9.—REPORT OF INVESTIGATIONS RESPECTING THE FISHES OF ARKANSAS, CONDUCTED DURING 1891, 1892, AND 1893, WITH A SYNOPSIS OF PREVIOUS EXPLORATIONS IN THE SAME STATE.

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INTRODUCTION.

During the summer of 1891, the writer, accompanied by Prof. P. H. Rolf, of the Florida Agricultural College, spent five weeks in exploring certain parts of Arkansas, with the combined objects of obtaining information respecting the character of the different streams and the abundance and variety of their fishes, for the purposes of the U. S. Fish Commission, and of securing data to be used in the preparation of a report upon the fishes of Arkansas, for the State Geological Survey. The latter report was written a year ago, but the completion of the present paper has been delayed in order to include the results of later investigations made in 1892, the writer, in the meantime, having become a resident of the State, and having thus secured opportunities to work upon this subject to much better advantage.

In the spring of 1892, with the coöperation of Prof. J. McNeill and two students of the Arkansas Industrial University, visits were paid to several streams lying east of Fayetteville, namely: War Eagle River near Huntsville; King River at Marble; Big Buffalo River near Loafer's Glory; Little Buffalo River near Jasper; Walnut Fork of the Piney River at Swain; Mulberry River west of the Loafer's Glory; White River near Thompson.

The high water during this period of the year prevented our obtaining as much material as we would otherwise have expected, and War Eagle and Mulberry rivers were so much swollen as to make any collecting in them impossible. These investigations, however, were not without some good results, and subsequently they were extended to the streams in the neighborhood of Fayetteville.

The body of this report deals only with the explorations conducted during 1891, 1892, and 1893, but it closes with a synopsis of the published results of all former ichthyological work carried on within the borders of this State. Very much remains yet to be done in this direction, however, before we can expect to obtain even a fair knowledge of the fishes of the State and of the relations of the different river basins. The lowlands have hitherto been almost entirely neglected and scarcely enough has been ascertained regarding that region to indicate, even in a superficial way, the character of its fish fauna.

The uplands comprise the northwestern two-fifths of the State and belong to the Ozark Mountain region. The highest point of this area is a little less than 3,000 feet above sea level, while its average elevation is between one-third and one-half that amount. The surface is much broken, the rocks belonging chiefly to the Upper and Lower Carboniferous systems, a small portion to the Silurian. The remainder of the surface of Arkansas is either low and rolling or consists of low, flat alluvial lands, the former being mainly of Tertiary or Cretaceous origin, the latter Quaternary. The general dip of the rocks north of the Arkansas River is south. The outcrop in the northern portion of the State, as far east as Batesville, consists of a cherty limestone, with occasional pockets of light-colored sandstone which crumbles readily when exposed to the air. This formation also covers a large part of southern Missouri, and in it are formed nearly all of the prominent caves for which the contiguous parts of these two States are noted. In disintegrating, this limestone leaves many small angular pieces of flint lying on the surface or embedded in the soil. Much of the rainfall is quickly absorbed by the porous material thus formed, only to reappear again in the many large and beautiful springs so characteristic of this entire region. Mammoth Spring, in northern Arkansas, is the largest spring in the Mississippi Valley. Roaring River is a large spring, about 8 miles east of Seligman, Mo., and at present with 16 feet of head, about one-half of the water supplied is sufficient to drive two turbine wheels of 16 and 24 horse-power, respectively. A spring nearly as large as the last occurs about 5 miles east of Lowell, Ark., and there are other large springs near Springdale and Rogers. Johnson Spring, 5 miles north of Fayetteville, discharges about 2,500,000 gallons of water every 24 hours, and many others similar to the above will be found in different places.

A few of these springs are now utilized for fish-cultural purposes entirely by private individuals, except at Neosho, the site of the U. S. Fish Commission hatchery, which has yielded results far exceeding expectations. The Mammoth Spring hatchery has been very successful. The trout placed in the spring ponds near the waterworks at Rogers by the Government have done very well. Mr. Stultz, who has been raising carp near Springdale during the past four years, has found the business profitable, and proposes soon to stock some of his ponds with rainbow trout. As his facilities for this purpose are very superior, we are confident of his success. One of the springs near Johnson has been successfully used for rearing carp to a slight extent, but much larger ponds have been constructed there during the past year, and they will soon be stocked. Mr. Davidson and Mr. Williams, of Fayetteville, are also utilizing ponds supplied by springs for fish-culture on a small scale. There seems to be no reason why this branch of industry should not be greatly extended, and many small areas not suited for other purposes could be utilized in this way.

The drainage of Arkansas is entirely toward the Mississippi River, and may be subdivided into six smaller basins, namely, the St. Francis, White, Arkansas, Bayou, Ouachita, and Red River.

The St. Francis River has its origin in southeastern Missouri and drains only a small part of northeastern Arkansas, which, with the exception of Crowley's Ridge, is very swampy. It is a broad, deep, and slow-flowing stream, having no very important affluents in Arkansas. Its basin has never been visited by ichthyologists, but the fact that it comprises the sunken lands would make its study very interesting.

The White River rises in the northwestern part of Arkansas, flows northeasterly for a short distance through Missouri, and thence southeasterly, emptying into the Arkansas River near its mouth. Its basin is the largest in Arkansas, and comprises the greater part of the State north of the Arkansas River, including most of the Ozark Mountain region north of that river, which is, in some places, very rugged. The upper portion of this basin is chiefly covered with the cherty limestone already mentioned, in which are many caves and from which flow many large and beautiful springs. The upper two-thirds are covered with a heavy growth of timber, such as oak, pine, and cedar, which becomes still heavier in the lowlands, the most abundant varieties there being oak, yellow pine, poplar, ash, etc. The main river is navigable for small steamboats as far as Buffalo City, a distance of 200 miles from its mouth, except during periods of very dry weather. It has a moderately rapid current, and a rocky or sandy bottom; but from Newport toward the mouth the bottom consists of sand and mud, and the current becomes more sluggish. It is one of the clearest and most beautiful streams in the Mississippi Valley.

The more important tributaries of the White River are the War Eagle, Kings, Buffalo, and Little Red rivers, on the south, and the North Fork and Black rivers, on the north, within the boundaries of the State. At least half of the investigation with respect to the fishes of Arkansas has been done in this basin.

The Arkansas is the largest river in the State. Its waters resemble those of the Platte and Missouri, holding in suspension much sand and silt, which give it a muddy appearance, while the fishes taken from it have the pale, sickly look, characteristic of the fishes of those rivers. The few tributaries it receives from the salt region of southern Kansas make its waters slightly saline. The basin of the Arkansas extends entirely across the State in a general northwest and southeast direction; at the west it is half as wide as the State, but it narrows eastward until its width is reduced to scarcely more than 10 miles. It lies mostly in a sandstone district. The important tributaries within the State are all mountain streams, resembling those of the upper White and Ouachita rivers.

The Bayou Bartholomew drains a small portion of the State south of the mouth of the Arkansas River, the area included within its basin being low rolling or flat. No collections have ever been made in this region.

The Ouachita River, with its tributaries, drains most of the mountain region south of the Arkansas River, and thence flows through the rolling and low lands of the southeastern part of the State, passing into Louisiana. It resembles the White River, but drains less of the upland and more of the lowland. The fish fauna of this river and of the White is very similar to that of the upper Tennessee River. Some collections have been made in the upper tributaries of the Ouachita and in the river itself.

The Red River drains only a small part of southwestern Arkansas, a low, gently rolling region. It bears a close resemblance to the Arkansas River, its waters being nearly always turbid from the fine silt brought down from the upper part of its basin. The only collection of fishes from this basin was obtained at Fulton, in 1884, by Dr. David S. Jordan and Prof. Charles H. Gilbert.

The extent of the territory drained by each of these river systems is as follows: White River, 17,470 square miles; Arkansas River, 12,300 square miles; Ouachita

River, 11,200 square miles; Red River, 3,780 square miles; Bayou Bartholomew, 2,650 square miles.

From an ichthyological standpoint Arkansas is well favored. The State is bordered on the east by the Mississippi, and has four large navigable rivers flowing through it. Two of these rivers, with most of their tributaries, rise in the Ozark Mountains within the boundaries of the State. These streams are fed by many large and beautiful springs, whose waters are cool enough for the mountain trout, their suitability being well demonstrated by the success which has attended trout-culture at the several hatcheries already mentioned. In fact, it has been proven, not only that trout will thrive in the Ozark Mountain region, but that their growth there is much more rapid than in some other places farther north, where their artificial cultivation is being carried on. The important question for the consideration of the practical fish-culturist is, how many pounds of fish he can secure from a certain number of eggs within a given period and with the least expenditure for artificial food. The records of the Neosho hatchery clearly indicate that fish-culture can be conducted successfully in this direction. While the mountain streams bid fair to contain an abundance of trout in the near future, the larger and more sluggish waters are well suited to the coarser food-fishes native to the State, the most important among them being the black bass, wall-eyed pike, eastern pickerel (*Lucius reticulatus*), buffalo-fishes, etc.

All of the important rivers mentioned supply many fishes to the markets every year, and they may continue to do so if assistance shall be given toward restoring, so far as possible, the balance of life in favor of those species which man has done so much to destroy.

These streams drain large areas of woodland and a region in which there is a considerable amount of rainfall, well distributed throughout the year. In the rocky and lower mountainous regions, intermediate between the mountain and lowland levels, the streams have cut deep and wide beds, in many places forming small lakes and affording habitation for the larger fishes during the drier portion of the year.

There is no doubt that Arkansas possesses piscatorial features of a high grade, which warrant more attention in the future than they have received in the past. The angler may find amusement along the picturesque streams of the Ozark Mountains, while the fish-culturist will come to recognize in this region one of his richest fields in North America.

Arkansas is as yet only thinly settled, and a thorough exploration of the streams of the State before their faunæ have been much changed by cultivation would be of great economic and scientific interest. The increase and protection of her food-fishes, both the native and introduced species, can not be successfully accomplished without a more complete knowledge of the physical and natural-history features of the streams, and it is to be hoped that the means for making such a survey will not long be delayed.

TROUT-REARING AT NEOSHO, MISSOURI.

The following notes on some of the methods and results of rearing trout at the U. S. Fish Commission station, at Neosho, Mo., kindly furnished me by Mr. W. F. Page, the superintendent of that station, will be read with interest in this connection:

On the files of the Neosho station are quite a number of letters detailing catches of rainbow trout, 3 to 7 pounds in weight, in the Ozark waters in 1893. The majority of the fish caught were from plants of yearling fish made from the Neosho station in 1891, though some were the results of fry planted by the Missouri Fish Commission in 1880; notably, those caught in Lawrence and Pulaski counties, Missouri. That these fish may have an opportunity to get a start and a firm hold on these waters, and to commence natural reproduction, it is not deemed politic at this time to make public the names of the streams and the localities where they are known to be acclimated. In general, it can be accepted that wherever in the Ozark system healthy trout have been planted, with due regard to the conditions of local environment, all reasonable expectations have been realized. This is to be accounted for partly by the fact that the streams are in the main fed by bold, generous, warm springs (ranging in temperature from 57° to 59° F.) preserving a nearly equable temperature; and by the further fact that in nearly all these streams there exists a multitude of organisms suited to the diet of the *Salmonidæ*. My limited observations lead me to believe that this latter important factor is more pronounced in those waters having their rise on the southern and eastern slope of the Ozark uplift. Several of the smaller streams could be mentioned which have, to all appearances, the same conditions, except that they are of higher temperature (but fortunately they are *not too high*), as the celebrated trout streams of Caledonia, N. Y., and Castalia, Ohio.

The cultivation of trout at the Neosho station on the one side, and at the Mammoth Spring hatchery on the other side of the uplift, met with unprecedented success. On the inauguration of the effort it was doubted by many if trout could be grown so far south of their natural habitat. The experience of these two establishments has not only demonstrated that they can be grown in this latitude, at the low elevation of 1,000 feet and less, but grown to a size in a given time not surpassed by any hatchery in the world, and further, that not only are their generative organs not stunted by this forcing process, but that they develop in from one to two years sooner than in other localities. Yearling trout which were shipped in 1891 from Neosho to Castalia, Ohio, were there pronounced from size and appearance to be past 2 years old. Nearly half a million trout eggs shipped from Neosho in the winter of 1892–93, to States ranging from Nebraska to Vermont, were pronounced in every case to have produced first-class vigorous fish. These eggs were the *surplus* yield from 3-year-old trout raised at Neosho. The same stock at 2 years old had given us a handsome lot of eggs.

A study of the accompanying tables will show that in this country trout can be made to attain the best marketable weight, namely one-fourth to one-third of a pound, by the end of their fourteenth month, at a cost of less than 7 cents a pound. From the study at present being given to the subject of the food of fishes under domestication, it is not improbable that in the near future this cost may be reduced 50 per cent. As it is, trout at 7 cents a pound gives a handsome revenue on the wholesale market price of 40 cents.

The fish-culturist engaged in rearing the finer grades of fish for the market can find no better water and climate for his work than is furnished by the uncounted springs of the Ozarks. It is here, in the shortest time, with the least expenditure of food materials, that he can convert his eggs into pounds of trout.

FEEDING AND GROWTH OF RAINBOW TROUT IN THEIR SECOND YEAR.

On February 20, 1893, we counted 1,500 13-months-old extra-select rainbow trout into pond No. 2, to be raised for future brood stock. Their total weight was 140·5 pounds, an average of 93·67 pounds per 1,000; their average length was 7 inches each.

April 26, 1893 (65 days afterward), these trout were reweighed and found to average 260 pounds per 1,000, and to measure from 8 to 9 inches, being an increase in weight of 178 per cent. During these 65 days they had been given 185 pounds of liver and 1,008 pounds of mush, costing $9.29; or each pound of trout gained (after the 20th of February) cost a fraction over 3⅞ cents.

May 20, 1893, 90 days after the fish were first put into No. 2 pond, they were again reweighed and found to average 320 pounds to the 1,000 fish and to run from 9 to 9½ inches long, being an increase in

weight of about 241 per cent. During these 90 days they had been given 305 pounds of liver and 1,627 pounds of mush, costing $17.01; or each pound of trout gained (after the 20th of February) cost a fraction over 5 cents.

Prior to April 1, 1893, liver cost 3½ cents a pound; after that the price was 4½ cents a pound. The cost of mush remained unchanged, namely, ¼ cent a pound.

Up to the time these fish were transferred to pond No. 2 they had been all the time in a pool 8 feet by 22 feet, among a lot of 6,000 other yearlings. The element of range so essential to the growth of fish was entirely lacking, as was also that of space and natural pasturage. Pond No. 2, into which they were transferred, supplied to a certain extent these requisites. It has a water surface of about 12,000 square feet and a greatest depth of 36 inches, whereas the pools had a greatest depth of only 2 feet, wooden sides and bottom, and with a constant change of 55 gallons of water per minute, the maintenance of pasture under these conditions being impossible. Pond No. 2 is, for at least a quarter of its area, less than 6 inches in depth, containing considerable aquatic flora and breeding no little natural food.

The following table gives the details of the food and cost of 28,000 rainbow trout raised at Neosho, Mo., Station, from fry to yearlings, on a mixed diet of beef, liver, and mush, commencing when the fry were transferred to the outdoor pools, April 1, 1892, and ending January 31, 1893:

Period.	Daily allowance.		Total for the month.	
	Liver.	Mush.	Liver.	Mush.
	Pounds.	*Pounds.*	*Pounds.*	*Pounds.*
30 days of April	7·0	8·4	210·0	252·0
31 days of May	7·0	8·4	217·0	260·4
60 days of June	8·4	25·2	252·0	756·0
31 days of July	6·3	35·0	195·3	1,085·0
31 days of August	12·0	45·0	372·0	1,395·0
30 days of September	12·0	60·0	360·0	1,800·0
31 days of October	12·0	54·0	372·0	1,674·0
30 days of November	12·0	60·0	360·0	1,800·0
31 days of December	15·0	60·0	465·0	1,860·0
31 days of January	15·0	60·0	465·0	1,860·0
306 days			3,268·3	12,742·4

3,268·3 pounds of liver, at 3½ cents a pound, cost $114·39; 12,742·4 pounds of mush, at ¼ cent a pound, cost $31·86; cost of food for 28,000 rainbow trout from April 1 to January 31, $146·25.

Cost per 1,000, $5·22, or each fish cost a fraction over ½ cent. Average cost per day per 1,000 was 1·707 cents.

Average allowance per day (per 1,000) was 1·87 pounds of the mixture (in the proportion of 1 of liver to 3·79 of mush).

The fish were two sizes. On February 11, 1893, they were measured and weighed—

4 000 averaged 7 inches long and 107·5 pounds per 1,000, or ..... 430 pounds gross.

24,000 averaged 5½ inches long and 42·5 pounds per 1,000, or ..... 1,020 pounds gross.

28,000 yearlings weighed ..... 1,452 pounds gross.

A cost per pound of a fraction over 10 cents.

Specimens of trout shipped from Neosho Station to Washington, D. C., January 25, 1892, to be cast for the World's Fair.

No. 1. Rainbow trout. Male fish. Hatched from eggs received from Wytheville Station in January, 1890. Weight, 30 ounces; age, 2 years.

No. 2. Same as No. 1. Weight, 21 ounces; age, 2 years.

No. 3. Brook trout. Hatched from eggs received from Northville Station January 25, 1891. Weight, 6 ounces; age 12 months.

No. 4. Same as No. 3. Weight, 6·5 ounces; age, 12 months.

No. 5. Von Behr (*S. fario*) trout. Hatched from eggs received from Northville Station February 5, 1891. Weight, 3·5 ounces; age, 11 months.

No. 6. Same as No. 5. Weight, 3·5 ounces; age, 11 months.

No. 7. Rainbow trout. Hatched from eggs received from Wytheville Station on January 17, 1891. Weight, 3 ounces; age, 12 months.

No. 8. Same as No. 7. Weight, 1·5 ounces; age, 12 months.

On February 11, 1893, at Neosho Station, the weighing of yearling rainbow trout showed that—

	Lbs.
100 of the largest, mush and liver fed, 7 inches long, weighed	10·75
100 medium size, mush and liver fed, 5·5 inches long, weighed	4·25
100 smallest size, fed on mush *only*, 4 inches long, weighed	2·75

The following table, showing the rainfall at Little Rock, Ark., by monthly averages, during the past fourteen years, from 1880 to 1893, inclusive, was prepared by the director of the U. S. Weather Bureau Station at that place:

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1880.....	4·64	7·95	7·60	4·69	2·44	3·23	3·37	5·53	5	2·07	6·84	3·03
1881.....	2·07	6·34	2·38	1·94	5·51	6·02	1·95	1·42	1·87	4·69	6·50	2·34
1882.....	8·17	12·74	6·25	5·59	15·91	1·96	5·17	3·17	3·03	6·05	6·17	1·33
1883.....	5·44	6·47	4·24	8·92	4·17	3·01	4·83	2·30	3·67	5·55	3·13	3·80
1884.....	3·45	9·79	4·67	10·24	7·33	2·18	4·23	3·26	5	1·30	2·83	16·92
1885.....	4·41	2·43	3·84	6·03	3·26	3·39	1·13	1·95	2·06	1·03	2·64	3·74
1886.....	3·97	4·27	3·45	3·09	1·13	9·28	2·97	5·31	6·24	1·07	5·81	·88
1887.....	2·26	6·42	4·54	·49	6·08	2·20	1·74	1·18	1·04	·97	4·50	7·14
1888.....	4·94	2·49	5·06	·84	5·09	7·25	3·78	11·13	1·33	2·39	8·82	4·43
1889.....	7·30	1·48	6·17	4·28	2·97	3·07	7·59	3·06	5·96	1·99	10·20	·14
1890.....	8·48	6·48	5·79	7·77	6·16	8·28	1·83	2·59	5·55	2·75	5·21	2·83
1891.....	7·68	3·90	5·48	3·29	2·38	2·81	9·23	2·66	·87	1·30	5·32	6·40
1892.....	3·92	3·44	2·55	7·53	9·62	2·48	3·10	6·63	3·54	2·82	8·02	8·48
1893.....	6·83	5·48	4·47	5·83	13·25	4·76	2·32	2·32	·73	·51	3·79	.....

DETAILED ACCOUNT OF THE INVESTIGATIONS.

WHITE RIVER BASIN.

The White River has its origin in three branches which unite 8 or 10 miles east of Fayetteville. These branches are known as Main, Middle, and West Forks of White River. The Main Fork is the largest and is the only one deserving to be called a river. The West Fork is the smallest and is only a moderate-sized creek. These streams are all very similar in character. Their currents are very swift and their bottoms usually rocky or gravelly. All have their source in the northern slope of the Boston Mountains and drain, for the most part, a sandstone country. The general dip of the rocks in this region is too much to the south to be favorable to the formation of large springs. A number of springs are formed, but none are important. These streams become very low during the driest portion of the year, and the water in them is then confined to the deeper places in their beds, forming long, deep pools, with little or no running water between them. There are very few bayous formed in these river bottoms, and none of any size. Below the junction of these three forks the White River becomes a stream of some importance. It cuts through the cherty limestone previously mentioned, which forms its bed most of the distance to Newport, and it also drains most of the cherty limestone region in Arkansas and Missouri, as explained above. The river and its largest tributaries are fed by many spring brooks. At most places visited, viz, near Fayetteville, Eureka Springs, and Batesville, its bed is usually gravelly or sandy, with occasional stretches of rocky or muddy bottoms. Except a short time after a rainy season the water in the river is quite clear. Taken all together the White River is one of the clearest and most beautiful streams in the Mississippi basin.

King River was visited near Marble during the spring of 1892. It is a very clear stream, flowing over a sandy and shingly bottom. It is also fed by many springs in the cherty limestone through which it flows for the greater portion of its course.

The War Eagle is a tributary of the White River, some distance above King River, which it exceeds in size. It is reported to be the best stream for fish in northwestern Arkansas. It is not uncommon for anglers to cross the one or two forks of the White River and travel some 15 miles over a rough road in order to try their fortunes in the

War Eagle River. The black basses, called "trout," are the favorite fishes, although wall-eyed pike and channel cat are found in moderate quantities. No collections were made from this stream.

Near Batesville we visited three northern and one southern tributary of the White River. Laferty Creek is some 10 to 15 miles up the river from Batesville. It is a small stream, with clear water and a rocky, sandy, and muddy bottom. It is fed by springs and is too small to be of much importance. Spring Creek is about 10 to 12 miles in length, and is fed almost entirely by what is known as Big Spring. A short distance below the spring a dam is constructed, above which is a lake, about an eighth of an acre in extent. In the dry season, by storing water at night in this lake, enough water can be had to run an 8-horse-power turbine during the day. Below the spring the valley is narrow and subject to overflows; otherwise this would afford an excellent site for a hatchery. We collected in the stream below the dam and about half way from the dam to its mouth. Its water is very cool, especially when compared with the water in Laferty Creek, White River, and Polk Bayou. Polk Bayou is the largest tributary near Batesville. It is similar to Laferty and Spring Creek. Miller Creek is a small tributary of Polk Bayou. Salado is a small tributary on the south side of the river, a short distance below Batesville. The region drained is mostly covered by sandstone. Where visited by us the bottom was too rocky to admit of successful seining. A short distance below the water was very deep and full of large fragments of rock. Large gars could be seen coming occasionally to the surface. Between this point and its mouth the Salado flows through the White River bottom with a slow current in a deep, narrow channel. Caney Creek is a small tributary of the Salado near Batesville. It is similar to the Salado, though much smaller.

The next important tributary of White River is Black River, which empties into the White a short distance above Newport. The Black is a very large stream and navigable for small boats as far as Pocahontas, almost its entire length in Arkansas. The Current rivers, its most important tributaries, rise in southern and eastern Missouri. The waters of the Black River are quite clear, though they are stained to some extent apparently by vegetation, giving it a dark appearance, from which, no doubt, its name was derived. We visited this stream at Black Rock. It is from 50 to 200 yards in width and flows mostly through a deep channel, with sandy and muddy bottoms; along its course are many shoals with sandy and rocky bottoms. It is fed mostly by spring brooks and rivers, and is an excellent stream. The region about Black Rock is heavily timbered, pine, poplar, elm, oak, and ash being the commonest of the larger lowland trees. Black Rock is noted for its large number of sawmills.

Spring River is a western tributary of Black River, into which it empties a short distance above Black Rock. It is the outlet of Mammoth Spring, one of the largest springs in the United States, and is about half the size of Black River above the point where it enters. The current of Spring River is swift, its bottom more rocky and sandy than that of the White. Our collections were made a short distance above the mouth of the river.

The Strawberry is also a western tributary of the Black. It is little more than a large creek and goes nearly dry in summer. Its current is moderate, but rather swifter than that of Spring River, the bottom being more rocky. It was visited near Smithville. Flat and Machine creeks are small northern tributaries of the Strawberry. They dry up in summer and are too small to be of any consequence.

The Buffalo rivers are southern tributaries of the White River, and, no doubt, drain the roughest and most rugged portion of the Ozarks, if not the most elevated. The current of both these streams is swift and the bottom rocky. They were visited near Jasper and Loafer's Glory in the spring of 1892, when the water was too high to admit of successful collecting.

Village Creek is a small stream near Newport. It is so full of snags that collecting was almost impossible, and only a few common species were taken.

LIST OF THE FISHES OF THE WHITE RIVER BASIN.

1. **Lepisosteus osseus** (Linnæus). *Long-nosed Gar Pike; Common Gar Pike.* Common in White River at Batesville and Oxford Bend, and in Strawberry River at Smithville. Many large specimens of this species and the short-nosed forms were observed in White River at Newport; also in Salado Creek near Batesville.
2. **Polyodon spathula** (Walbaum). *Paddle-fish; Spoon-billed Cat.* White River at Oxford Bend; an occasional specimen taken.
3. **Ictalurus punctatus** (Rafinesque). *Channel Cat; White Cat.* Common in White River at Batesville, Strawberry River at Smithville, and in the Middle and Main Forks of White River at Fayetteville. Specimens can frequently be seen in the Fayetteville markets. Most of them are caught in fish-traps between Wyman and Oxford Bend.
4. **Ameiurus nigricans** (Le Sueur). *Great Catfish; Mississippi Cat.* A catfish weighing 67 pounds was caught in a fish-trap near Oxford Bend in the spring of 1892. I did not see it, but from what I learned about it I presume it belonged to this species. Other large catfishes are reported to have been caught in the White River near Fayetteville, and I have no doubt some of them belong to *Leptops olivaris*.
5. **Ameiurus nebulosus** (Le Sueur). *Common Bullhead; Horned Pout.* Miller Creek at Batesville; Black River at Black Rock. This species seems to be rare in the Ozark Mountain region.
6. **Ameiurus melas** (Rafinesque). *Bullhead.* Scarce in the White River and Polk Bayou at Batesville, but common in Spring Creek at the same place. Evidently more abundant than the preceding species.
7. **Noturus nocturnus** Jordan & Gilbert. A few small specimens from Spring River near Black Rock.
8. **Noturus gyrinus** (Mitchill). *Stone Cat.* A few specimens were obtained from Flat and Machine creeks at Smithville.
9. **Noturus miurus** Jordan. Thirty-seven specimens from the Middle Fork of White River, Fayetteville; 12 from the Main Fork; and 2 from White River at Oxford Bend. The longest is from Oxford Bend and measures 2¼ inches. Nearly all the others are from 1¾ to 2¼ inches in length; head, 4; depth, 5½ to 6; anal rays, 11 to 13, usually 12; pectoral spine moderate; its length equal distance from tip of snout to posterior margin of orbit. On its inner margin are 6 retrorse spines; its outer margin smooth; occasionally one or two small spines on outer margin and near its tip. Top of head flattish, or slightly concave between orbits; mouth rather large. Origin of ventrals behind last dorsal rays. Color, light olivaceous, punctated with dark dots. Top of head darker; 4 dark bands on back, extending as faint bands on sides. Caudal fin with a dark band at its base, and one also near its tip. No dark spot on dorsal fin. These specimens differ from typical *miurus* in the smaller pectoral spine, with unserrated outer margin. It also has a more slender body.
10. **Noturus exilis** Nelson. Middle Fork of White River at Fayetteville (scarce).
11. **Noturus eleutherus** Jordan. One specimen from the Main Fork of White River at Fayetteville, and one from Sallisaw River near Makey's store. Length, 1¾ inches; head, 3½; depth, 6; anal rays, 13. Pectoral spine large, 7 retrorse teeth on the inner margin, longer than the diameter of the spine; outer margin strongly toothed with from 18 to 25 teeth. The outer teeth are turned toward the tip of spine; those nearest base, toward base of spine, while those nearest the middle of the spine are directed at right angles to the spine. Mouth very small; head pointed; top of head convex. Origin of ventrals under last dorsal ray. Pectoral spine, 1½ in the length of the head. Eye larger than in the preceding species. Color similar to *N. miurus*. A dark band across nape from one pectoral fin to the other; a dark band at base of dorsal fin, extending faintly on sides of body; 3 black bands behind dorsal fin; tip of caudal black.

12. **Ictiobus urus** (Agassiz). *Razor-back Buffalo.* I saw several large specimens of buffalo-fish in possession of fishermen near Batesville. They were caught on a hook baited with cotton and cornmeal. I was unable to identify the species with certainty. Buffalo-fish of large size are reported to be quite common in the White River.

13. **Catostomus nigricans** Le Sueur. *Hog Sucker; Stone-roller; Stone-toter.* This is a very common species in the Ozark Mountains, and seems to prefer clear streams. Rare in White River at Batesville, but abundant in Laferty and Spring creeks at Batesville, Black River and Spring River at Black Rock, Strawberry River at Smithville, Big Buffalo River and King River at Marble, middle and main forks of White River at Fayetteville.

14. **Erimyzon sucetta** (Lacépède). *Chub Sucker.* This species appears to be rare throughout the Ozarks. It is seldom taken except from stagnant ponds, bayous, or deep still water, in streams of rather small size. A few specimens were obtained at Batesville, from White River, Salado, Conley and Spring creeks.

15. **Moxostoma duquesnei** (Le Sueur). *Common Redhorse.* Common in White River, Polk Bayou, Salado, Caney and Spring creeks at Batesville; scarce in Village Creek at Newport; common in Black and Spring rivers at Black Rock, Strawberry River and Flat and Machine creeks at Smithville, Kings River at Marble, Middle and Main forks of the White River at Fayetteville. This species is easily confounded with *P. carinatus* Cope. In the White River basin it is the more common.

16. **Minytrema melanops** (Rafinesque). *Striped Sucker.* Obtained in Spring, Salado, and Caney creeks at Batesville, but only one specimen in each stream. This species is very scarce or very difficult to capture in our collecting seines. It seems to prefer still and deep water.

17. **Placopharynx carinatus** Cope. This species very much resembles *Moxostoma duquesnei.* It is more abundant in lowland than in mountain streams. A few specimens were taken in Black River at Black Rock.

18. **Cycleptus elongatus** (Le Sueur). *Missouri Sucker.* One large specimen was taken in Black River at Black Rock. This species lives in large streams and is difficult to capture. It is far from being abundant.

19. **Campostoma anomalum** (Rafinesque). *Stone-lugger; Stone-roller.* A very common and in some places a very abundant species in the Ozark region. It prefers spring brooks. Specimens were taken as follows: In the White River, Polk Bayou, Miller, Laferty, and Spring creeks at Batesville (common); Black and Spring rivers at Black Rock (scarce); Strawberry River, Flat and Machine creeks at Smithville, Big and Little Buffalo rivers at Jasper, and Middle and Main forks of the White River at Fayetteville (common).

20. **Hybognathus nuchalis** Agassiz. *Silvery minnow.* White River, Polk Bayou; Miller, Salado, and Caney creeks at Batesville (abundant); Laferty Creek at Batesville (common); Black and Spring River at Black Rock (scarce); Strawberry River at Smithville (scarce). The body of many of the specimens from Black Rock are more compressed than usual. A very abundant and variable minnow in the Ozarks.

21. **Hybognathus nubila** (Forbes). White River and Laferty Creek at Batesville (scarce); Big Buffalo River (common); King River at Marble (scarce); Main and Middle forks of White River at Fayetteville (abundant); West Fork of White River at Greenland (scarce).

22 **Chrosomus erythrogaster** Rafinesque. *Red-bellied minnow.* Spring Creek at Batesville (abundant); King River at Marble (common); Big Buffalo River and Little Buffalo River at Jasper (scarce). Very common in spring brooks throughout the Ozarks.

23. **Pimephales notatus** (Rafinesque). *Blunt-nosed Minnow.* White River and Polk Bayou at Batesville (scarce); Salado, Caney, and Laferty creeks at Batesville (common); Strawberry River, Flat and Machine creeks at Smithville; Big Buffalo River at Jasper (scarce); King River at Marble and Spring River at Black Rock (common); West Fork of White River at Greenland and White River at Oxford Bend (scarce); Main and Middle forks of White River at Fayetteville (abundant).

24. **Cliola vigilax** Girard. Taken in White River, Salado and Caney creeks at Batesville, and in Black River at Black Rock; but scarce at all of these places.

25. **Notropis blennius** (Girard). *Blunt-nosed Minnow.* Black River and Spring River at Black Rock. The types (2 specimens) of *Notropis* (*Moniana*) *deliciosus* are from Rio Leon, near San Antonio, Tex., and are preserved in the U. S. National Museum. The types of *Notropis*

(Alburnops) blennius are from Arkansas River near Fort Smith. The specimens listed above are identical with *N. blennius*. The types of *N. deliciosus* differ in being a little more slender and in having a more pointed snout and smaller preorbital bone. *N. blennius* is the older name and should be used for this species; *N. deliciosus* representing the most southern variety of this exceedingly variable species.

26. **Notropis ozarcanus** Meek. Salado and Caney creeks at Batesville; Strawberry River at Smithville (scarce).

27. **Notropis shumardi** (Girard).

Notropis (Alburnops) shumardi Girard, Proc. Acad. Nat. Sci. Phila. 1856, 194 (Arkansas River at Fort Smith, types); Girard, Fishes Pacific R. R. Survey, 1858, 261 (Arkansas River at Fort Smith, types).

Notropis boops Gilbert, Proc. U. S. Nat. Mus. 1884, 201 (Salt Creek, Brown County, Ind., and Flat Rock Creek, Rush County, Ind., types).

Notropis scabriceps Jordan & Gilbert, Proc. U. S. Nat. Mus. 1885 (White River, Eureka Springs, Ark., in part).

The types of *Alburnops shumardi* Girard have never been found. His description and figure would suggest *Notropis boops* Gilbert, rather than any other species so far known from western Arkansas, unless it be one of the other species figured on same page of Dr. Girard's paper, *Alburnops blennius* or *Alburnops illecebrosus*. *Notropis boops* Gilbert, is a very common species in the Ozark Mountain region, and it seems not unlikely to have been in Dr. Girard's collection. *Alburnops blennius* and *illecebrosus* of Girard are distinct species and different from *Notropis boops* of Gilbert. The specimens from White River, Eureka Springs, recorded by Drs. Jordan and Gilbert as *Notropis scabriceps*, are for the most part the *N. boops* of Gilbert. A few specimens are *N. arcansanus* Meek. The description evidently is that of *N. boops* Gilbert, which is here regarded as identical with *Notropis shumardi* (Girard). White River and Polk Bayou, Batesville, scarce; Black River.

28. **Notropis whipplei** (Girard). *Silver-fin.* Common in White River, Polk Bayou; Miller, Salado, and Caney creeks at Batesville; Strawberry River at Smithville, and in the main and middle forks of White River at Fayetteville; scarce in Laferty Creek at Batesville.

29. **Notropis venustus** (Girard). *Black-tailed Minnow.* White River at Batesville (scarce); Polk Bayou and Miller Creek at Batesville (common); Black and Spring rivers at Black Rock (abundant).

30. **Notropis xænocephalus** (Jordan). Scarce in White River at Batesville and Spring River at Black Rock; common in Black River at Black Rock. This species resembles *N. shumardi*, but has a smaller eye, dorsal fin more posterior, and a small black spot at the base of the caudal fin. The specimens recorded as *N. shumardi*, in the Bulletin of the U. S. Fish Commission for 1889, p. 121, with small black spot at base of caudal, belongs to this species. I have recently compared these specimens with the types of *N. xænocephalus* in the U. S. National Museum at Washington, and find no difference except such as would be expected among specimens preserved in alcohol.

31. **Notropis cornutus** (Mitchill). *Common Shiner.* Polk Bayou, Laferty and Spring creeks at Batesville (abundant); Salado and Caney creeks at Batesville; Black River at Black Rock (common); Spring River at Black Rock; Strawberry River, Flat and Machine creeks at Smithville; King River at Marble; Big Buffalo River (scarce); Little Buffalo River, Jasper (common); Main and Middle forks of White River, Fayetteville (abundant). It is difficult to distinguish the young of this species from the young of *Notropis zonatus*. This species is the more common in ordinary streams, the other is found more in spring brooks.

32. **Notropis zonatus** (Agassiz). White River, Polk Bayou, and Laferty Creek at Batesville; Black River and Spring River at Black Rock (scarce); King River at Marble (common); Middle Fork of White River at Fayetteville and Big Buffalo River (abundant).

33. **Notropis umbratilis** (Girard). White River, Polk Bayou, Salado, Caney, and Spring creeks at Batesville (scarce); Flat and Machine creeks at Smithville (common). This minnow is extremely variable in form and color. Some individuals have a very deep and much compressed body, and the deeper specimens are usually the darkest in color.

34. **Notropis galacturus** (Cope). *Milky-tailed Minnow.* Polk Bayou and Laferty Creek at Batesville (scarce); Spring River at Black Rock and Strawberry River at Smithville (common); Main Fork of White River at Fayetteville (scarce).

35. **Notropis telescopus arcansanus** (Meek). This species is scarce in Laferty, Salado, and Caney creeks at Batesville, Strawberry River at Smithville, and the Main and Middle forks of the White River at Batesville; but is abundant in Little Buffalo River at Jasper and Big Buffalo River. Many females taken from the Little Buffalo River were full of mature eggs. Their breeding season seems to be about the last of May or first of June.
36. **Notropis atherinoides caddoënsis** (Meek). Taken in White River and Miller Creek (common); Polk Bayou and Laferty Creek (abundant) and Salado and Caney creeks (scarce) at Batesville; Village Creek at Newport and Spring River at Black Rock (abundant); Black River at Black Rock (common).
37. **Notropis dilectus** (Girard). *Emerald Minnow.* White River at Batesville (abundant); Polk Bayou at Batesville (common); Laferty, Salado, and Caney creeks at Batesville, Black and Spring rivers at Black Rock, and Middle Fork of the White River at Batesville (scarce).
38. **Hybopsis dissimilis** (Kirtland). *Spotted Minnow.* White River at Batesville (scarce).
39. **Hybopsis amblops** (Rafinesque). White River and Polk Bayou at Batesville (scarce); Big Buffalo River (common); Little Buffalo River at Jasper (abundant); Strawberry River at Smithville; West Fork of White River at Greenland; Main and Middle forks of the White River at Fayetteville (scarce).
40. **Hybopsis kentuckiensis** (Rafinesque). *Horny-headed Minnow.* Taken at Batesville in Laferty Creek (scarce); Spring Creek (common).
41. **Semotilus atromaculatus** (Mitchill). *Horned Dace; Creek Chub.* Polk Bayou and Laferty Creek at Batesville (scarce); Spring Creek at Batesville; Flat and Machine creeks at Smithville (common); Big Buffalo River (scarce); King River at Marble.
42. **Notemigonus chrysoleucus** (Mitchill). *Golden Shiner.* White River and Polk Bayou at Batesville (scarce); Salado, Caney, and Spring creeks at Batesville (common).
43. **Opsopœodus emiliæ** (Hay). Salado and Caney creeks at Batesville (scarce). Teeth, 5-5; scales, 41. No black on dorsal fin; due, no doubt, to the specimen having faded.
44. **Dorosoma cepedianum** (Le Sueur). *Gizzard Shad; Hickory Shad.* White River at Batesville, Black River at Black Rock; White River at Oxford Bend; scarce at all of these places.
45. **Clupea chrysochloris** (Rafinesque). *Skipjack.* White River at Batesville (scarce).
46. **Fundulus catenatus** (Storer). *Studfish.* White River and Polk Bayou at Batesville (scarce); Spring River at Black Rock; Flat and Machine creeks at Smithville (common); King River at Marble; Big Buffalo River (abundant); West Fork of White River at Greenland; Main and Middle forks of White River at Fayetteville (scarce).
47. **Zygonectes notatus** (Rafinesque). *Top-minnow.* White River, Polk Bayou, Salado and Caney creeks at Batesville (common); Laferty and Spring creeks at Batesville (scarce); Village Creek at Newport and Black River at Black Rock (common); Spring River at Black Rock (scarce); Strawberry River; Flat and Machine creeks at Smithville (common); Main and Middle forks of White River at Fayetteville (common).
48. **Gambusia affinis** (Baird & Girard). Polk Bayou at Batesville (common); Spring Creek at Batesville (abundant); Black and Spring rivers at Black Rock (common); Strawberry River at Smithville (abundant); Salado and Caney creeks at Batesville (scarce). Many of the females were full of young, especially those from Spring Creek, taken the second week in August.
49. **Lucius vermiculatus** (Le Sueur). *Little Green Pickerel.* Spring Creek at Batesville and Black River at Black Rock (common).
50. **Lucius reticulatus** (Le Sueur). *Eastern Pickerel.* Spring Creek at Batesville, not common. A few specimens were taken from a deep hole in the stream.
51. **Anguilla chrysypa** Rafinesque. *Common Eel.* Black River at Black Rock. One specimen was taken on the shoals, a short distance above the city. White River at Oxford Bend (scarce).
52. **Labidesthes sicculus** (Cope). *Brook Silverside.* White River, Polk Bayou, Salado and Caney creeks at Batesville (scarce); Village Creek at Newport (common); Spring River at Black Rock (scarce); Black River at Black Rock; Strawberry River at Smithville (common); Big Buffalo River (scarce); King River at Marble and Main and Middle forks of White River at Fayetteville (scarce).
53. **Aphredoderus sayanus** (Gilliams). *Pirate Perch.* Spring Creek at Batesville and Black River at Black Rock (scarce).
54. **Elassoma zonatum** Jordan. Spring Creek at Batesville (scarce).

55. **Ambloplites rupestris** (Rafinesque). *Goggle-eye; Rock Bass.* Black River at Black Rock (scarce).
56. **Pomoxis sparoides** (Lacépède). *Calico Bass.* Black River at Black Rock.
57. **Lepomis cyanellus** Rafinesque. *Green Sunfish; Perch.* White River and Spring Creek at Batesville (common); Laferty Creek at Batesville; Black River at Black Rock (scarce); Strawberry River, Flat and Machine creeks at Smithville (common); Big Buffalo River (abundant); King River at Marble and Main and Middle forks of White River at Fayetteville (scarce). The species of sunfishes, more especially those belonging to the genus *Lepomis*, are known in Arkansas as "perch."
58. **Lepomis macrochirus** (Rafinesque). Taken in the White River, Spring, Salado, and Caney creeks at Batesville, and in Black River at Black Rock, but scarce at all these places.
59. **Lepomis garmani** Forbes. Obtained in Salado, Caney, and Spring creeks at Batesville, and in Black River at Black Rock; scarce at all of these places. Probably identical with *L. miniatus.*
60. **Lepomis pallidus** (Mitchill). *Blue Sunfish; Perch.* White River at Batesville (scarce); Village Creek at Newport; Black and Spring rivers at Black Rock (common).
61. **Lepomis megalotis** (Rafinesque). *Long-eared Sunfish; Perch.* White River and Laferty Creek at Batesville (scarce); Salado and Caney creeks at Batesville; Black and Spring rivers at Black Rock; Strawberry River at Smithville (common); Flat and Machine creeks at Smithville, King River at Marble, and Big Buffalo River (scarce); Main and Middle forks of White River at Fayetteville (abundant).
62. **Micropterus salmoides** (Lacépède). *Big-mouthed Black Bass; Trout.* White River and Polk Bayou at Batesville (common); Salado and Caney creeks at Batesville (scarce); Black and Spring rivers at Black Rock; Strawberry River at Smithville (common); Village Creek at Newport (scarce); Main and Middle forks of White River at Fayetteville (common).
63. **Micropterus dolomieu** Lacépède. *Small-mouthed Black Bass; Trout.* White River and Laferty Creek at Batesville; Strawberry River at Smithville; Main and Middle forks of White River at Fayetteville (common). Both this and the preceding species are known in the South as "trout."
64. **Etheostoma pellucidum vivax** (Hay). *Sand Darter.* White River at Batesville (common); Polk Bayou and Miller Creek at Batesville; Strawberry River at Smithville (scarce). In these specimens the body is covered with scales except on the belly and anterior dorsal region. The rest of the dorsal region is loosely scaled.
65. **Etheostoma nigrum** Rafinesque. Polk Bayou; Salado and Caney creeks at Batesville; Strawberry River at Smithville (scarce).
66. **Etheostoma chlorosoma** (Hay). Spring River and Black River at Black Rock (scarce).
67. **Etheostoma blennioides** Rafinesque. *Green-sided Darter.* White River at Batesville; Black River at Black Rock; Strawberry River; Flat and Machine creeks at Smithville (scarce); Big Buffalo River (common).
68. **Etheostoma caprodes** (Rafinesque). *Hogfish; Log Perch.* White River at Batesville; Black and Spring rivers at Black Rock; Middle and Main forks of White River at Fayetteville (scarce); Strawberry River at Smithville (common).
69. **Etheostoma aspro** (Cope & Jordan). *Black-sided Darter.* White River at Batesville (scarce); Salado and Caney creeks at Batesville (common); Black and Spring rivers at Black Rock (scarce); Strawberry River at Smithville (common).
70. **Etheostoma phoxocephalum** Nelson. White River at Batesville; Spring River at Black Rock; Strawberry River at Smithville (scarce).
71. **Etheostoma evides** (Jordan & Copeland). Spring River at Black Rock; Strawberry River at Smithville; Black River at Black Rock (scarce).
72. **Etheostoma cymatotænia** Gilbert & Meek. Salado and Caney creeks (scarce).
73. **Etheostoma ouachitæ** (Jordan & Gilbert). Black River at Black Rock. Two specimens were obtained. Head, 4; depth, 6½; dorsal fin, X–13; anal fin, II–10; scales, 6–58–7; lateral line complete. Breast and nape naked, cheeks and opercles scaled. Scales on belly deciduous, leaving a naked strip. Gill membrane scarcely connected, free from the isthmus. Snout pointed, mouth terminal; jaws equal and well supplied with teeth. Upper jaw with frenum scarcely protractile. Color similar to *E. aspro;* spots on sides confluent and irregular. All of the fins are barred with darker except ventrals and anal. Body very slender, subterete.

74. **Etheostoma zonale** (Cope). Polk Bayou and Spring Creek at Batesville; Black River at Black Rock (scarce); Spring River at Black Rock (common); White River, Oxford Bend, and Main and Middle forks of White River at Fayetteville (scarce).

75. **Etheostoma whipplei** (Girard). Polk Bayou, Salado and Caney creeks at Batesville; Spring River at Black Rock (scarce).

76. **Etheostoma histrio** (Jordan & Gilbert). Black River at Black Rock, one specimen. Length, head, 4½; depth, 5½; dorsal, IX-12; anal, II-7; scales, 5-56-7. Nape well scaled. Cheeks naked; opercles with a few scales on the upper portion. Breast and anterior portion of belly naked; rest of belly with ordinary scales. Body very robust; dorsal region elevated; snout blunt, sharply decurved; mouth small, subinferior, lower jaw included; upper jaw slightly protractile; teeth in jaws well developed. Color very dark, mottled; spinous dorsal with dark band across tops of spines and extending down on front of fin; soft dorsal, with black dots, irregularly barred; anal and paired fins barred.

77. **Etheostoma uranidea** (Jordan & Gilbert). White River at Batesville; Black and Spring rivers at Black Rock (common).

78. **Etheostoma juliæ** Meek. King River at Marble; Middle Fork of White River at Fayetteville (scarce). Known only from these specimens and the types which were obtained from James River near Springfield, Mo.

79. **Etheostoma cœruleum spectabile** (Agassiz). *Rainbow Darter.* Polk Bayou (scarce); Miller Creek (common); Laferty and Spring creeks, at Batesville (abundant); Spring River at Black Rock; Flat and Machine creeks at Smithville (common); Big Buffalo River (abundant); Little Buffalo River at Jasper; King River at Marble; White River at Oxford Bend; West Fork of White River at Greenland; Middle and Main forks of White River at Fayetteville (common). This is the most abundant of the darters in the Ozark Mountain region.

80. **Etheostoma iowæ** Jordan & Meek. Little Buffalo River at Jasper. Three specimens were obtained. Head, 4 in the length of the body; depth, 5⅓ to 6; dorsal, IX or X-10 or 11; anal, II-7 or 8; scales in the lateral line 54 to 58. Nape, cheeks, opercles, and breast scaly; breast partially naked; belly entirely scaled with ordinary scales; body slender, not much compressed; snout bluntish; mouth little oblique, large, maxillary reaching pupil of eye; jaws equal; gill membranes not broadly united, free from the isthmus; upper jaw slightly protractile, maxillary free from the preorbital. Eye large, 3¼ in head; interorbital width 2 in eye. Lateral line incomplete, terminating about half way. Color olivaceous, mottled with darker. Nine blackish (irregular) spots on sides. Six dark bands across the back. Dorsal and caudal fins barred; ventrals dark, other fins light. *E. iowæ* is a very variable darter. The specimens here described differ somewhat in form and coloration from specimens from the northwest. The range known at present is Iowa and Nebraska to British Columbia. I am inclined to consider these specimens as *E. iowæ*, regarding the difference here recorded as seasonal. These specimens were taken in the spring, evidently near the breeding season; other specimens I have examined were collected in the summer and fall.

81. **Etheostoma saxatile** (Hay). Village Creek at Newport; Strawberry River at Smithville; Main and Middle forks of White River at Fayetteville; Black River at Black Rock; Polk Bayou at Batesville (scarce); Spring River at Black Rock (common).

82. **Etheostoma punctulatum** (Agassiz). Main fork of White River at Fayetteville. Only 2 small specimens obtained; apparently very scarce.

83. **Roccus chrysops** (Rafinesque). *Striped Bass.* White River at Batesville (common). This species is reported as being quite common in the White River near Batesville. It is a favorite with hook-and-line sportsmen.

84. **Cottus bairdi** Girard. *Miller's Thumb; "Cod"; Blob.* Polk Bayou and Spring Creek at Batesville (common); Spring River at Black Rock (scarce); King River at Marble and Big Buffalo River (common); Little Buffalo River at Jasper (scarce).

LITTLE RED RIVER BASIN.

Little Red River belongs to the eastern slope of the Ozark Mountains. It was visited near Heber and Judsonia. At the former place the bottom is very rocky and the current swift. A heavy rainfall in the upper part of its basin had caused the water to rise in the river to such an extent as to render our efforts at collecting less successful than they otherwise would have been. A few fishes were obtained from a small creek on the north side of the river. At Judsonia the current is sluggish, the water usually deep, and the bottom muddy. A short distance above the city are some shoals with rocky and sandy bottom. Our collections were made at this point.

We also visited three tributaries of the Little Red River near Kinderhook and Shiloh, namely, Devil's Fork, North and West forks. These streams were very rocky and seining in them was difficult. They were cut in many places, so as to form deep, wide holes, which seemed full of fish life, sunfishes being especially abundant. Of all the streams seen by me in the Ozark region these seemed to have the largest and deepest holes, the one on North Fork near the crossing of the Kinderhook road being large enough to be called a lake. Its depth is said to be over 25 feet in times of low water. These long, deep holes excavated in the beds of streams seem to be very characteristic of the Ozark Mountain rivers.

The region drained by these three branches is very thinly populated, and the fishes in the streams appear to have been but little disturbed by man.

Bull Creek is a small stream draining a comparatively low and level region. It contained very little water when seen by us and was full of snags and cypress knees. Our collecting was mostly done near the railroad, in some holes which receive overflow water from the creek during most of the heavy rains each year.

LIST OF THE FISHES OF THE LITTLE RED RIVER BASIN.

1. **Lepisosteus osseus** (Linnæus). *Common Gar Pike; Long-nosed Gar.* Common in the Little Red River at Judsonia.
2. **Lepisosteus platystomus** Rafinesque. *Short-nosed Gar Pike.* Little Red River at Judsonia (scarce).
3. **Amia calva** Linnæus. *Dogfish; "Grindle."* Bull Creek at Beebe (abundant). Many specimens of this species were taken from some large ponds near the railroad.
4. **Ameiurus melas** (Rafinesque). *Bullhead.* Little Red River at Heber (not common); Bull Creek at Beebe (abundant).
5. **Ameiurus nebulosus** (Le Sueur). *Common Bullhead.* South Fork of Little Red River at Kinderhook (scarce).
6. **Ictalurus punctatus** (Rafinesque). *Channel Cat; White Cat.* Little Red River at Judsonia (common).
7. **Ictiobus bubalus** (Rafinesque). *Buffalo.* Little Red River at Judsonia, scarce. Head, 4; depth, $2\frac{1}{3}$; dorsal rays, 26; anal rays, 8; scales, 9–38–6; lateral line straight; lips thick, the margin of the lower jaw forming an acute angle. Color dark.
8. **Carpiodes velifer** (Rafinesque). *Quillback.* Little Red River at Judsonia (common).
9. **Catostomus nigricans** (Le Sueur). *Hog Sucker; Mullet.* Little Red River at Heber; Devil's Fork at Shiloh; Middle Fork and South Forks at Kinderhook (scarce).
10. **Moxostoma duquesnei** (Le Sueur). *Common Redhorse.* Little Red River at Heber (scarce); at Judsonia (common); Devil's Fork at Shiloh; Middle Fork at Kinderhook (common); South Fork at Kinderhook (scarce).
11. **Minytrema melanops** (Rafinesque). *Striped Sucker.* Bull Creek at Beebe (scarce).
12. **Erimyzon sucetta** (Lacépède). *Chub Sucker.* Little Red River at Heber (common); South Fork at Kinderhook (scarce); Bull Creek at Beebe (abundant).

13. **Placopharynx carinatus** (Cope). Little Red River at Heber and Devil's Fork at Shiloh (common).
14. **Campostoma anomalum** (Rafinesque). *Stone-roller.* Little Red River at Heber and Devil's Fork at Shiloh (scarce); Middle and South forks at Kinderhook (common).
15. **Hybognathus nuchalis** Agassiz. *Silver-fish.* Little Red River at Heber and Judsonia; Middle Fork at Kinderhook (scarce).
16. **Pimephales notatus** (Rafinesque). *Blunt-nosed Minnow.* Little Red River at Heber and Devil's Fork at Shiloh (common); South Fork at Kinderhook (scarce).
17. **Pimephales promelas** Rafinesque. *Flathead Minnow.* Little Red River at Heber and Middle Fork at Kinderhook (common); South Fork at Kinderhook (scarce).
18. **Notropis heterodon** (Cope). Little Red River at Heber (scarce).
19. **Notropis xænocephalus** (Jordan). Devil's Fork at Shiloh (common); Middle Fork at Kinderhook; Little Red River at Judsonia (scarce).
20. **Notropis shumardi** (Girard). Little Red River at Heber (abundant); Devil's Fork at Shiloh; Middle and South forks at Kinderhook (common).
21. **Notropis galacturus** (Cope). *Milky-tailed Minnow.* Middle Fork at Kinderhook (scarce).
22. **Notropis whipplei** (Girard). *Silver-fin.* Little Red River at Heber (common) and Judsonia (scarce); Devil's Fork at Shiloh (scarce); Middle and South forks at Kinderhook (abundant).
23. **Notropis venustus** (Girard). *Black-tailed Minnow.* Little Red River at Heber and Judsonia; Middle Fork at Kinderhook; Devil's Fork at Shiloh (scarce).
24. **Notropis umbratilis** (Girard). Little Red River at Judsonia; Middle Fork at Kinderhook (scarce).
25. **Notropis dilectus** (Girard). *Emerald Minnow.* Little Red River at Heber (scarce.)
26. **Notropis atherinoides caddoënsis** Meek. Little Red River at Heber (scarce) and Judsonia (common); Middle Fork at Kinderhook (abundant).
27. **Notropis cornutus** (Mitchill). *Common Shiner.* Bull Creek at Beebe (scarce).
28. **Hybopsis watauga** (Jordan & Evermann). Four specimens from the South Fork of the Little Red River at Kinderhook. Length of longest specimen, 2¾ inches; head, 4⅖; depth, 6; D. 8, A. 7; scales, 7-52-6; (vertical rows counted from dorsal to ventral fins); lateral line on the 7th row. First dorsal ray nearer tip of snout than base of caudal fin by nearly two-fifths length of head. About 23 scales before dorsal. Body long and slender. Snout rather long; less blunt than in *H. amblops.* Eye medium, its diameter equaling the length of snout, three in head. Ventrals have their origin under vertical from first dorsal rays; barbels small. A dusky lateral band, very little silvery reflection; above lateral band a lighter olivaceous band about as wide as lateral band. Dorsal region dusky. Belly olivaceous. Differs from typical *watauga* somewhat in coloration and in being more slender, but agrees with it in other respects.
29. **Hybopsis storerianus** (Kirtland). Middle Fork of Little Red River at Kinderhook (scarce).
30. **Semotilus atromaculatus** (Mitchill). *River Chub.* South Fork at Kinderhook.
31. **Notemigonus chrysoleucus** (Mitchill). *Golden Shiner.* Little Red River at Judsonia (common); Bull Creek at Beebe (abundant).
32. **Dorosoma cepedianum** (Le Sueur). *Gizzard Shad; Hickory Shad.* Little Red River at Heber (scarce) and Judsonia (common); Bull Creek at Beebe (abundant).
33. **Clupea chrysochloris** (Rafinesque). *Skipjack.* Little Red River at Judsonia (common).
34. **Zygonectes notatus** (Rafinesque). *Top-minnow.* Little Red River at Heber and Judsonia; Devil's Fork at Shiloh; Middle and South forks at Kinderhook (common).
35. **Lucius vermiculatus** (Le Sueur). *Little Pickerel.* Little Red River at Heber (scarce) and Judsonia (common); Bull Creek at Beebe (common).
36. **Lucius reticulatus** (Le Sueur). *Eastern Pickerel.* Little Red River at Heber (common).
37. **Labidesthes sicculus** (Cope). *Brook Silverside.* Little Red River at Heber (abundant) and Judsonia (common); Devil's Fork at Shiloh (common); Middle and South forks at Kinderhook (scarce).
38. **Pomoxis sparoides** (Lacépède). *Calico Bass.* Little Red River at Judsonia (common).
39. **Centrarchus macropterus** (Lacépède). Bull Creek at Beebe (common).
40. **Ambloplites rupestris** (Rafinesque). *Rock Bass.* Little Red River at Heber and Devil's Fork at Shiloh (scarce); Middle Fork at Kinderhook (common).
41. **Lepomis cyanellus** Rafinesque. *Green Sunfish; "Perch."* South Fork at Kinderhook (common).

42. **Lepomis macrochirus** (Rafinesque). *"Perch."* Devil's Fork of Little Red River (scarce).
43. **Lepomis pallidus** (Mitchill). *Blue Sunfish.* Little Red River at Heber and Judsonia (common); Devil's Fork at Shiloh and Middle Fork at Kinderhook (scarce); Bull Creek at Beebe (abundant).
44. **Lepomis humilis** (Girard). *Red-spotted Sunfish; "Perch."* Little Red River at Heber (scarce)
45. **Lepomis megalotis** (Rafinesque). *Long-eared Sunfish; "Perch."* Little Red River at Heber (abundant) and Judsonia (common); Devil's Fork at Shiloh (scarce); Middle and South forks at Kinderhook (abundant); Bull Creek at Beebe (abundant).
46. **Micropterus salmoides** (Lacépède). *Big-mouthed Black Bass; "Trout."* Little Red River at Heber and Judsonia (common); Middle and South forks at Kinderhook (scarce).
47. **Micropterus dolomieu** Lacépède. *Small-mouthed Black Bass; Trout.* Little Red River at Heber (abundant) and Judsonia (common); Devil's Fork at Shiloh and Middle Fork at Kinderhook (common); South Fork at Kinderhook (scarce).
48. **Etheostoma pellucidum vivax** (Hay). *Sand Darter.* Little Red River at Judsonia; Middle Fork at Kinderhook (scarce).
49. **Etheostoma blennioides** Rafinesque. *Green-sided Darter.* Middle and South forks at Kinderhook (scarce).
50. **Etheostoma caprodes** (Rafinesque). *Hogfish.* Little Red River at Heber (scarce).
51. **Etheostoma aspro** (Cope & Jordan). *Black-sided Darter.* Little Red River at Judsonia (scarce).
52. **Etheostoma phoxocephalum** (Nelson). Middle Fork at Kinderhook (scarce).
53. **Etheostoma cœruleum spectabile** (Agassiz). *Rainbow Darter.* Middle and South forks at Kinderhook (scarce).
54. **Etheostoma whipplei** (Girard). South Fork at Kinderhook (scarce).
55. **Etheostoma zonale** (Cope). Middle and South forks at Kinderhook (scarce).
56. **Etheostoma saxatile** Hay. South Fork at Kinderhook; Little Red River at Judsonia (scarce).
57. **Etheostoma microperca** Jordan & Gilbert. *Least Darter.* Little Red River at Heber (scarce).
58. **Aplodinotus grunniens** (Rafinesque). *Fresh-water Drum.* Little Red River at Judsonia (scarce).

THE ARKANSAS RIVER BASIN.

The Arkansas River was visited at Little Rock, Mulberry, and Fort Smith. The water of this river is seldom, if ever, clear, and the fishes taken from it have that pale, sickly color so characteristic of the fishes of the Platte and Missouri rivers. The species of smaller fishes seem very scarce.

The Chadron is a northern tributary of the Arkansas near Conway. It is a small stream, flowing over a rocky bottom until it reaches the lowlands along the Arkansas River, where it continues with a sluggish current in a deeper channel. We visited this stream near Pinnacle Springs. Its bottom was very rocky and the current swift.

Cove Creek, a western tributary, was visited near Martinsville. It is similar to the main river, though less rocky, and the current less swift.

East Fork near Conway is a sluggish creek with very muddy bottom, similar to the lower Chadron.

Illinois River (Russellville) and Mulberry River resemble very closely the Chadron, as does also the Big Piney. We collected in the Walnut Fork of Big Piney near Swain, in Illinois River near Russellville, and in the Mulberry near Mulberry. All of these streams drain a sandstone region.

Sallisaw River is a northern tributary of the Arkansas, about 50 miles west of Fort Smith. It drains mostly a limestone region, is well fed by springs, and where visited (near Makey's store) has a sandy and gravelly bottom. It is very similar to the Illinois River, which is only a few miles west of it.

LIST OF THE FISHES OF THE ARKANSAS RIVER BASIN.

1. **Petromyzon concolor** (Kirtland). *River Lamprey.* One small specimen (larval) of this species was taken in Sallisaw River, near Makey's store.
2. **Lepisosteus osseus** (Linnæus). *Common Gar-Pike; Long-nosed Gar.* Common in Arkansas River at Little Rock and Mulberry, and in the East Fork of Chadron at Conway. The negroes along the Arkansas River eat this and the following species, some of them expressing a preference for gars over catfishes. All the gars we took at Mulberry were carried off by negroes for food.
3. **Lepisosteus platystomus** Rafinesque. *Short-nosed Gar-Pike.* East Fork of Chadron at Conway (scarce).
4. **Ictalurus furcatus** (Cuvier & Valenciennes).
5. **Ictalurus punctatus** (Rafinesque). *Channel Cat; White Cat.* Arkansas River at Little Rock (abundant) and Mulberry (common); Mulberry River at Mulberry (common).
6. **Leptops olivaris** (Rafinesque). *Mud Cat; Flathead Cat.* Arkansas River at Little Rock and Mulberry and Cove Creek at Martinsville (scarce).
7. **Ameiurus melas** (Rafinesque). *Bullhead.* East Fork of Chadron at Conway (scarce); Sallisaw River at Makey's store (common).
8. **Noturus eleutherus** Jordan. *Stone Cat.* Sallisaw River at Makey's store (scarce).
9. **Ictiobus velifer** (Rafinesque). *Quillback; Carp Sucker.* Arkansas River at Little Rock and Mulberry; East Fork of Chadron at Conway; Sallisaw River at Makey's store (common). In specimens from East Fork of Chadron, at Conway, the dorsal rays are 24; scales, 37. A specimen from the Arkansas River has dorsal 25; scales, 6-37-5; head, $4\frac{3}{4}$; depth, 3; color, silvery. In all specimens the lips are thin, the under jaws making an obtuse angle.
10. **Ictiobus urus** (Agassiz). *Razor-back Buffalo.* Arkansas River at Little Rock. Lips thick; the lower jaw forming an acute angle. D. 25; A. 7; scales, 7-37-5; head, 4; depth, $2\frac{3}{5}$; color darker and less silvery than in preceding species. Illinois River at Russellville (scarce). Similar to the above in appearance. Scales, 6-38-5; head, $3\frac{4}{5}$; depth, 3; silvery.
11. **Catostomus nigricans** Le Sueur. *Hog Sucker; Stone-roller.* Cove Creek at Martinsville; Mulberry River at Mulberry and Sallisaw River at Makey's store (common).
12. **Erimyzon sucetta** (Lacépède). *Chub Sucker.* Illinois River at Russellville and Sallisaw River at Makey's (scarce).
13. **Moxostoma duquesnei** (Le Sueur). *Common Redhorse; White Sucker.* Cove Creek at Martinsville (abundant); Illinois River at Russellville (scarce); Sallisaw River at Makey's (abundant).
14. **Minytrema melanops** (Rafinesque). *Striped Sucker.* Illinois River at Russellville (scarce).
15. **Placopharynx carinatus** Cope. Cove Creek at Martinsville and Mulberry River at Mulberry (scarce); Sallisaw River at Makey's (abundant). This sucker so resembles the redhorse that fishermen know it by the same name.
16. **Campostoma anomalum** (Rafinesque). *Stone-Lugger; Stone-Roller.* Cove Creek at Martinsville (common); Illinois River at Russellville (scarce); Mulberry River at Mulberry (abundant); Sallisaw River at Makey's (scarce).
17. **Hybognathus nubila** (Forbes). Sallisaw River at Makey's (common).
18. **Hybognathus nuchalis** Agassiz. *Silvery Minnow.* Arkansas River at Little Rock and Mulberry (abundant); East Fork Chadron at Conway (common); Illinis River at Russellville (scarce); Sallisaw River at Makey's (common).
19. **Pimephales notatus** (Rafinesque). *Blunt-nosed Minnow.* Cove Creek at Martinsville; Illinois River at Russellville and Mulberry River at Mulberry (common); Sallisaw River at Makey's (abundant).
20. **Pimephales promelas** Rafinesque. *Flat-head Minnow.* Illinois River at Russellville (scarce).
21. **Cliola vigilax** Girard. Arkansas River at Little Rock and East Fork of the Chadron at Conway (common).
22. **Notropis blennius** (Girard). Arkansas and Mulberry rivers at Mulberry (scarce).
23. **Notropis shumardi** (Girard). Arkansas River at Mulberry and Cove Creek at Martinsville (scarce); Illinois River at Russellville (common); Sallisaw River at Makey's (scarce). All of the species belonging to the genus *Notropis* are known as minnows. Only a few of the larger and better-known ones have received common names.

24. **Notropis whipplei** (Girard). *Silver-fin.* Arkansas River at Mulberry; Chadron River at Pinnacle Springs; East Fork of Chadron at Conway (common); Cove Creek at Martinsville (abundant); Illinois River at Russellville (common); Mulberry River at Mulberry; Sallisaw River at Makey's (abundant); North Fork of Chadron at Martinsville (common).
25. **Notropis lutrensis** (Baird & Girard). Arkansas River at Little Rock (common) and at Mulberry (scarce); Mulberry River at Mulberry (scarce).
26. **Notropis xænocephalus** (Jordan). Mulberry River at Mulberry (scarce), Cove Creek at Martinsville and Illinois River at Russellville (common).
27. **Notropis telescopus caddoënsis** Meek. Cove Creek at Martinsville (scarce); Illinois River at Russellville; North Fork of Chadron at Martinsville (common).
28. **Notropis umbratilis** (Girard). Chadron River at Pinnacle Spring and Cove Creek at Martinsville (scarce).
29. **Notropis dilectus** (Girard). *Emerald Minnow.* Arkansas and Mulberry rivers at Mulberry; Chadron River at Pinnacle Springs; East Fork of Chadron at Conway and Sallisaw River at Makey's store (scarce). The bodies of all of these specimens are deeper than usual.
30. **Hybopsis amblops** (Rafinesque). *Silver Chub.* Arkansas River at Mulberry (scarce).
31. **Hybopsis storerianius** (Kirtland). *Hornyhead; River Chub.* Arkansas River at Mulberry and East Fork of Chadron at Conway (scarce).
32. **Hybopsis kentuckiensis** (Rafinesque). Sallisaw River at Makey's (abundant).
33. **Semotilus atromaculatus** (Mitchill). *Horned Dace; Creek Chub.* Illinois River at Russellville (scarce).
34. **Notemigonus chrysoleucus** (Mitchill). *Golden Shiner.* Sallisaw River at Makey's (scarce).
35. **Dorosoma cepedianum** (Le Sueur). *Gizzard Shad; Hickory Shad.* Arkansas River at Mulberry (common); East Fork of Chadron at Conway (scarce).
36. **Clupea chrysochloris** (Rafinesque). *Skipjack.* Mulberry River at Mulberry (scarce).
37. **Hiodon alosoides** (Rafinesque). *Moon-eye.* Arkansas River at Little Rock and Mulberry (common), and Sallisaw River at Makey's (scarce).
38. **Zygonectes notatus** (Rafinesque). *Top-minnow.* Chadron at Pinnacle Spring (scarce); East Fork of Chadron at Conway, (common); Cove Creek at Martinsville (scarce); Illinois River at Russellville (common); Mulberry River at Mulberry (abundant); Sallisaw River at Makey's (common); North Fork of Chadron at Martinsville (scarce).
39. **Gambusia affinis** (Baird & Girard). Chadron River at Pinnacle Spring (scarce); East Fork of Chadron at Conway (common). Gravid females were taken the last week in August.
40. **Labidesthes sicculus** (Cope). *Brook Silverside.* Cove Creek at Martinsville and Illinois River at Russellville (scarce); Mulberry River at Mulberry and Sallisaw River at Makey's (common).
41. **Ambloplites rupestris** (Rafinesque). *Rock Bass.* Sallisaw River at Makey's (scarce).
42. **Chænobryttus gulosus** (Cuvier & Valenciennes). *Warmouth; Red-eyed Bream.* Cove Creek at Martinsville (scarce).
43. **Pomoxis sparoides** (Rafinesque). *Calico Bass; Grass Bass.* Chadron River at Pinnacle Springs (scarce).
44. **Lepomis cyanellus** (Rafinesque). *Green Sunfish; Perch.* East Fork of Chadron at Conway; Cove Creek at Martinsville; Illinois River at Russellville and Mulberry River at Mulberry (scarce); Sallisaw River at Makey's (common).
45. **Lepomis pallidus** (Mitchill). *Blue Sunfish; Perch.* Chadron at Pinnacle Spring, Cove Creek at Martinsville, and Illinois River at Russellville (scarce).
46. **Lepomis megalotis** (Rafinesque). *Long-eared Sunfish; Perch.* The Chadron River at Pinnacle Springs; (scarce); East Fork of Chadron at Conway; Cove Creek at Martinsville; Illinois River at Russellville (common); Mulberrry River at Mulberry; Sallisaw River at Makey's (abundant); North Fork of Chadron at Martinsville (common).
47. **Lepomis humilis** (Girard). *Red-spotted Sunfish; Perch.* Illinois River at Russellville (scarce); Sallisaw River at Makey's (common).
48. **Micropterus salmoides** (Lacépède). *Large-mouthed Black Bass; Trout.* Arkansas River at Mulberry (common); Chadron River at Pinnacle Springs and East Fork of Chadron at Conway (scarce); Cove Creek at Martinsville; Illinois River at Russellville and Mulberry River at Mulberry (common); Sallisaw River at Makey's; North Fork of Chadron at Conway (scarce). In the Southern States this and the following species are usually called trout. The true trout are not natives of Arkansas, but a few have been introduced by the U. S. Fish Commission.

49. **Micropterus dolomieu** Lacépède. *Small-mouthed Black Bass; Trout.* Illinois River at Russellville; Mulberry River at Mulberry and Sallisaw River at Makey's (common).
50. **Etheostoma pellucidum vivax** (Hay). *Sand Darter.* East Fork Chadron at Conway (scarce); Illinois River at Russellville (common).
51. **Etheostoma blennioides** (Rafinesque). *Green-sided Darter.* Cove Creek at Martinsville; Illinois River at Russellville and Sallisaw River at Makey's (scarce).
52. **Etheostoma aspro** (Cope & Jordan). *Black-sided Darter.* Chadron River at Pinnacle Springs; East Fork Chadron at Conway ; Cove Creek at Martinsville and Sallisaw River at Makey's (scarce).
53. **Etheostoma saxatile** (Hay). East Fork Chadron at Conway and Cove Creek at Martinsville (scarce) ; Illinois River at Russellville and Sallisaw River at Makey's (common).
54. **Etheostoma zonale** (Cope). Illinois River at Russellville (scarce).
55. **Etheostoma whipplei** (Girard). Illinois River at Russellville (scarce) ; Sallisaw River at Makey's (common).
56. **Etheostoma chlorosoma** (Hay). East Fork of Chadron River at Conway (scarce). Dorsal spines, 8 to 10.
57. **Etheostoma cœruleum spectabile** (Agassiz). *Rainbow Darter.* Sallisaw River at Makey's (common).
58. **Etheostoma microperca** Jordan & Gilbert. *Least Darter.* Illinois River at Russellville and Sallisaw River at Makey's (scarce).
59. **Stizostedion canadense** (C. H. Smith). *Wall-eyed Pike; Sauger.* Illinois River at Russellville (scarce).
60. **Roccus chrysops** (Rafinesque). *Striped Bass.* Arkansas River at Mulberry (common).
61. **Aplodinotus grunniens** (Rafinesque). *Fresh-water Drum.* Arkansas River at Little Rock and Mulberry (common).

THE ILLINOIS RIVER BASIN.

This river drains a portion of the northern and western slope of the Boston Mountains. It first flows north and then west, into the Indian Territory, thence bending south and emptying into the Arkansas River near Fort Gibson. Its basin lies, for the most part, in a cherty limestone region, and its upper tributaries are well supplied with springs and spring brooks. The Illinois resembles closely the upper White River. It was examined near Prairie Grove and Ladd's Mill, in Washington County, Ark. At both of these localities the stream is a good-sized creek, with rocky and sandy bottom. Clear Creek, an eastern tributary, is a clear stream well fed by springs, Johnson spring being near its source. The Barren Fork and Jordan Creek are also supplied richly by springs, though these are all small. Our collections from Jordan Creek were made near the mouth at Dutch Mills; from Clear Creek, near Johnson.

LIST OF THE FISHES OF THE ILLINOIS RIVER BASIN IN WASHINGTON COUNTY, ARKANSAS.

1. **Ameiurus melas** (Rafinesque). *Bullhead.* Illinois River at Prairie Grove and Ladd's Mill (common).
2. **Catostomus teres** (Mitchill). *Common White Sucker.* Illinois River at Prairie Grove (abundant) and Ladd's Mill (common); Clear Creek at Johnson and Jordan Creek at Dutch Mills (common).
3. **Catostomus nigricans** (Le Sueur). *Hog Sucker; Mullet.* Illinois River at Prairie Grove (common) and Ladd's Mill (scarce).
4. **Noturus exilis** (Nelson). *Stone Cat.* Illinois River at Ladd's Mill (scarce).
5. **Moxostoma duquesnei** (Le Sueur). *Common Redhorse Sucker.* Illinois River at Prairie Grove and Ladd's Mill (scarce); Clear Creek at Johnson and Jordan Creek at Dutch Mills (common).
6. **Campostoma anomalum** (Rafinesque). *Stone-roller; Stone-lugger.* Illinois River at Prairie Grove and Ladd's Mill; Jordan Creek at Dutch Mills; Clear Creek at Johnson (common).

7. **Hybognathus nubila** (Forbes). Illinois River at Prairie Grove and Ladd's Mill and Jordan Creek at Dutch Mills (abundant); Clear Creek at Johnson (scarce).
8. **Pimephales promelas** (Rafinesque). *Fathead Minnow.* Illinois River at Prairie Grove (common).
9. **Pimephales notatus** (Rafinesque). *Blunt-nosed Minnow.* Illinois River at Prairie Grove (abundant) and Ladd's Mill (common); Jordan Creek at Dutch Mills (common).
10. **Notropis shumardi** (Girard). Illinois River at Prairie Grove and Ladd's Mill; Jordan Creek at Dutch Mills; Clear Creek at Johnson (common).
11. **Notropis cornutus.** (Mitchill). *Common Shiner.* Illinois River at Prairie grove (abundant) and Ladd's Mill (scarce).
12. **Notropis zonatus** (Agassiz). Illinois River at Prairie Grove (abundant) and Ladd's Mill (common); Jordan Creek at Dutch Mills (abundant); Clear Creek at Johnson (common).
13. **Notropis dilectus** (Girard). *Emerald Minnow.* Illinois River at Prairie Grove and Ladd's Mill, and Jordan Creek at Dutch Mills (scarce).
14. **Hybopsis amblops** (Rafinesque). Illinois River at Prairie Grove and Ladd's Mill; Clear Creek at Johnson (common).
15. **Hybopsis kentuckiensis** (Rafinesque). *River Chub.* Illinois River at Prairie Grove (scarce) and Ladd's Mill (common); Jordan Creek at Dutch Mills and Clear Creek at Johnson (abundant).
16. **Semotilus atromaculatus** (Mitchill). *Horned Dace; River Chub.* Illinois River at Prairie Grove (common).
17. **Zygonectes notatus** (Rafinesque). *Top-minnow.* Illinois River at Prairie Grove and Ladd's Mill; Clear Creek at Johnson (scarce).
18. **Labidesthes sicculus** (Cope). *Brook Silverside.* Illinois River at Prairie Grove (scarce) and Ladd's Mill (common).
19. **Lepomis cyanellus** (Rafinesque). *Green Sunfish; Perch.* Illinois River at Prairie Grove (common and Ladd's Mill (scarce).
20. **Lepomis macrochirus** (Rafinesque). *Perch.* Illinois River at Prairie Grove (scarce). Scales, 45; dorsal fin, x-11; gill-rakers long, nearly half diameter of eye; last rays of dorsal with a black spot; pectoral fins long, their tips reaching third anal spine; body similar in form to *Lepomis megalotis.* A decided angle in profile between eyes.
21. **Lepomis humilis** (Girard). *Red-spotted Sunfish; Perch.* Illinois River at Prairie Grove (common) and Ladd's Mill (scarce).
22. **Lepomis megalotis** (Rafinesque). *Long-eared Sunfish; Perch.* Illinois River at Prairie Grove and Ladd's Mill, and Jordan Creek at Dutch Mills (abundant); Clear Creek at Johnson (common).
23. **Micropterus salmoides** (Lacépède). *Large-mouthed Black Bass; Trout.* Clear Creek at Johnson (scarce).
24. **Micropterus dolomieu** Lacépède. *Small-mouthed Black Bass; Trout.* Illinois River at Prairie Grove (scarce) and at Ladd's Mill (abundant); Jordan Creek at Dutch Mills (common); Clear Creek at Johnson (scarce).
25. **Etheostoma caprodes** (Rafinesque). *Log Perch; Hogfish.* Illinois River at Prairie Grove and Clear Creek at Ladd's Mill (scarce).
26. **Etheostoma blennioides** (Rafinesque). *Green-sided Darter.* Illinois River at Prairie Grove and Ladd's Mill; Clear Creek at Johnson (scarce).
27. **Etheostoma cœruleum spectabile** (Agassiz). *Rainbow Darter.* Illinois River at Prairie Grove (abundant); Jordan Creek at Dutch Mills (scarce); Clear Creek at Johnson (common).
28. **Etheostoma zonale** (Cope). Illinois River at Prairie Grove (common) and Ladd's Mill (scarce).
29. **Etheostoma flabellare** (Rafinesque). *Striped Darter.* Illinois River at Prairie Grove and Ladd's Mill (scarce).
30. **Etheostoma saxatile** (Hay). Illinois River at Prairie Grove (scarce). D. XII-12; A. 2-9; scales, 51. No distinct black spot at base of caudal.
31. **Cottus bairdi** (Girard). *Miller's Thumb; "Cod."* Illinois River at Prairie Grove and Ladd's Mill (scarce); Clear Creek at Johnson (common).

NOTES ON PREVIOUS INVESTIGATIONS OF THE FISHES OF ARKANSAS, WITH LISTS OF THE SPECIES COLLECTED.

During the explorations and surveys for a railroad route from the Mississippi River to the Pacific Ocean in 1851 to 1858, a few fishes were collected in the State of Arkansas by the surveying party. These specimens were studied by Dr. Charles Girard, whose results were published in the Proceedings of the Academy of Natural Sciences at Philadelphia, from 1856 to 1859, inclusive, and also in volume x of the Pacific Railroad Survey Report, 1858.

In Bulletin U. S. National Museum, 1877, p. 50, Dr. David S. Jordan described two new species of fishes from the Little Red River at Judsonia, Arkansas: *Elassoma zonatum* and *Asternotremia mesotrema* = *Aphredoderus sayanus*.

In 1884, under the auspices of the U. S. National Museum and the U. S. Fish Commission, Dr. David Starr Jordan and Prof. Charles H. Gilbert made a collection of fishes in the same State, at Eureka Springs, Fort Smith, Arkadelphia, Benton, and Fulton. Their report upon this material was printed in the Proceedings of the U. S. National Museum for 1886.

During the latter part of June, 1888, Prof. Charles H. Gilbert, while in the employ of the Arkansas State Geological Survey, obtained a few fishes in a small tributary of the Poteau, 7 miles west of Waldron, in Scott County. The list of these species, published in the Proceedings of the U. S. National Museum for the same year, is as follows:

Campostoma anomalum.
Pimephales notatus.
Notropis heterodon.
Notropis umbratilis.
Zygonectes notatus.
Lepomis humilis.
Lepomis megalotis.
Etheostoma cæruleum lepidum.
Etheostoma whipplei.
Etheostoma microperca.

The writer, also, in June, 1888, being then in the service of the State Geological Survey, collected a small number of fishes in Spadra Creek, near Clarksville, Johnson County. In July and August of the following year he spent six weeks in exploring the streams of the Ozark region in western Arkansas and southern Missouri, in the interests of the U. S. Fish Commission, and with the assistance of Mr. Louis Rettger and Mr. Frank M. Drew, then students in the Indiana University, a large collection of fishes was obtained. The results of the investigation were published in the Bulletin of the U. S. Fish Commission, vol. IX, for 1889, pp. 113-141.

The following three tables, giving lists of the fishes reported upon by Drs. Girard, Jordan, and Gilbert, and the writer, as above indicated, have been arranged to show also the different places at which the several species were collected on each of the expeditions to which they relate.

List of fishes collected in Arkansas during the survey for a railroad route from the Mississippi to the Pacific Ocean, and reported upon by Dr. Charles Girard.

Place of publication.			Girard's names.	Names used at present.	Localities where obtained.								
Proc. Acad. Nat. Sci. Phila.		Pac. R. R. survey rep., vol. X.			Ft. Smith.	Arkansas River, near Ft. Smith.	Near mouth of Poteau River.	Coal Creek.	Otter Creek, tributary of the Red River.	Sugar Loaf Creek.	Antelope Creek.	Fort Wichita, Red River.	Sluice of Arkansas River, near Fort McKee.
1856.	1858.	1858.											
Page.	*Page.*	*Page.*											
.....	.....	35	Ichthyomyzon hirudo	Petromyzon concolor	×	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	357	Scaphyrhynchus platyrhynchus.	Scaphirhynchus platyrhynchus.	.....	.....	×	.....	.....	.....	.....	.....	.....
.....	.....	211	Pimelodus olivaceus	Ictalurus punctatus	.....	×	.....	.....	.....	.....	.....	.....	.....
.....	.....	209	Pimelodus felinus	Ameiurus natalis	.....	.....	.....	×	.....	.....	.....	.....	.....
.....	.....	208	Pimelodus catulus	Ameiurus melas	×	.....	.....	.....	.....	.....	.....	.....	.....
170	.....	.....	Carpiodes damalis	Ictiobus velifer	×	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	229	Dionda spadicea	Zophendum plumbeum	×	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	236	Hybognathus placita	Hybognathus nuchalis	.....	.....	.....	.....	.....	.....	.....	.....	×
182	.....	.....	Hybognathus argyritus	Hybognathus argyritus	×	.....	.....	.....	.....	.....	.....	.....	.....
180	.....	234	Pimephales maculosus	Pimephales promelas	.....	.....	.....	.....	.....	.....	.....	.....	×
179	.....	231	Hyborhynchus perspicuus	Pimephales notatus	.....	×	.....	.....	.....	.....	.....	.....	.....
192	.....	257	Cliola vigilax	Cliola vigilax	.....	.....	.....	.....	×	.....	.....	.....	.....
194	.....	262	Alburnops illecebrosus	Notropis blennius	×	.....	.....	.....	.....	.....	.....	.....	.....
194	.....	261	Alburnops shumardi	Notropis shumardi	×	.....	.....	.....	.....	.....	.....	.....	.....
194	.....	.....	Alburnops blennius	Notropis blennius	×	.....	.....	.....	.....	.....	.....	.....	.....
197	.....	265	Cyprinella bubalinus	Notropis bubalinus	.....	.....	.....	.....	×	.....	.....	.....	.....
.....	.....	266	Cyprinella umbrosa	do	.....	.....	.....	×	.....	.....	.....	.....	.....
197	.....	267	Cyprinella beckwithi	do	.....	.....	.....	.....	.....	.....	.....	.....	×
199	.....	272	Moniana lutrensis	Notropis lutrensis	.....	.....	.....	.....	×	.....	.....	.....	.....
200	.....	275	Moniana pulchella	do	.....	×	.....	.....	.....	×	.....	.....	.....
198	.....	270	Cyprinella whipplei	Notropis whipplei	.....	.....	.....	.....	.....	×	.....	.....	.....
193	.....	260	Alburnus umbratilis	Notropis umbratilis	.....	.....	.....	.....	.....	×	.....	.....	.....
193	.....	259	Alburnellus dilectus	Notropis dilectus	.....	×	.....	.....	.....	.....	.....	.....	.....
191	.....	256	Exoglossum mirabile	Phenacobius mirabilis	.....	×	.....	.....	.....	.....	.....	.....	.....
180	.....	249	Gobio vernalis	Hybopsis storerianus	.....	×	.....	.....	.....	.....	.....	.....	.....
190	.....	255	Leucosomus pallidus	Semotilus atromaculatus	.....	.....	.....	.....	.....	.....	×	.....	.....
.....	200	14	Calliurus formulosus	Lepomis cyanellus	×	.....	.....	.....	×	.....	.....	×	.....
.....	.....	16	Calliurus longulus	do	.....	.....	.....	.....	×	.....	.....	.....	.....
.....	.....	17	Calliurus microps	do	.....	.....	.....	.....	.....	.....	.....	×	.....
.....	.....	28	Pomotus breviceps	Lepomis megalotis	×	.....	.....	.....	×	.....	.....	×	.....
.....	201	21	Bryttus humilis	Lepomis humilis	.....	.....	.....	.....	.....	×	.....	.....	.....
.....	.....	5	Dioplites nuecensis	Micropterus salmoides	.....	.....	.....	×	.....	.....	.....	.....	.....
.....	.....	96	Amblodon grunniens	Aplodinotus grunniens	.....	.....	×	.....	.....	.....	.....	.....	.....
.....	103	.....	Boleichthys whipplei	Etheostoma whipplei	.....	.....	.....	×	.....	.....	.....	.....	.....

List of fishes collected in Arkansas, in 1884, by Dr. D. S. Jordan and Prof. C. H. Gilbert, and reported upon by them in Proc. U. S. Nat. Mus. for 1886.

Names of the species.	Localities where obtained.			
	Eureka Springs.	Fort Smith.	Arkadelphia.	Fulton.
Scaphirhynchus platyrhynchus				×
Lepisosteus osseus		×		×
Lepisosteus tristœchus		×		
Ictalurus punctatus	×	×	×	×
Ameiurus natalis		×		
Leptops olivaris		×		×
Noturus flavus		×		
Noturus nocturnus		×	×	
Noturus miurus	×	×	×	
Ictiobus bubalus				×
Carpiodes veliter		×	×	×
Catostomus nigricans		×	×	
Moxostoma duquesnei	×	×	×	
Placopharynx carinatus	×	×	×	
Lagochila lacera	×			
Campostoma anomalum	×	×	×	
Hybognathus nuchalis		×	×	×
Hybognathus nubila	×			
Pimephales notatus	×	×		
Cliola vigilax		×		
Notropis blennius		×		
Notropis shumardi	×	×	×	
Notropis telescopus arcansanus	×			
Notropis galacturus	×			
Notropis venustus				×
Notropis lutrensis		×		
Notropis whipplei		×		
Notropis zonatus	×			
Notropis megalops	×			
Notropis umbratilis		×		
Notropis dilectus		×	×	×
Notropis micropteryx	×			
Phenacobius mirabilis		×		
Hybopsis dissimilis	×		×	
Hybopsis wataugа	×			
Hybopsis æstivalis		×		×
Hybopsis amblops	×	×		
Hybopsis storerianus		×		×
Hybopsis kentuckiensis	×			
Phoxinus neogæus	×			
Hiodon alosoides				×
Hiodon tergisus			×	
Clupea chrysochloris			×	×
Dorosoma cepedianum		×	×	×
Fundulus catenatus	×		×	
Zygonectes notatus	×	×	×	×
Gambusia affinis		×	×	×
Lucius vermiculatus			×	
Labidesthes sicculus	×	×	×	
Pomoxis sparoides				×
Pomoxis annularis		×		
Lepomis cyanellus		×	×	
Lepomis pallidus		×	×	×
Lepomis megalotis	×	×	×	
Lepomis humilis	×	×	×	
Micropterus salmoides	×	×	×	×
Micropterus dolomieu			×	
Etheostoma clarum				×
Etheostoma vivax		×	×	
Etheostoma asprellum			×	
Etheostoma histrio		×	×	
Etheostoma uranidea			×	
Etheostoma shumardi		×	×	×
Etheostoma blennioides	×	×		
Etheostoma caprodes	×	×	×	
Etheostoma copelandi		×	×	
Etheostoma phoxocephalum		×		
Etheostoma aspro		×	×	
Etheostoma ouachitæ			×	
Etheostoma camurum		×	×	
Etheostoma evides	×			
Etheostoma scierum			×	
Etheostoma zonale arcansanum	×		×	
Etheostoma saxatile			×	
Etheostoma whipplei		×		
Etheostoma spectabile	×		×	
Etheostoma fusiforme		×	×	
Etheostoma fonticola			×	
Stizostedion canadense		×		
Stizostedion vitreum		×		
Roccus chrysops			×	×
Aplodinotus grunniens		×		×
Cottus richardsoni	×			

List of fishes collected in Arkansas in 1888 and 1889, by Seth E. Meek, and reported upon by him in Bulletin U. S. Fish Commission for 1889, pp. 113–141.

Names of the species.	Localities where obtained.												
	Ouachita River, Crystal Springs, Ark.	Caddo River, Caddo Gappe and Black Spring.	West Ouachita River, Mount Ida, Ark.	Mazam Creek, Myers, Ark.	Myers Creek, Myers, Ark.	West Fork Saline River, Hot Springs, Ark.	Little Red River, Judsonia, Ark.	Spring Creek, Mammoth Springs.	Spring River, Mammoth Springs.	Warm Fork Spring River, Mammoth Spring.	English Creek, Mammoth Springs.	Myatt Creek, Mammoth Spring.	Spadra Creek.
Ictalurus punctatus	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	×
Ameiurus melas	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	×	.....
Ameiurus nebulosus	.....	.....	.....	.....	.....	.....	.....	.....	×	.....	×	.....	.....
Noturus nocturnus	×	.....	.....	.....	.....	×	.....	.....	.....	.....	.....	.....	.....
Ictiobus velifer	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	×
Catostomus teres	.....	.....	.....	.....	.....	.....	.....	.....	×	.....	.....	.....	.....
Catostomus nigricans	×	×	×	×	×	×	.....	.....	×	.....	×	×	.....
Erimyzon sucetta	×	.....	.....	×	.....	.....	×	.....	×	.....	.....	×	×
Moxostoma duquesnei	×	×	×	×	×	×	.....	.....	×	.....	×	×	×
Campostoma anomalum	×	×	×	×	×	×	.....	.....	×	.....	.....	×	×
Chrosomus erythrogaster	.....	.....	×	.....	.....	.....	.....	×	.....	.....	.....	.....	.....
Pimephales notatus	×	×	×	×	×	×	.....	.....	×	×	.....	×	×
Hybognathus nuchalis	.....	.....	.....	.....	.....	.....	×	.....	×	.....	×	×	.....
Hybognathus nubila	.....	.....	.....	.....	.....	×	.....	.....	.....	.....	.....	.....	.....
Notropis boops	×	×	×	×	×	×	.....	.....	.....	.....	.....	.....	×
Notropis galacturus	.....	.....	.....	.....	.....	.....	.....	.....	×	.....	×	×	.....
Notropis lutrensis	.....	.....	.....	.....	.....	.....	.....	.....	.....	×	.....	.....	.....
Notropis whipplei	×	×	×	×	×	×	×	.....	.....	.....	.....	.....	×
Notropis megalops	.....	.....	.....	.....	.....	.....	×	.....	×	.....	×	×	×
Notropis zonatus	.....	.....	.....	.....	.....	.....	.....	.....	×	.....	×	×	.....
Notropis umbratilis	×	×	×	×	×	×	×	.....	×	.....	.....	.....	.....
Notropis dilectus (rubrifrons)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Notropis telescopus arcansanus	.....	.....	.....	.....	.....	.....	.....	.....	×	.....	.....	.....	.....
Notropis atherinoides caddoënsis	.....	×	.....	.....	.....	.....	×	.....	.....	.....	.....	.....	.....
Hybopsis dissimilis	×	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hybopsis amblops	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	×	.....	.....
Hybopsis kentuckiensis	.....	.....	.....	.....	.....	.....	.....	.....	×	.....	×	×	.....
Semotilus atromaculatus	.....	×	.....	.....	.....	.....	×	×	.....	.....	.....	×	.....
Notemigonus chrysoleucus	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	×
Salmo irideus	.....	.....	.....	.....	.....	.....	.....	.....	×	.....	.....	.....	.....
Dorosoma cepedianum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	×
Fundulus catenatus	×	×	×	×	×	×	.....	.....	.....	.....	.....	×	.....
Zygonectes macdonaldi	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Zygonectes notatus	.....	×	×	×	.....	×	×	.....	×	.....	×	×	×
Lucius vermiculatus	.....	.....	×	×	.....	.....	.....	.....	×	.....	.....	×	.....
Lucius reticulatus	.....	.....	.....	.....	.....	.....	×	.....	×	.....	×	.....	.....
Labidesthes sicculus	×	×	×	×	×	×	×	.....	.....	.....	.....	×	×
Aphredoderus sayanus	×	.....	.....	.....	.....	.....	×	.....	.....	.....	.....	.....	.....
Elassoma zonatum	.....	.....	.....	.....	.....	.....	×	.....	.....	.....	.....	.....	.....
Ambloplites rupestris	.....	.....	×	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chænobryttus gulosus	×	.....	.....	.....	.....	.....	×	.....	.....	.....	.....	×	.....
Lepomis cyanellus	×	×	×	×	×	.....	×	.....	×	.....	×	×	.....
Lepomis garmani	.....	.....	.....	.....	.....	.....	.....	.....	?	.....	.....	.....	.....
Lepomis pallidus	.....	×	.....	.....	.....	.....	.....	.....	×	.....	×	×	.....
Lepomis megalotis	×	×	×	×	×	×	.....	.....	×	.....	×	×	×
Lepomis humilis	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	×
Micropterus salmoides	×	×	.....	.....	.....	.....	.....	.....	×	.....	×	×	.....
Micropterus dolomieu	×	×	×	×	×	×	.....	.....	×	.....	.....	.....	.....
Etheostoma nigrum	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Etheostoma blennioides	×	×	×	×	×	×	×	.....	×	.....	×	×	×
Etheostoma caprodes	×	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	×
Etheostoma copelandi	×	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Etheostoma phoxocephalum	×	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Etheostoma zonale	×	×	×	.....	.....	×	×	.....	×	.....	.....	.....	.....
Etheostoma whipplei	×	×	×	×	×	×	.....	.....	.....	.....	.....	.....	.....
Etheostoma cœruleum	.....	.....	.....	.....	.....	.....	.....	.....	×	.....	.....	.....	.....
Etheostoma cœruleum spectabile	.....	.....	.....	.....	.....	.....	.....	×	×	.....	×	×	.....
Etheostoma stigmæum	×	×	×	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Etheostoma fusiforme	.....	.....	.....	.....	.....	.....	×	.....	.....	.....	.....	.....	.....
Etheostoma chlorosoma	×	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Etheostoma microperca	.....	.....	.....	.....	.....	.....	×	.....	.....	.....	.....	.....	.....
Aplodinotus grunniens	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	×
Cottus richardsoni	.....	.....	.....	.....	.....	.....	.....	.....	×	.....	.....	.....	.....

GEOGRAPHICAL DISTRIBUTION OF THE FISHES OF ARKANSAS.

The following table includes a list of the fishes so far found in Arkansas and their distribution in the principal river basins:

[*g* listed by Dr. Girard; *j* listed by Drs. Jordan and Gilbert; *m* listed by the writer.]

No.	Names.	White River basin.	Black River basin.	Little Red River basin.	Arkansas River basin.	Illinois River basin.	Ouachita River basin.	Red River basin.
	Family Petromyzontidæ:							
1	Petromyzon concolor				*g, m*			
	Family Polyodontidæ:							
2	Polyodon spathula	*m*						*j*
	Family Acipenseridæ:							
3	Scaphirhynchus platyrhynchus				*g*			
	Family Lepisosteidæ:							
4	Lepidosteus osseus	*m*	*m*	*m*	*j, m*			*j*
5	Lepidosteus platystomus			*m*				
6	Lepidosteus tristœchus				*j, m*			
	Family Amiidæ:							
7	Amia calva			*m*				
	Family Siluridæ:							
8	Ictalurus punctatus	*j, m*	*m*	*m*	*g, j, m*		*j*	*j*
9	Ictalurus furcatus							
10	Ameiurus nigricans	*m*						
11	Ameiurus natalis				*j, g*			
12	Ameiurus nebulosus	*m*	*m*	*m*				
13	Ameiurus melas	*m*	*m*	*m*	*g, m*	*m*		
14	Leptops olivaris				*j, m*			*j*
15	Noturus flavus				*j*			
16	Noturus miurus	*j, m*			*j*		*j*	
17	Noturus nocturnus		*m*		*j*		*j, m*	
18	Noturus eleutherus	*m*			*m*			
19	Noturus gyrinus					*m*		
20	Noturus exilis	*m*				*m*		
	Family Catostomidæ:							
21	Ictiobus bubalus		*m*					*j*
22	Ictiobus urus	*m*			*m*			
23	Carpiodes velifer			*m*	*j, g, m*		*j*	*j*
24	Cycleptus elongatus		*m*					
25	Catostomus teres		*m*			*m*		
26	Catostomus nigricans	*m*	*m*		*j, m*	*m*	*j, m*	
27	Erimyzon sucetta	*m*	*m*	*m*	*m*		*m*	
28	Minytrema melanops	*m*		*m*	*m*			
29	Moxostoma duquesnei	*j, m*	*m*	*m*	*j, m*	*m*	*j, m*	
30	Placopharynx carinatus	*j*	*m*	*m*	*j, m*		*j*	
31	Lagochila lacera	*j*						
	Family Cyprinidæ:							
32	Campostoma anomalum	*j, m*	*m*	*m*	*j, m*	*m*	*j, m*	
33	Chrosomus erythrogaster	*m*	*m*				*m*	
34	Hybognathus nuchalis	*m*	*m*	*m*	*j, g, m*		*j*	*j*
35	Hybognathus argyritis				*g*			
36	Hybognathus nubila	*j, m*			*m*	*m*	*m*	
37	Zophendum plumbeum				*g*			
38	Pimephales promelas			*m*	*g, m*	*m*		
39	Pimephales notatus	*j, m*	*m*	*m*	*g, j, m*	*m*	*m*	
40	Cliola vigilax	*m*	*m*		*m*			*g*
41	Notropis heterodon			*m*	*j*			
42	Notropis illecebrosus				*j, g*			
43	Notropis blennius		*m*		*g, m*			
44	Notropis ozarcanus	*m*	*m*					
45	Notropis shumardi	*j, m*	*m*	*m*	*j, m*	*m*	*j*	
46	Notropis xænocephalus	*m*	*m*	*m*	*m*			
47	Notropis whipplei	*m*	*m*	*m*	*j, m*		*m*	
48	Notropis galacturus	*m*	*m*	*m*				
49	Notropis venustus	*m*	*m*	*m*				*j*
50	Notropis lutrensis		*m*		*j, g, m*			*g*
51	Notropis bubalinus				*g*			
52	Notropis cornutus	*j, m*	*m*	*m*	*m*	*m*		
53	Notropis zonatus	*j, m*	*m*			*m*		
54	Notropis umbratilis	*m*	*m*	*m*	*j, g, m*		*m*	
55	Notropis dilectus	*m*	*m*	*m*	*j, g, m*	*m*	*j*	*j*
56	Notropis telescopus arcansus	*m*	*m*					
57	Notropis atherinoides caddoënsis	*m*	*m*	*m*	*m*		*m*	
58	Notropis micropteryx	*j*						
59	Phenacobius mirabilis				*j, g*			
60	Hybopsis amblops	*j, m*	*m*		*j, m*	*m*		
61	Hybopsis dissimilis	*j, m*					*j, m*	
62	Hybopsis wataugа	*j*		*m*				
63	Hybopsis æstivalis				*j*		*j*	
64	Hybopsis storerianus			*m*	*j, g, m*		*j*	
65	Hybopsis kentuckiensis	*j, m*	*m*		*m*	*m*		
66	Phoxinus neogæus	*j*						
67	Opsopœodus emiliæ	*m*						

Geographical distribution of the fishes of Arkansas.

No.	Names.	White River basin.	Black River basin.	Little Red River basin.	Arkansas River basin.	Illinois River basin.	Ouachita River basin.	Red River basin.
	Family Cyprinidæ—Continued.							
68	Semotilus atromaculatus	*m*	*m*	*m*	*m, g*	*m*	*m*	.....
69	Notemigonus chrysoleucus	*m*	.....	*m*	*m*	.....	.....	.....
	Family Salmonidæ							
70	Salmo irideus	.....	*m*	.....	.....	.....	.....	.....
	Family Hiodontidæ							
71	Hiodon alosoides	.....	.....	.....	*m*	.....	.....	*j*
72	Hiodon tergisus	.....	.....	.....	.....	.....	*j*	.....
	Family Clupeidæ:							
73	Clupea chrysochloris	*m*	.....	*m*	*m*	.....	*j*	*j*
	Family Dorosomatidæ:							
74	Dorosoma cepedianum	*m*	*m*	*m*	*j, m*	.....	*j*	*j*
	Family Cyprinodontidæ:							
75	Fundulus catenatus	*j, m*	*m*	.....	.....	.....	*j, m*	.....
76	Zygonectes notatus	*j, m*	*m*	*m*	*j, m*	*m*	*j, m*	*j*
77	Gambusia affinis	*m*	*m*	.....	*j, m*	.....	*j*	*j*
	Family Luciidæ:							
78	Lucius vermiculatus	*m*	*m*	*m*	.....	.....	*j, m*	.....
79	Lucius reticulatus	*m*	*m*	*m*	.....	.....	.....	.....
	Family Anguillidæ:							
80	Anguilla chrysypa	*m*	*m*	.....	.....	.....	.....	.....
	Family Atherinidæ:							
81	Labidesthes sicculus	*j, m*	*m*	*m*	*j, m*	*m*	*j, m*	.....
	Family Aphredoderidæ:							
82	Aphredoderus sayanus	*m*	*m*	*j, m*	.....	.....	.....	.....
	Family Elassomatidæ:							
83	Elassoma zonatum	*m*	.....	*j, m*	.....	.....	.....	.....
	Family Centrarchidæ:							
84	Centrarchus macropterus	.....	.....	*m*	.....	.....	.....	.....
85	Pomoxis sparoides	.....	*m*	*m*	*m*	.....	.....	*j*
86	Pomoxis annularis	.....	.....	.....	*j*	.....	.....	.....
87	Ambloplites rupestris	*m*	*m*	*m*	*m*	.....	*m*	.....
88	Chænobryttus gulosus	.....	*m*	*m*	*m*	.....	*m*	.....
89	Lepomis cyanellus	*m*	*m*	*m*	*j, g, m*	*m*	*j, m*	*g*
90	Lepomis macrochirus	*m*	*m*	*m*	.....	*m*	.....	.....
91	Lepomis megalotis	*j, m*	*m*	*m*	*j, g, m*	*m*	*j, m*	*g*
92	Lepomis garmani	*m*	*m*	.....	.....	.....	.....	.....
93	Lepomis pallidus	*m*	*m*	.....	*j, m*	.....	*j, m*	*j*
94	Lepomis humilis	*j*	.....	*m*	*j, g, m*	*m*	*j*	.....
95	Micropterus salmoides	*j, m*	*m*	*m*	*j, g, m*	*m*	*j, m*	*j*
96	Micropterus dolomieu	*m*	*m*	*m*	*m*	*m*	*j, m*	.....
	Family Percidæ:							
97	Etheostoma pellucidum vivax	*m*	*m*	*m*	*j, m*	.....	*j*	.....
98	Etheostoma pellucidum clarum	.....	.....	.....	.....	.....	.....	*j*
99	Etheostoma asprellum	.....	.....	.....	.....	.....	*j*	.....
100	Etheostoma nigrum	*m*	*m*	.....	.....	.....	.....	.....
101	Etheostoma chlorosoma	.....	*m*	.....	*m*	.....	*m*	.....
102	Etheostoma histrio	.....	*m*	.....	*j*	.....	*j*	.....
103	Etheostoma uranidea	*m*	*m*	.....	.....	.....	*j*	.....
104	Etheostoma juliæ	*m*	.....	.....	.....	.....	.....	.....
105	Etheostoma shumardi	.....	.....	.....	*j*	.....	*j*	*j*
106	Etheostoma blennioides	*j, m*	*m*	*m*	*j, m*	*m*	*m*	.....
107	Etheostoma caprodes	*j, m*	*m*	.....	*j, m*	*m*	*j, m*	.....
108	Etheostoma copelandi	.....	.....	*m*	*j*	.....	*j, m*	.....
109	Etheostoma phoxocephalum	.....	.....	*m*	*j*	.....	*m*	.....
110	Etheostoma aspro	*m*	*m*	*m*	*j, m*	.....	*j*	.....
111	Etheostoma ouachitæ	*m*	.....	.....	.....	.....	*j*	.....
112	Etheostoma camurum	.....	.....	.....	*j*	.....	*j*	.....
113	Etheostoma evides	*j*	*m*	.....	.....	.....	.....	.....
114	Etheostoma cymatotænia	*m*	.....	.....	.....	.....	.....	.....
115	Etheostoma scierus	.....	.....	.....	.....	.....	*j*	.....
116	Etheostoma zonale	*j, m*	*m*	*m*	*m*	*m*	*j, m*	.....
117	Etheostoma flabellare	.....	.....	.....	.....	*m*	.....	.....
118	Etheostoma stigmæum	*m*	*m*	.....	*m*	*m*	*j, m*	.....
119	Etheostoma punctulatum	*m*	.....	.....	.....	.....	.....	.....
120	Etheostoma whipplei	*m*	*m*	*m*	*j, g, m*	.....	*m*	.....
121	Etheostoma cœruleum spectabile	*j, m*	*m*	*m*	*m*	*m*	*j*	.....
122	Etheostoma cœruleum lepidum	*m*	.....	.....	*j*	.....	.....	.....
123	Etheostoma jessiæ	*m*	.....	.....	.....	.....	.....	.....
124	Etheostoma lowiæ	*m*	.....	.....	.....	.....	.....	.....
125	Etheostoma fusiforme	.....	.....	*m*	*j*	.....	*j*	.....
126	Etheostoma fonticola	.....	.....	.....	.....	.....	*j*	.....
127	Etheostoma microperca	.....	.....	*m*	*j*	.....	.....	.....
128	Stizostedion canadense	.....	.....	.....	*j, m*	.....	.....	.....
129	Stizostedion vitreum	.....	.....	.....	*j*	.....	.....	.....
	Family Serranidæ:							
130	Roccus chrysops	*m*	.....	.....	*m*	.....	*j*	*j*
	Family Sciænidæ:							
131	Aplodinotus grunniens	.....	.....	*m*	*j, g, m*	.....	.....	*j*
	Family Cottidæ:							
132	Cottus bairdi	*j, m*	*m*	.....	.....	*m*	.....	.....
		82	68	59	84	32	59	25

APPENDIX.

The following list comprises two small collections of fishes from the Indian Territory; one collection was made in the last week of May, 1893, from a small creek tributary to a southern affluent of the Canadian River at McAlester; the other from a lake and adjoining ponds near the Poteau River, Poteau.

The creek at McAlester is very small, has a rocky to muddy bottom, and becomes nearly dry in the summer.

The lake near Poteau is from a few rods to one-fourth of a mile in width, and about 2 miles in length, with a depth of over 30 feet. It is connected with the river, which is about one-fourth of a mile distant, in times of high water. The lake is also connected during the year with some ponds near by made by the Frisco Railroad when grading their roadbed. The collection was made from the east end of the lake and from these ponds.

This lake seems to be quite a favorite resort for anglers in the neighboring country. The large-mouthed black bass, the crappie, and the common sunfishes are the more important fishes found; large catfishes, buffalo, and gars are reported as quite common.

The water in the Poteau River was too deep and too full of snags to permit collecting in it.

Ameiurus melas (Rafinesque). *Bullhead.* Abundant in both places.

Campostoma anomalum (Rafinesque). Poteau, scarce.

Minytrema melanops (Rafinesque.) McAlester, 1 specimen.

Hybognathus nuchalis Agassiz. Poteau, scarce.

Pimephales notatus (Rafinesque). Scarce in both localities.

Notropis lutrensis (Baird & Girard). McAlester, scarce.

Notropis umbratilis (Girard). McAlester, common. Specimens very variable in color and form.

Notropis dilectus (Girard). Poteau, scarce.

Hybopsis amblops (Rafinesque). McAlester, scarce.

Opsopœodus emiliæ Hay. McAlester, common. Color of males plain olivaceous, a faint dark lateral band. Anterior and posterior rays of dorsal fin with a conspicuous black blotch. The females are lighter in color and have a more conspicuous lateral band. Sides with a few dark spots forming irregular lateral stripes. Blotches on dorsal fin very faint or none. These specimens were taken the last week in May, which is about their breeding season.

Notemigonus chrysoleucus (Mitchill). McAlester, scarce.

Gambusia affinis (Baird & Girard). Poteau, scarce.

Zygonectes notatus (Rafinesque). McAlester, scarce.

Zygonectes escambiæ Bollman. Poteau, scarce. Scales 32, 9 in transverse row; dorsal rays, 8; anal, 8; head, $3\frac{2}{3}$ in length of body; depth, $4\frac{1}{2}$. Teeth weak, outer series the larger; eye large, its diameter $2\frac{1}{2}$ in length of head, interorbital area flat or slightly concave. Color similar to *Fundulus catenatus*, irregularly spotted except on lower and posterior portion of the body, where the spots form irregular lateral bands.

Labidesthes sicculus Cope. McAlester, scarce; Poteau, abundant.

Pomoxis annularis Rafinesque. Poteau, abundant.

Lepomis cyanellus Rafinesque. Poteau, common.

Lepomis humilis (Girard). Common in both localities.

Lepomis megalotis (Rafinesque). Common in both localities.

Micropterus salmoides (Lacépède). *Large-mouthed Black Bass.* McAlester, common; several specimens 18 inches in length taken one afternoon on a trot line.

Etheostoma nigrum (Rafinesque). McAlester, scarce.

Etheostoma whipplei (Girard). McAlester, scarce.

ARKANSAS INDUSTRIAL UNIVERSITY,
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