were considerably greater in De Soto Bend and Decatur than in the three lakes open to the river. At least 32 channel catfish were caught in De Soto Bend and Decatur in 1964 which were larger than any recovered from the other lakes during the same year. This suggests that relatively few large channel catfish inhabit the lakes open to the river or that growth of these fish is better in the lakes separated from the river. Longevity of these lakes is not a factor since Decatur is over 10 years old and De Soto Bend is less than 5 years old.

*White bass.* White bass were numerous at each lake during 1963. Total lengths ranged between 1.8 and 13.8 inches. They were also abundant in 1964, except at De Soto Bend. There is no apparent explanation for this. Electro-fishing surveys later in 1964 collected both young-of-the-year and adult white bass, although not in large numbers. Total lengths of white bass caught at all lakes during the 1964 survey ranged between 3.0 and 13.7 inches.

*Bluegill.* These fish were the fourth most abundant game fish caught each year. De Soto Bend has the best bluegill environ-

ment. Approximately twice as many were caught in this lake each year than were taken in any other lake. Total lengths recorded during 1963 ranged between 1.5 and 6.7 inches. Total lengths recorded in 1964 ranged between 2.5 and 6.8 inches.

*Sauger.* Sauger were caught in all lakes and ranked fifth in abundance among all game fish caught each year. Sauger of age group 0 through 111 were found in most lakes; however, most of the older fish were caught in the two lakes separated from the river. A few sauger older than 4 years were recovered during the surveys but could not be aged accurately. Reproduction of sauger in these lakes is limited.

*Walleye.* Walleye were caught in all lakes during 1964, and all lakes except Snyder Bend in 1963. Maximum total lengths were greater in Decatur and De Soto Bend than in the lakes open to the river. Reproduction of walleye in these lakes is limited.

*Northern pike.* These fish were not abundant in any lake. Decatur Lake, with its many acres of shallow water and dense stands of emergent vegetation, probably offers the best northern pike habitat among the five lakes. The 1964 Decatur survey had the largest number (33) of northern pike caught in any lake either year. Reduction in turbidity along much of the Iowa-Nebraska portion of the Missouri River, caused by the construction of upstream reservoirs, has probably been most responsible for the increased numbers of northern pike reported caught in this same area during recent years. These sight-feeding fish require a much less turbid water condition than was present in the river before reservoir construction.

*Miscellaneous Species.* Gar were the fifth most abundant fish caught during the 1963 survey and the sixth most abundant in 1964. Considerably fewer were taken from De Soto Bend both years than from any other lake. No young-of-the-year were collected from any lake.

Redhorse were taken in all lakes except De Soto Bend. This may be a sampling error since few were caught in the other lakes.

Fewer goldeye were caught in De Soto Bend and Decatur in either of the years than in the three lakes open to the river. This fish is abundant in the river, but apparently does not adapt well to areas separated from the river.

Carp were numerous at all lakes. The largest carp were caught in De Soto Bend.

Small cyprinids, less than 4 inches long, were collected from all lakes in 1963, and all lakes except Omadi in 1964. More than



three times as many were caught in De Soto Bend than in any other lake.

Both bigmouth and smallmouth buffalo were taken in all lakes; however, bigmouth buffalo were generally more abundant.

Twenty one flathead catfish were caught in De Soto Bend in 1964. Total lengths ranged between 14.0 and 31.0 inches. Only eight flathead catfish were collected from all other lakes in the 2 years.

Total lengths and weights of the eleven paddlefish caught in all lakes both years ranged between 29.0 inches (3.8 pounds) and 56.0 inches (42 pounds estimate).

Largemouth bass were not abundant, but were taken from all lakes. Total lengths ranged between 2.0 and 17.0 inches.

Orangespotted sunfish were caught only at Snyder Bend in 1963, and De Soto Bend in 1964. A total of five sunfish was taken from De Soto Bend and Decatur Bend in 1963. None were recovered at any lake during 1964.

Only 12 bullheads, ranging in total length from 3.3 to 8.5 inches, were caught in all lakes in 1963. The larger number caught in 1964 (24) is probably a reflection of the greater unit of effort expended during the 1964 survey. Total lengths recorded in 1964 ranged between 2.5 and 9.5 inches.

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