

7.—A REPORT UPON THE FISHES OF IOWA, BASED UPON OBSERVATIONS
AND COLLECTIONS MADE DURING 1889, 1890, AND 1891.

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INTRODUCTION.

In August, 1884, Dr. David S. Jordan, now of Palo Alto, California, accompanied by the writer, made a collection of fishes in the southern part of Iowa in the interest of the U. S. Fish Commission and the U. S. National Museum. This was practically the first step taken toward a comprehensive study of the ichthyological features of Iowa. The work was not, however, resumed until 1889, when, under the direction of the U. S. Fish Commissioner, the writer began an exhaustive examination of all the streams and lakes within the borders of the State. This investigation was continued until July, 1891, and the present paper is based upon the collections and observations made during that period of about two and a half years.

In the conduct of my field work I have been placed under many obligations to Mr. C. J. Ives, president of the Burlington, Cedar Rapids and Northern Railroad, and to Mr. Joseph White, superintendent of the water supply of the same corporation, for special facilities in the way of transportation and for other favors, which have enabled me to extend my studies beyond the limit of means at my disposal. Valuable assistance has been received from Prof. R. E. Call, of Des Moines; from Prof. Osborn, of Ames, and from Prof. C. C. Nutting, of Iowa City, who have also obtained for me the privilege of examining the collections of fishes belonging to the respective institutions with which they are connected. I am also greatly indebted to Mr. B. F. Shaw, formerly State fish commissioner, and to Dr. David S. Jordan and Prof. Charles H. Gilbert, the latter especially for their kind assistance in regard to the identification of rare and difficult species. Prof. Percy B. Burnett, of Lincoln, Nebraska, and my students, Mr. W. T. Jackson and Mr. E. P. Boynton, have rendered efficient services in connection with the field expeditions, the first mentioned having accompanied me during much of the summer of 1890.

Iowa has a comparatively level surface over its entire extent, being nowhere traversed by mountain ranges and having no pronounced hills except in the northeastern part. In this corner of the State the hills and cliffs sometimes attain an elevation of over 300 feet above the general level of the surrounding country, but being products

of erosion they never extend far back from the Mississippi River. The surface rises gradually, however, from the southern and eastern borders toward the northern and western, the least elevation above the sea being about 450 feet, and the greatest about 1,500 feet. Iowa is near the center of the best agricultural portion of the country, and the soil, which is from 1 to 2 feet thick on the uplands, becomes very much deeper in the depressions and bottom lands. This soil consists of finely comminuted material, generally strewn with scattered boulders or rock fragments. Most of the State is undulating or rolling prairie. None of its surface is heavily timbered, and the greater part of the timber land which does occur is confined to the borders of the streams.

The prairie was originally covered with a dense growth of prairie grass and herbaceous plants, which tended to produce a stiff sod. During heavy rains this sod absorbed the water, preventing its direct flow into the rivers, and it reached the latter chiefly by slowly filtering through the soil. The streams were thus relieved from overflow, and were kept from drying up during the summers. I have been informed that many streams, formerly deep and narrow, and abounding in pickerel, bass, and catfishes, have since grown wide and shallow, while the volume of water in them varies greatly in the different seasons, and they are now inhabited only by bullheads, suckers, and a few minnows. The breaking of the native sod for agricultural purposes has especially affected the smaller streams in this respect, while the construction of ditches and the practice of underdraining have had their effects upon the larger ones. Moreover the constant loosening of the soil, in farming, tends to reduce it to that condition in which it is readily transported by the heavy rains to produce muddy currents. To this cause, no doubt, is due the present absence of trout from many of the streams of northeastern Iowa and their marked decrease in other parts of the State. The rainfall in Iowa is not very great and, as it occurs chiefly in the spring, even the larger rivers become reduced in volume during the remainder of the year much beyond the apparent capacity of their basins. There are, however, in the northern and eastern parts of the State many large and beautiful springs, some of which are capable of maintaining considerable streams of water during the entire year. Spring Branch, near Manchester, in which trout are common, and McCloud Run, near Cedar Rapids, are fed by springs of this character. A hatchery was built, a few years ago, at the spring giving rise to McCloud Run, and many trout were hatched and planted there. This station has recently been abandoned, but a few trout are still to be found in the clear, cold water.

Iowa is situated between two of the largest rivers of the continent, being bounded on the east by the Mississippi, and on the west, except at the northwestern corner, by the Missouri. It is drained by many smaller rivers which empty into these main arteries, forming two general systems, the waters of which flow nearly at right angles to each other. Those tributary to the Mississippi trend, in a general way, southeasterly; and those tributary to the Missouri, southwesterly. The northern boundary of the State lies near the watershed between the tributaries of the Minnesota River and the streams which drain Iowa. Most of the rivers of this State, therefore, have their origin within its borders, a few, however, rising in southern Minnesota; and, except a limited number whose sources are in the southern part of the State, all terminate within its limits. The affluents of the Mississippi drain a little more than two-thirds of the area of the State; among them are its largest and most important rivers.

The streams of southwestern Iowa have usually very muddy bottoms, while those elsewhere, having stronger currents, are generally characterized by sandy, gravelly, or rocky bottoms. The former are the least adapted to fish life and are not rich in either species or individuals; with the latter the contrary is the rule.

There are within the limits of the State a few lakes of moderate size; these are situated on or near some watershed and each is fed by only a few small streams. The most important are Clear, Storm, Spirit, and Okobojis Lakes. Clear Lake is very shallow; Storm and Spirit Lakes are successively somewhat deeper, while Okobojis is by far the deepest of them all.

All of the more important rivers have one or more, sometimes many, dams across them; and few, if any, of these are supplied with fishways. As a rule, the dams are not firmly constructed, and every spring many are washed away, never to be rebuilt. During the spring of 1890 much injury was done to the dams in the northeastern part of the State, where these structures are more common than elsewhere, but in 1891 the region about Cherokee suffered most in this respect. At many places where dams exist the streams widen out above them, forming shallow lakes. These areas contain much swamp vegetation, and seem to have become fairly stocked with bass, pickerel, and sunfishes. The same fishes, I am told, have increased in abundance in such localities since the dams were built.

All of the streams examined by the writer, except perhaps a few in the southwestern part of the State, were well supplied with the smaller fishes. With respect, however, to the abundance of the larger forms, it was often difficult to reach satisfactory conclusions by the use of the ordinary collecting seines. In the bayous along the larger streams young black bass, pickerel, and various species of sunfishes were always found in large numbers. M. B. F. Shaw, at one time fish commissioner of Iowa, did very effective work during his occupancy of that office in seining the fishes out of many of these bayous, where a great mortality occurs annually, and depositing them in the lakes and rivers. He was the first to suggest and put into practice this efficient method of transplanting and preserving the native species, but the work was not continued subsequently, as it should have been. Much would be gained by again resorting to this economical system of propagation, the utility of which has been sufficiently demonstrated in Illinois and other adjacent States. There is at present, however, a growing interest among certain Iowa sportsmen to organize for the purpose of preventing the illegal taking of game of all kinds and of assisting in the protection and increase of our native food-fishes.

As a result of observations, it was found that the temperature of the coldest springs in the State was about 48° F.; but in few streams was the water temperature below 60° F. In nearly all such cases the range was from 70° to 75° F., but it should be taken into consideration that these observations were chiefly confined to the warmer months.

In the following report the fishes are discussed in accordance with each river basin. The streams and lakes examined were as follows:

A. Drainage of the Mississippi River.

- I. Mississippi River at Muscatine and Davenport.
- II. Des Moines River: (1) The main river, at Des Moines, Fort Dodge, and Esterville. (2) Raccoon River, at Perry, Des Moines, and Adel. (3) Beaver Creek. (4) Four-mile Creek. (5) Walnut Creek. (6) Middle River. (7) North River, at Des Moines. (8) Lizard River, at Fort Dodge.
- III. Skunk River: (1) The main river. (2) Squaw Creek. (3) College Creek, at Ames.
- IV. Iowa River, at Garner, Belmond, Amana, and Iowa City.
- V. Cedar River: (1) The main river, at Austin (Minn.), Waverly, Palo, Cedar Rapids, Mount Vernon, and West Liberty. (2) Turtle River. (3) Rose Creek, at Austin, Minn. (4) West Fork. (5) Hartgraves Creek, at Dumont. (6) Shellrock Creek, 6 miles southwest of Waverly. (7) Quarter Section Run, 5 miles southeast of Waverly. (8) Dry Creek, $4\frac{1}{2}$ miles west of Palo. (9) Prairie Creek, at Beverly. (10) Indian Creek, near Marion.
- VI. Clear Lake.

A. Drainage of Mississippi River—Cont'd.

- VII. Wapsipinicon River: (1) The main river, at Independence, Anamosa, and Wheatland. (2) Buffalo River. (3) Minnow Creek, at Anamosa.
- VIII. Maquoketa River: (1) North Branch, at Worthington. (2) South Fork, at Manchester and Hopkinton. (3) Spring Creek, at Delhi.
- IX. Turkey River: (1) The main river, at Elkport and Fort Atkinson. (2) Volga River, at Fayette. (3) Bear Creek, 6 miles northeast of Edgewood.
- X. Yellow River: (1) The main river, about 6 miles northeast of Postville. (2) Hickory Creek, about 4 miles northeast of Postville.
- XI. Upper Iowa River, at Chester and Decorah.

B. Drainage of the Missouri River.

- I. Missouri River, at Sioux City.
- II. Big Sioux River, at Sioux Falls (S. Dak.) and Sioux City.
- III. Silver Lake.
- IV. Soldier River: East Fork of Soldier River, at Charter Oak.
- V. Boyer River, at Arion Station.

DRAINAGE OF THE MISSISSIPPI RIVER.

I.—THE MISSISSIPPI RIVER.

Collections were made in this river at Muscatine and Davenport, the former locality affording by far the best results. There are many bayous at Muscatine, and the river there has generally a sandy bottom and many islands. The best fish market in Iowa is also located in that city. At Davenport there are fewer bayous, and the bottom of the river is more muddy and rocky. One day was spent at Davenport, and three days, at different times, at Muscatine. Mad Creek is a small stream flowing through Muscatine and emptying into the Mississippi. Few specimens were observed except near its mouth. The species enumerated in the following list are from the river at Muscatine unless otherwise expressly stated.

FISHES OF THE MISSISSIPPI RIVER.

1. *Petromyzon concolor* (Kirtland). *Brook lamprey*. Common; parasitic on buffalo-fishes.
2. *Polyodon spathula* (Walbaum). *Paddle-fish*; *Spoon-bill*; *Duck-billed cat*. Rare; taken more frequently in the autumn and from the bayous.
3. *Scaphirhynchus platyrhynchus* (Rafinesque). *Shovel-nosed sturgeon*. Rare; seldom found in the market.
4. *Acipenser rubicundus* Le Sueur. *Lake sturgeon*. Not common; more abundant in the spring.
5. *Lepisosteus osseus* (Linnaeus). *Common gar-pike*; *Long-nosed gar*; *Bill-fish*. Common at both Muscatine and Davenport.
6. *Lepisosteus platystomus* Rafinesque. *Short-nosed gar*. Common.
7. *Amia calva* Linnaeus. *Dogfish*; *Bow-fin*; *Mudfish*. Common; but seldom taken from the river.
8. *Ictalurus furcatus* (Cuv. and Val.). *Fork-tailed cat*. Rare; not observed by the writer.
9. *Ictalurus punctatus* (Rafinesque). *Channel cat*; *White cat*; *Silver cat*. Common at both Muscatine and Davenport, and many seen in the markets at the former place.
10. *Ameiurus nigricans* (Le Sueur). *Mississippi catfish*. Rare; specimens weighing 50 pounds are occasionally captured.
11. *Ameiurus melas* (Rafinesque). *Bullhead*. Abundant at Muscatine; common at Davenport.
12. *Ameiurus nebulosus* (Le Sueur). *Common catfish*. Abundant.
13. *Leptops olivaris* (Rafinesque). *Mud cat*; *Flathead cat*. Common.
14. *Noturus gyrinus* (Mitchill). *Stone cat*. Rare.
15. *Ictiobus cyprinella* (Cuv. and Val.). *Red-mouthed buffalo*. Common; usually taken from the bayous.
16. *Ictiobus urus* (Agassiz). *Big-mouthed buffalo*. Common.
17. *Ictiobus bubalus* (Rafinesque). *Small-mouthed buffalo*. Common.
18. *Carpiodes velifer* (Rafinesque). *Quillback*; *Carp sucker*. Very abundant at Muscatine; common at Davenport.
19. *Cycleptus elongatus* (Le Sueur). *Blackhorse*. Not common.
20. *Catostomus teres* (Mitchill). *Common sucker*. Abundant.
21. *Minytrema melanops* (Rafinesque). *Striped sucker*. Rare; taken from the bayous.
22. *Moxostoma duquesnei* (Le Sueur). *Common redbhorse*. Common.
23. *Hybognathus nuchalis* Agassiz. *Silvery minnow*. Common alongshore and at Davenport; abundant at mouth of Mad Creek.
24. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Common.
25. *Cliola vigilax* (Baird and Girard). *Silver-fin*. Rare at the mouth of Mad Creek; common at Davenport.
26. *Notropis deliciosus* (Girard). Rare; taken at mouth of Mad Creek.
27. *Notropis gilberti* Jordan and Meek. Common at mouth of Mad Creek.
28. *Notropis whipplei* (Girard). Rare.
29. *Notropis jejunus* (Forbes). Common at Davenport.
30. *Notropis dilectus* (Girard). *Emerald minnow*. Common at mouth of Mad Creek; not common at Davenport.
31. *Hybopsis storerianus* (Kirtland). *Spawn-eater*. Common at mouth of Mad Creek; rare at Davenport.
32. *Semotilus atromaculatus* (Mitchill). *Horned dace*. Rare.
33. *Notemigonus chrysoleucus* (Mitchill). *Roach*; *Golden shiner*; *Bream*. Rare; taken in bayous and at Davenport.
34. *Clupea chrysochloris* Rafinesque. *Golden shad*; *Skipjack*. Common at Muscatine and Davenport.
35. *Dorosoma cepedianum* (Le Sueur). *Gizzard shad*; *Hickory shad*; *Mud shad*. Common, especially in the muddy bayous and at Davenport.
36. *Salvelinus fontinalis* (Mitchill). *Brook trout*. On May 14, 1889, a specimen was taken from Mad Creek, at Muscatine, Iowa; it is preserved in the Muscatine Academy of Sciences; it was no doubt a straggler from some of the spring brooks farther north.
37. *Lucius vermiculatus* (Le Sueur). *Little pickarel*. Common in grassy bayous.

38. *Lucius lucius* (Linnæus). *Pike; Northern pickerel.* Very common, especially in the large grassy bayous.
39. *Lucius masquinongy* (Mitchill). *Muskellunge.* Rare.
40. *Anguilla chrysypa* Rafinesque. *Eel.* Rare; no specimens were observed by the writer.
41. *Labidesthes sicculus* Cope. *Brook silverside.* Common at mouth of Mad Creek; rare at Davenport.
42. *Pomoxis sparoides* (Lacépède). *Calico bass; Grass bass; Strawberry bass.* Abundant, especially in grassy bayous.
43. *Pomoxis annularis* Rafinesque. *Crappie; Bachelor.* Common; found with the preceding, but in less numbers; not common at Davenport.
44. *Ambloplites rupestris* (Rafinesque). *Rock bass; Red-eye; Goggle-eye.* Very common.
45. *Chænobryttus gulosus* (Cuv. and Val.). *War-mouth; Red-eyed bream.* Very common, especially in the bayous; common at Davenport.
46. *Lepomis cyanellus* (Rafinesque). *Green sunfish.* Very abundant at Muscatine; common at Davenport.
47. *Lepomis humilis* (Girard). *Red-spotted sunfish.* Common at Davenport.
48. *Lepomis pallidus* (Mitchill). *Blue sunfish.* Abundant; common at Davenport.
49. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish.* Common.
50. *Lepomis gibbosus* (Linnæus). *Common sunfish.* Very common.
51. *Micropterus dolomieu* Lacépède. *Small-mouthed black bass.* Abundant at Muscatine; not common at Davenport.
52. *Micropterus salmoides* (Lacépède). *Large-mouthed black bass.* Abundant; small specimens found in bayous on the Illinois side of the river at Muscatine; not common at Davenport.
53. *Etheostoma pellucidum clarum* (Jordan and Meek). *Sand darter.* Rare at Davenport.
54. *Etheostoma shumardi* (Girard). A few specimens taken from the river.
55. *Etheostoma phoxocephalum* Nelson. Rare.
56. *Perca flavescens* (Mitchill). *Yellow perch.* Very common.
57. *Stizostedion vitreum* (Mitchill). *Wall eyed pike; Jack salmon.* Very common.
58. *Stizostedion canadense* (C. H. Smith). *Sauger; Sand pike.* Less common than the preceding.
59. *Roccus chrysops* Rafinesque. *White bass.* Common at both Muscatine and Davenport.
60. *Morone interrupta* Gill. *Yellow bass.* Not common.
61. *Aplodinotus grunniens* Rafinesque. *Fresh-water drum; White perch.* Common at Muscatine and Davenport.
62. *Lota lota maculosa* (Le Sueur). *Burbot; Lake lawyer.* Not common.

II.—THE DES MOINES RIVER AND ITS TRIBUTARIES.

This is the largest river basin within the State, occupying a large part of its central area. The main river was visited at Estherville, Fort Dodge, and Des Moines. At Estherville it is little more than a small creek, with sandy or gravelly bottom and much vegetation. At Fort Dodge the river is large, but its physical characteristics are about the same as at Estherville. At Des Moines the bottom is sandy, with considerable mud and but few rocks.

Lizard Creek, near Fort Dodge, is a small stream with very rocky bottom. Its current is not swift and it becomes nearly dry during the summer. The Raccoon River is a large western tributary of the Des Moines. At Perry it has a sandy bottom with little mud and rocks, while at Des Moines its characteristics are about the same, but it is larger. Beaver and Walnut creeks, near Des Moines, are small streams, with muddy and sandy bottoms, which become nearly dry during the summer. The other streams near Des Moines mentioned in this paper were not visited by the writer. The specimens examined from them were collected by Prof. Call, of Des Moines, and are mostly in the Des Moines High School. In the following list all citations of the Raccoon River refer only to that river at Des Moines.

FISHES OF THE DES MOINES RIVER AND ITS TRIBUTARIES.

1. *Petromyzon concolor* (Kirtland). *Brook lamprey*. Des Moines, rare. Infraoral cusps 9 or 10.
2. *Lepistosteus osseus* (Linnaeus). *Common gar-pike; Long-nosed gar; Bill-fish*. Raccoon River, Des Moines; Adel.
3. *Ictalurus punctatus* (Rafinesque). *Channel cat; White cat; Silver cat*. Des Moines (Raccoon River), common; Middle River; Adel; Fort Dodge, abundant; Lizard Creek, common; Perry, common; Des Moines, rare; North River, Walnut Creek, Beaver Creek, rare.
4. *Ameiurus melas* (Rafinesque). *Bullhead*. Des Moines (Raccoon River), abundant in bayous; Fort Dodge, not common; Walnut Creek, Estherville, Perry, North River, Adel, Walnut and Beaver creeks, rare.
5. *Noturus exilis* Nelson. *Stone cat*. Perry, rare.
6. *Noturus gyrinus* (Mitchill). *Stone cat*. Estherville and Raccoon River, Fort Dodge, and Des Moines, rare.
7. *Carpiodes velifer* (Rafinesque). *Quillback; Carp-sucker*. Lizard Creek, very abundant; Des Moines (Raccoon River) and Perry, abundant; Des Moines and Fort Dodge, common; Beaver and Walnut creeks, rare; Adel, Middle River and North River.
8. *Moxostoma anisurum* (Le Sueur). Lizard Creek and Fort Dodge, not common.
9. *Moxostoma duquesnei* (Le Sueur). *Redhorse*. Lizard Creek and Perry, abundant; Des Moines (Raccoon River), Des Moines, Estherville, Fort Dodge, common; Beaver Creek, rare; Middle River, Adel.
10. *Placopharynx carinatus* Cope. *Big-jawed sucker*. Perry and Raccoon River, common; Adel.
11. *Catostomus teres* (Mitchill). *Common sucker*. Des Moines, Raccoon River, Fort Dodge, and Estherville, common; Walnut Creek, Beaver Creek, Lizard Creek, and Perry, rare; Middle River, Adel, North River.
12. *Catostomus nigricans* Le Sueur. *Hog sucker; Stone-roller; Hog mullet*. Perry, abundant; Fort Dodge, common; Beaver Creek, Des Moines, and Raccoon River, rare; Adel, Middle River.
13. *Campostoma anomalum* (Rafinesque). *Stone-lugger; Stone-roller*. Raccoon River and Lizard Creek, not common; Beaver and Walnut creeks, Des Moines, Fort Dodge, and Perry, rare; Four-mile Creek, Adel, North River, Middle River.
14. *Chrosomus erythrogaster* Rafinesque. *Red-bellied minnow*. Walnut Creek, rare.
15. *Hybognathus nuchalis* Agassiz. *Silvery minnow*. Raccoon River and Perry, abundant; Beaver Creek, Walnut Creek, Des Moines, and Fort Dodge, common; Lizard Creek, Adel.
16. *Hybognathus nuchalis placita* (Girard). *Silvery minnow*. Adel; Raccoon River, rare. Mouth much smaller than in previous form; head also narrower.
17. *Pimephales promelas* Rafinesque. *Fat-head*. Beaver Creek, abundant; Raccoon River, Walnut Creek, Des Moines, Lizard Creek, Fort Dodge, and Perry, rare; Four-mile Creek, North River, Adel.
18. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Beaver Creek and Fort Dodge, abundant; Des Moines, Estherville, and Perry, common; Raccoon River and Lizard Creek, rare; Walnut Creek, Adel, Middle River, Four-mile Creek, North River.
19. *Cliola vigilax* (Baird and Girard). *Silver-fn*. Walnut Creek and Des Moines, common; Perry, not common; Raccoon River, Beaver Creek, and Estherville, rare; Middle River, Adel.
20. *Notropis heterodon* (Cope). Estherville, not common.
21. *Notropis cayuga* Meek. Estherville, common; Beaver Creek and Lizard Creek, rare; Adel.
22. *Notropis deliciosus* (Girard). Raccoon River and Beaver Creek, abundant; Walnut Creek and Estherville, common; Des Moines, Lizard Creek, and Perry, rare; Fort Dodge, not common; Middle River, Adel, Four-mile Creek.
23. *Notropis topeka* Gilbert. Beaver Creek, Estherville, and Lizard Creek, rare.
24. *Notropis gilberti* Jordan and Meek. Raccoon River and Beaver Creek, abundant; Walnut Creek, Des Moines, Lizard Creek, Fort Dodge, and Perry, common; Middle River, Adel, Four-mile Creek, North River.
25. *Notropis lutrensis* (Baird and Girard).
26. *Notropis whipplei* (Girard). Estherville, Lizard Creek, and Fort Dodge, abundant; Raccoon River, Beaver and Walnut creeks, Des Moines, and Perry, common; Middle River, Adel, North River, Yader River.

27. *Notropis megalops* (Rafinesque). *Shiner*. Beaver and Walnut creeks, Lizard Creek, and Perry, abundant; Des Moines, Raccoon River, Estherville, and Fort Dodge, common; Four-mile Creek, Adel, North River, Middle River.
28. *Notropis ardens* (Cope). *Redfin*. Fort Dodge, not common; Beaver Creek (scales 55), Des Moines, Raccoon River, Perry, Walnut Creek, rare; Adel, Middle River, North River.
29. *Notropis dilectus* (Girard). *Emerald minnow*. Des Moines, Fort Dodge, common; Lizard Creek, not common; Beaver Creek, Estherville, Perry, Walnut Creek, Raccoon River, rare; North River, Adel.
30. *Phenacobius mirabilis* (Girard). Des Moines, common; Raccoon River, Walnut and Beaver creeks, Perry, rare; Middle River, North River, Four-mile Creek.
31. *Rhinichthys atronasmus* (Mitchill). *Black-nosed dace*. Lizard Creek, Fort Dodge, Walnut and Beaver creeks, rare.
32. *Hybopsis storerianus* (Kirtland). *Spawn-eater*. Raccoon River, common; Des Moines and Perry, rare; Middle River, Adel, Walnut Creek.
33. *Hybopsis kentuckiensis* (Rafinesque). *Hornyhead*. Estherville, abundant; Walnut and Beaver creeks, Raccoon River, Des Moines, and Fort Dodge, common; Lizard Creek, not common; Perry, rare; Adel, North River.
34. *Semotilus atromaculatus* (Mitchill). *Horned dace*. Raccoon River, common; Beaver and Walnut creeks, Des Moines, Estherville, and Perry, rare; Adel, Lizard Creek, North River.
35. *Notemigonus chrysoleucus* (Mitchill). *Golden shiner*; *Bream*; *Roach*. Estherville, common; Des Moines (Raccoon River), Perry, Beaver Creek, rare.
36. *Fundulus zebrinus* Jordan and Gilbert. Fort Dodge, rare.
37. *Zygonectes notatus* (Rafinesque). *Top-minnow*. Raccoon River, rare.
38. *Lucius vermiculatus* (Le Sueur). *Little pickerel*. Beaver Creek, Yader Creek.
39. *Lucius lucius* (Linnaeus). *Pike*; *Northern pickerel*. Fort Dodge, common; Perry, rare; Raccoon River, Adel, Des Moines.
40. *Anguilla chrysypa* Rafinesque. *Common eel*. Raccoon River and Des Moines, rare, occasionally taken with hook and line; Adel.
41. *Labidesthes sicculus* Cope. *Brook silverside*. Adel; Fort Dodge and Raccoon River, rare.
42. *Pomoxis annularis* Rafinesque. *Crappie*; *Bachelor*. Raccoon River, common in bayou; Middle River.
43. *Ambloplites rupestris* (Rafinesque). *Rock bass*; *Red-eye*; *Goggle-eye*. Fort Dodge, abundant; Estherville, common; Raccoon River, not common; Lizard Creek and Perry, rare; Adel.
44. *Lepomis cyanellus* (Rafinesque). *Green sunfish*. Beaver Creek, abundant; Perry, abundant in small bayou; Raccoon River, common in bayou; Des Moines and Fort Dodge, common; Estherville, rare; North River, Middle River, Walnut Creek, Adel.
45. *Lepomis humilis* (Girard). *Red-spotted sunfish*. Raccoon River, abundant in bayou; Perry, abundant; Fort Dodge, common; Middle River, Des Moines, Beaver Creek, Walnut Creek, North River, Adel.
46. *Lepomis pallidus* (Mitchill). *Blue sunfish*. Des Moines, uncommon; Raccoon River, rare; Adel.
47. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish*. Estherville, common; Raccoon River, rare; Beaver Creek.
48. *Micropterus dolomieu* Lacépède. *Small-mouthed black bass*. Fort Dodge, common; Des Moines and Raccoon River, not common; Lizard Creek, Perry, Beaver Creek, and Estherville, rare; Adel, Middle River.
49. *Micropterus salmoides* (Lacépède). *Large-mouthed black bass*. Raccoon River, common in bayou; Perry, rare; Beaver Creek, Adel, Des Moines.
50. *Etheostoma pellucidum clarum* (Jordan and Meek). *Sand darter*. Raccoon River, Fort Dodge, and Perry, rare; Adel.
51. *Etheostoma nigrum* (Rafinesque). *Johnny darter*. Beaver and Walnut creeks, Raccoon River, Des Moines, and Fort Dodge, common; Perry, not common; Lizard Creek, rare; North River, Adel.
52. *Etheostoma caprodes* (Rafinesque). *Log perch*. Estherville, common; Fort Dodge, rare; Des Moines.

53. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter*. Estherville, common; Des Moines, Lizard Creek, Fort Dodge, and Perry, rare; Beaver Creek, North River, Adel.
54. *Etheostoma phoxocephalum* Nelson. Estherville and Perry, rare.
55. *Etheostoma zonale* (Cope). Beaver Creek, Estherville, and Fort Dodge, common.
56. *Etheostoma flabellare* Rafinesque. Fort Dodge, not common; Beaver Creek, Estherville, and Perry, rare; Raccoon River.
57. *Etheostoma jessiae* (Jordan and Brayton). Beaver Creek.
58. *Etheostoma iowæ* Jordan and Meek. Fort Dodge and Perry, rare.
59. *Perca flavescens* (Mitchill). *Yellow perch*. Estherville and Perry, rare.

III.—THE SKUNK RIVER.

The Skunk River drains a narrow basin between the Iowa and Des Moines rivers. At Ames it is not large, has a sandy bottom, and flows with considerable current. Collections were made in the river and in a small bayou. Squaw Creek is smaller than Skunk River, and in the summer the water is confined to a few holes. In October, 1889, these holes contained many pickerel, bass, suckers, and buffalo-fishes. The following September I collected again in the same holes, but found very few fishes compared with the previous year.

FISHES OF THE SKUNK RIVER.

1. *Ammocetes branchialis* (Linnaeus). *Mud lamprey*. A larval specimen from this river is preserved in the Iowa Agricultural College Museum.
2. *Ictalurus punctatus* (Rafinesque). *Channel cat*; *White cat*; *Silver cat*. Skunk River, common.
3. *Ameiurus nebulosus* (Le Sueur). *Common bullhead*; *Horned pout*. Two specimens in the Iowa Agricultural College Museum have the anal rays 23.
4. *Ameiurus melas* (Rafinesque). *Bullhead*. Skunk River, abundant in the bayou; Squaw Creek, abundant.
5. *Noturus exilis* Nelson. *Stone cat*. Anal rays, 16. A few specimens are preserved in the Iowa Agricultural College Museum.
6. *Noturus gyrinus* (Mitchill). *Stone cat*. Skunk River, rare, anal rays 13 or 14; Squaw Creek, rare.
7. *Ictiobus cyprinella* (Cuv. and Val.). *Red-mouthed buffalo*. Squaw Creek; abundant in 1889, but none taken the following year.
8. *Carpiodes velifer* (Rafinesque). *Quillback*; *Carp sucker*. Skunk River and Squaw Creek, common.
9. *Catostoma teres* (Mitchill). *Common sucker*. Squaw Creek, abundant; Skunk River, common.
10. *Catostomus nigricans* Le Sueur. *Hog sucker*; *Stone roller*; *Hog mallet*. Skunk River, common; Squaw Creek, rare.
11. *Minytrema melanops* (Jordan). *Striped sucker*. Squaw Creek, rare.
12. *Moxostoma duquesnei* (Le Sueur). *Common redhorse*; *Mallet*. Squaw Creek, abundant; Skunk River, not common.
13. *Moxostoma*, sp. Squaw Creek, rare. Scales, 41; dorsal rays, 15; base of dorsal, $4\frac{1}{2}$ in body; head, 4; depth, $3\frac{1}{2}$; eye, $4\frac{1}{3}$; caudal lobes equal; body very deep; back much arched. These specimens resemble the preceding, but the back is much more arched and the body much deeper.
14. *Moxostoma aureolum* (Le Sueur). Skunk River, rare; head very small.
15. *Campostoma anomalum* (Rafinesque). *Stone-lugger*; *Stone-roller*. Skunk River and Squaw Creek, common.
16. *Chrosom s erythrogaster* Rafinesque. *Red-bellied minnow*. Small brook, near Ames, Iowa, on the University campus; six specimens.
17. *Hybognathus nuchalis* Agassiz. *Silvery minnow*. Squaw Creek, common; Skunk River, rare.

18. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Skunk River, not common; Squaw Creek, abundant.
19. *Pimephales promelas* Rafinesque. *Fat-head*. Skunk River, common in bayou; Squaw Creek, not common.
20. *Cliola vigilax* (Baird and Girard). *Silver-fin*. Skunk River, common.
21. *Notropis heterodon* Cope. Skunk River, not common; found with the following species.
22. *Notropis cayuga* Meek. Skunk River, very abundant in a small bayou; Squaw Creek, common.
23. *Notropis deliciosus* (Girard). Squaw Creek and Skunk River, rare.
24. *Notropis gilberti* Jordan and Meek. Skunk River and Squaw Creek, common.
25. *Notropis whipplei* (Girard). Skunk River and Squaw Creek, common.
26. *Notropis megalops* (Rafinesque). *Shiner*. Squaw Creek and Skunk River, common.
27. *Notropis ardens* (Cope). Skunk River, rare, scales 55; Squaw Creek, rare, scales 44 to 50; lateral line not complete in some specimens; anal rays, 10 to 12.
28. *Notropis dilectus* (Girard). *Emerald minnow*. Skunk River, abundant; Squaw Creek, rare.
29. *Hybopsis kentuckiensis* (Rafinesque). *Hornyhead*; *River chub*; *Jerker*. Skunk River and Squaw Creek, common.
30. *Semotilus atromaculatus* (Mitchill). *Horned dace*; *Creek chub*. College Creek, Ames, common.
31. *Notemigonus chrysoleucus* (Mitchill). *Golden shiner*; *Bream*. Skunk River, common in the bayou; Squaw Creek, common.
32. *Phenacobius mirabilis* (Girard). Skunk River, not common; Squaw Creek, rare.
33. *Zygocetes notatus* (Rafinesque). *Top-minnow*. Skunk River and Squaw Creek, rare.
34. *Lucius lucius* (Linnaeus). *Pike*; *Northern pickerel*. Several specimens from the Skunk River are contained in the Ames Museum.
35. *Lucius masquinongy* (Mitchill). *Muskellunge*. Skunk River, rare. I have examined the head of a large specimen which weighed 35½ pounds. It was taken from Skunk River, just below the mouth of Squaw Creek. Fishermen report that several were captured at the same place a few years ago.
36. *Labidesthes sicculus* Cope. *Brook silverside*. Skunk River and Squaw Creek, rare.
37. *Pomoxis sparoides* (Lacépède). *Calico bass*; *Grass bass*; *Strawberry bass*. Skunk River, not common.
38. *Ambloplites rupestris* (Rafinesque). *Rock bass*; *Red-eye*; *Goggle-eye*. Ames, rare. Contained in the Iowa Agricultural College Museum.
39. *Lepomis cyanellus* (Rafinesque). *Green sunfish*. Skunk River, abundant; Squaw Creek, common.
40. *Lepomis humilis* (Girard). *Red-spotted sunfish*. Skunk River, not common.
41. *Lepomis pallidus* (Mitchill). *Blue sunfish*. Squaw Creek, rare.
42. *Micropterus salmoides* (Lacépède). *Large-mouthed black bass*. Skunk River, abundant, mostly young from the bayou; Squaw Creek, common.
43. *Micropterus dolomieu* Lacépède. *Small-mouthed black bass*. Squaw Creek and Skunk River, not common.
44. *Etheostoma nigrum* Rafinesque. *Johnny darter*. Squaw Creek, common; Skunk River, rare.
45. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter*. Skunk River, rare. Lateral line, 70; cheeks and opercles scaly; breast naked; head, 4; depth, 6; anal rays, 11-9. Squaw Creek, scarce.
46. *Etheostoma zonale* (Cope). Skunk River, rare. Scales, 50; dorsal, XI-12; anal rays, 11-7; cheeks, opercles, and breast scaly, the latter naked near isthmus.
47. *Etheostoma jessiae* (Jordan and Brayton). Squaw Creek, rare. Scales, 48; cheeks scaled; breast naked; dorsal rays, XI or XII-14.
48. *Etheostoma cæruleum* Storer. Skunk River and Squaw Creek, rare.
49. *Etheostoma iowæ* Jordan and Meek. Skunk River, common in the bayou. Sides with 10 or 11 reddish spots, interspersed with darker bands of about the same size. The 2d, 3d, 4th, and 5th extend on sides under pectoral fins. Dorsal with a narrow, dark margin, about half of the fin; below this with a red band below a darker band; soft dorsal, caudal, and pectorals irregularly barred with yellow and darker; anal nearly plain. In some (female) specimens the red spots on the sides were absent, otherwise all were alike in color. Scales, 56; dorsal rays, VIII-IX, 10 or 11; A., 2-7.

IV.—THE IOWA RIVER.

The Iowa River rises in the north-central part of the State. The country near its source is a slightly undulating prairie, becoming more and more broken toward its mouth. The river was visited at Garner, Belmond, Amana, and Iowa City. At Garner the water was confined to a few holes, rather distant from one another, in which grass was so abundant that it was quite impossible to seine. We succeeded, however, in taking a few bullheads (*A. melas*) and the mud minnow (*U. limi*). The great scarcity of water was due to a prolonged season of dry weather, and was an unusual occurrence. The stream at this point was not bordered by timber.

At Belmond the river is from 20 to 40 feet wide. A dam at this place backs the water for some distance above. We collected below the dam, where the bottom was gravelly and sandy. There is much vegetation in the river a short distance below the dam and a weak growth of timber along its banks. The water was clear, the current rather slack, and the river unusually slow. When the mill was in operation there was but little water flowing over the dam. Pickerel seemed quite plentiful in the grass, but only a few were caught in our nets. Small fishes were abundant, especially just below the dam. The temperature on July 29 was 73° F.

At Amana the river is much larger than at Belmond. Aquatic vegetation is very scarce and the bottom sandy. There is not much timber along the banks. A small creek empties into the river at this point, and when we were there the water in the creek was confined to a few holes. From these holes large pickerel were taken, and also many crappies, *P. annularis* and *P. sparoides*. At the mouth of the creek the water was from 4 to 7 feet deep, and the bottom muddy. The examination at Amana was made September 11. The temperature is about the same as in the Cedar River at Waverly.

At Iowa City the river has about the same characteristics as at Amana. It is somewhat larger and deeper, and in some places is bordered by rather low cliffs. There is also more timber along its borders. A small creek with a very muddy bottom near its mouth flows into the river near Iowa City. Collections were made in the river and in the creek by Prof. C. C. Nutting and the writer in October, 1889. I was informed by a fisherman that in former years the larger catfishes, pickerel, buffalo, and bass were very common in the river, and that fishing for the markets in the spring was then quite lucrative. These larger fishes are still taken, but in much less numbers.

Through the kindness of Prof. Nutting I have been able to examine the collection of fishes from the Iowa River in the museum of the Iowa State University, and the additional facts gained thereby have been utilized in the preparation of the following list.

FISHES OF THE IOWA RIVER.

1. *Ammocetes branchialis* (Linnaeus). *Mud lamprey*. A few specimens are contained in the Museum of the Iowa State University.
2. *Petromyzon concolor* (Kirtland). *Brook lamprey*. A few specimens in the museum of the Iowa State University.
3. *Amia calva* Linnaeus. *Dogfish; Bow-fin; Mudfish*. Iowa City and Amana, not common.
4. *Lepisosteus osseus* (Linnaeus). *Common gar-pike; Long-nosed gar; Bill-fish*. Iowa City; said to be quite common in the spring. The specimens examined are in the museum of the Iowa State University.
5. *Polyodon spathula* (Walbaum). *Paddle-fish; Spoon-bill; Duck-billed cat*. The specimens examined are in the museum of the Iowa State University. Said to have been frequently taken in previous years.
6. *Ictalurus punctatus* (Rafinesque). *Channel cat; White cat; Silver cat*. Small specimens were obtained in considerable numbers at Amana and Iowa City. Larger specimens are said to be more rare than formerly.
7. *Ameiurus melas* (Rafinesque). *Bullhead*. Garner and Belmont, common.
8. *Noturus gyrinus* (Mitchill). *Stone cat*. Belmont and Amana, rare. All the specimens taken were small.
9. *Carpiodes velifer* (Rafinesque). *Quillback; Carp sucker*. Iowa City and Amana, very abundant in bayous at the side of the river. The specimens exhibit considerable variations. In some the first dorsal rays are prolonged to near the caudal fin, while in others these rays scarcely reach the middle of the dorsal fin. Some are deeper than others, and in all the profile is quite trenchant.
10. *Catostomus teres* (Mitchill). *Common sucker*. Belmont, Amana, and Iowa City, not common.
11. *Catostomus nigricans* (Le Sueur). *Hog sucker; Stone-roller; Hog mullet*. Belmont, abundant just below the dam.
12. *Moxostoma duquesnei* Le Sueur. *Common redhorse; "Mullet"*. Belmont and Iowa City, common; Amana, rare.
13. *Minytrema melanops* (Rafinesque). *Striped sucker*. One specimen was obtained at Amana. This species seems rare in Iowa, and I have taken it in only three localities.
14. *Campostoma anomalum* (Rafinesque). *Stone-lugger; Stone-roller*. Iowa City and Amana, rare; Belmont, common. Scales, 44 to 48.
15. *Chrosomus erythrogaster* Rafinesque. *Red-bellied minnow*. Belmont, abundant.
16. *Hybognathus nuchalis* Agassiz. *Silvery minnow*. Amana, rare.
17. *Hybognathus nubila* (Forbes). Belmont, abundant.
18. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Amana, very common; Iowa City and Belmont, rare.
19. *Cliola vigilax* (Baird and Girard). *Silver-fin*. Iowa City, rare.
20. *Notropis heterodon* (Cope). Rare.
21. *Notropis cayuga* Meek. Belmont, common; the specimens taken at this place agree with those from the Cedar Basin and elsewhere in the State.
22. *Notropis deliciosus* (Girard). Iowa City and Amana, not common.
23. *Notropis topeka* Gilbert. Amana, rare.
24. *Notropis gilberti* Jordan and Meek. Iowa City and Belmont, abundant; Amana, rare.
25. *Notropis whipplei* (Girard). Amana, very common; Iowa City, not common.
26. *Notropis megalops* (Rafinesque). *Shiner*. Belmont and Iowa City, very common; scales before the dorsal fin, small.
27. *Notropis ardens* (Cope). *Redfin*. Belmont, rare. Scales, 43; anal rays, 11; color, dark blue; dark spot at the base of first dorsal ray prominent; base of first dorsal ray midway between the nostril and base of caudal fin.

28. *Notropis dilectus* (Girard). *Emerald minnow*. Amana, very rare. Base of first dorsal ray midway between eye and base of caudal fin; the diameter of the eye equals that of the snout, $3\frac{1}{2}$ in head; about 20 scales before dorsal fin.
29. *Notropis atherinoides* (Rafinesque). *Rosy minnow*. Iowa City, common. The specimens from Iowa City are much larger than the preceding; length, $3\frac{1}{2}$ inches. Color, light olivaceous, with a bright, silvery luster; head, $4\frac{1}{2}$ to $4\frac{3}{4}$ in length of body; depth, $5\frac{1}{2}$; diameter of eye greater than the length of the snout, 3 in the head; snout, $3\frac{1}{4}$ in head; anal rays, 10; scales in the lateral line, 40; dorsal fin behind ventrals; base of its first ray midway between nostrils or front of orbit and base of caudal fin. These specimens agree very well with *N. atherinoides* from Ohio and Indiana, and are also very similar to the preceding.
30. *Phenacobius mirabilis* (Girard). Amana and Iowa City, rare.
31. *Hybopsis storerianus* (Kirtland). *Spaen-eater*. Amana and Iowa City, common.
32. *Hybopsis kentuckiensis* (Rafinesque). *Hornyhead*. Belmond and Iowa City, common; scales, 43.
33. *Conesius dissimilis* (Girard). Belmond, two specimens, $2\frac{1}{2}$ inches in length. Body elongate, not much compressed; snout pointed; mouth terminal, oblique; maxillary, reaching nearly to front of pupil; diameter of eye equals length of snout, $3\frac{1}{2}$ in head; base of first dorsal ray midway between base of caudal fin and nostril; scales, small before dorsal, about 60 in the lateral line; breast scaly; teeth, 1, 5-5, 1, hooked and without grinding surface. Color, dark olivaceous, a dark lateral band bounded below by the decurved lateral line; a lighter and narrower band above it from upper part of orbit to the caudal fin; fins all dusky. This species seems very rare in Iowa. It was taken among weeds.
34. *Fundulus zebrinus* Jordan and Gilbert. Belmond, rare.
35. *Zygonectes notatus* (Rafinesque). *Top-minnow*. Iowa City, rare.
36. *Umbra limi* (Kirtland). *Mud-minnow*; *Dogfish*. Garner. A few specimens were taken from one of the isolated holes in the Iowa River.
37. *Lucius lucius* (Linneus). *Pike*; *Northern pickerel*. Belmond and Amana, common.
38. *Anguilla chryssypa* (Rafinesque). *Common eel*. One specimen in the Iowa State University Museum was obtained from the Iowa River. The species is very rare in Iowa.
39. *Pomoxis sparoides* (Lacépède). *Calico bass*; *Grass bass*; *Strawberry bass*. Amana, common; Iowa City, rare.
40. *Pomoxis annularis* Rafinesque. *Crappie*; *Bachelor*. Amana; more common than the preceding species.
41. *Chænobryttus gulosus* (Cuv. and Val.). *War-mouth*; *Red-eyed bream*. Amana, rare.
42. *Lepomis cyanellus* Rafinesque. *Green sunfish*. Belmond, common; Iowa City, not common.
43. *Lepomis pallidus* Mitchill. *Blue sunfish*. Amana and Iowa City, common.
44. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish*. Belmond, common.
45. *Lepomis holbrooki* (Cuv. and Val.). Amana, not common. Opercular flap with a red spot, but without a red margin.
46. *Micropterus salmoides* (Lacépède). *Large-mouthed black bass*. Iowa City, not common; most of the specimens were taken from the creek near its mouth.
47. *Etheostoma nigrum* Rafinesque. *Johnny darter*. Belmond, abundant; Iowa City, common in the creek; Amana, rare.
48. *Etheostoma flabellare* Rafinesque. Belmond and Iowa City, rare; stripes on both sides very prominent.
49. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter*. Belmond and Iowa City, rare.
50. *Etheostoma iowæ* Jordan and Meek. Not common.
51. *Perca flavescens* Mitchill. *Yellow perch*. Belmond, common.
52. *Stizostedion vitreum* (Mitchill). *Wall-eyed pike*; *Jack salmon*. Iowa State University Museum.

V.—THE CEDAR RIVER AND ITS TRIBUTARIES.

The Cedar River basin properly forms a part of the Iowa River basin, but owing to the fact that above the junction of the two rivers the Cedar River is much the larger stream, it seems best to treat the latter separately.

The Cedar is the second largest river in the State and one of the most picturesque. Together with its northern tributaries it rises in southern Minnesota. Its general course is southeast as far as Moscow, about 15 miles from the Mississippi River, where it turns almost at right angles and, flowing southwest only about 30 miles, empties into the Iowa River. The current of the Cedar River is swifter than that of either the Des Moines or the Iowa. Its bottom for the most part is sandy, especially above Moscow, but there are occasional stretches of mud and some rocky patches.

The Cedar basin is an undulating prairie, with considerable timber along both the main river and its tributaries. There are also many bayous and small ponds which are connected with the river at times of high water. In the larger bayous, where there is much swamp vegetation, pickerel and various species of sunfishes abound. The largest bayou is near Cedar Rapids. On the maps it is usually designated as Cedar Lake, but locally it is known as the "Slough." It is about three-fourths of a mile wide and 2 miles long, and is fast filling up at present. It is connected with the river at all times of the year, contains an abundance of vegetation, and abounds with sunfishes and bullheads. Some black bass and pickerel and many mudfish are also taken from its waters. The Slough is decidedly the fishing-ground for the small boys of Cedar Rapids, and I have often seen them on their homeward trip with strings of bullheads and sunfishes about as long as the average boy himself.

At Austin, Minnesota, the river is little more than a large creek. The bottom is mostly sandy, but there are occasional stretches of deep water with muddy bottom. Aquatic vegetation is scarce and confined to small patches in shallow water. At the time of our visit the volume of water had been much reduced by dry weather. Its temperature on July 25, 1890, was 71° F. Turtle River is a tributary of the Cedar and empties into it near Austin; its current is sluggish and its bottom mostly muddy; it is fed by large marshes and shallow lakes. Rose Creek, another small tributary near Austin, is fed by springs, has a very rocky bottom and a swift current; pickerel seemed especially abundant in it; its temperature on July 25, 1890, was 69° F.

The Cedar River at Waverly is very much larger than at Austin; its banks are bordered with a rather heavy growth of timber; its bottom is very sandy, and its water clear; its temperature on July 31 was 74° F.

The Shellrock River is not much smaller than the Cedar above its junction with the latter, which it much resembles except that its banks are less heavily timbered. Its temperature on July 31 was 74° F. Fishes were about as abundant as in the Cedar River. Near Waverly there are some large springs. We seined in one of the spring branches on the west side of the Cedar River, where the water was less clear than in other similar branches. Fishes were scarce; its temperature was 58° F.

The west branch of the Cedar River is formed by two small creeks near Dumont. The average width of these creeks is less than 30 feet; their bottoms are sandy, with some mud; timber is scarce along their borders. One of them is termed the main fork, the other is called Hartgraves Creek. Near Dumont is a small lake connected

by a small channel with Hartgraves Creek. The bottom of this lake is very muddy and is covered with vegetation. Sunfishes and pickerel were very abundant in it.

At Palo the bottom of the river is sandy, in some places rocky. There are many bayous in this region, and the river is bordered with less timber than at Waverly. Dry creek is a small tributary of the Cedar River near Palo, having a very muddy bottom. We collected on the farm of Mr. Joseph Owens, who informed me that the creek used to be deep and narrow and contained fine pickerel and catfishes. At present it is wider and shallower.

At Cedar Rapids the river is about 700 feet wide. A dam at this place holds the water back over a distance of about 5 miles, thereby increasing the width of the river. This enlarged part contains many islands and much aquatic vegetation. Below the dam, for about one-third of a mile, the current is very swift and the bottom very rocky, but farther down it becomes sandy. There is considerable timber in this region.

Prairie Creek is a western tributary of the Cedar, a small stream bordered in the lower part with timber. Its bottom is usually muddy, with occasional stretches of sand. Mr. Aquilla Miller, who has resided on its banks many years, informed me that the larger fishes were formerly quite abundant in it, but at present only small ones can be found.

Indian Creek is an eastern tributary, smaller than Prairie Creek, with a sandy or rocky bottom, and is bordered by timber. A much greater number of fishes was found in Indian Creek than in Prairie.

At Mount Vernon the bottom of the Cedar River is sandy. Cliffs, called the Palisades, about 60 feet high, occur on the western side. A few small streams flow into the river near this place. At West Liberty the current was more moderate than at the other places visited, but the general characteristics of the river were the same. Most of the collection was obtained from bayous near the river, but a few specimens were taken from a small creek between West Liberty and the river.

FISHES OF THE CEDAR RIVER AND ITS TRIBUTARIES.

1. *Ammocetes branchialis* (Linnaeus). *Mud lamprey*. This small lamprey ascends clear brooks in the spring for the purpose of spawning, and at that time of the year large numbers can be captured. They were spawning at Cedar Rapids April 20, 1889, and about April 10, 1891, the season lasting about two weeks. I have secured many specimens from small brooks near Cedar Rapids, but have seen none from other localities and am not aware of their being taken at other times than in the spring. Specimens seldom exceed 6½ inches in length. It would be an easy matter to destroy large quantities of these lampreys in the spring, if it were thought expedient, in view of the injury which they are supposed to inflict upon some of the food-fishes. They undoubtedly do some destruction, but how much it is difficult to say. I have compared the lampreys from Cedar Rapids with specimens from Ithaca, New York, and regard the species from both localities as identical.
2. *Petromyzon concolor* (Kirtland). *Brook lamprey*. I have never observed this species in the spring. It is represented in the Coe College Museum by a single specimen, collected in the Cedar River several years ago by Prof. F. Starr.
3. *Polyodon spathula* (Walbaum). *Paddle-fish; Spoon-bill; Duck-billed cat*. Cedar Rapids, rare. The snouts of a few individuals, collected in the Cedar River during the past ten years, are in the Coe College Museum.
4. *Scaphirhynchus platyrhynchus* (Rafinesque). *Shovel-nosed sturgeon*. An occasional specimen is taken from the Cedar River with hook and line.

5. *Lepisosteus ossens* (Linnæus). *Common gar-pike; Long-nosed gar; Bill-fish*. Cedar Rapids, common. A few specimens from this locality are contained in the Coe College Museum. The species also occurs in the river.
6. *Amia calva* Linnæus. *Dogfish; Bow-fish; Mudfish*. Very abundant in the Slough and occasionally taken from the Cedar River.
7. *Ictalurus punctatus* (Rafinesque). *Channel cat; White cat; Silver cat*. Cedar Rapids, common; Palo, Cedar River, several small specimens taken in the seine. During the months of June and July many specimens of this species are taken from the Cedar River with hook and line. The best bait seems to be fibrin from blood. The favorite fishing-places are just below the dam or below Sinclair's packing-house, the latter apparently being the best. The water below the packing house is far less clear and pure than below the dam.
8. *Ameiurus natalis* (Le Sueur). *Yellow cat*. Indian Creek, scarce. Anal rays, 25; base of anal, $3\frac{1}{2}$ in the length of the body and longer than the length of the head.
9. *Ameiurus nebulosus* (Le Sueur). *Common bullhead; Horned pout*. Dry Creek, Palo, common; Dumont, not common; anal rays, 20 to 23; Indian Creek and Austin, Turtle River, rare.
10. *Ameiurus melas* (Rafinesque). *Bullhead*. Cedar Rapids, abundant in the Slough; Indian Creek, Dumont, and Dry Creek, common; Waverly (Shellrock and Clear rivers), Prairie Creek, and Mount Vernon, not common.
11. *Leptops olivaris* (Rafinesque). *Mud cat; Flat-head cat*. Several large specimens of this species were reported taken from the Cedar River with hook and line in July, 1890, the largest weighing about 20 pounds. I saw only a few of these, but all that I examined were of this species. It is not unlikely that some of the larger specimens recorded may have belonged to *A. nigricans*. According to the anglers, cat fishing was better in July, 1890, than it had been at any time during the past ten years.
12. *Noturus flavus* (Rafinesque). *Stone cat*. Cedar Rapids, rare.
13. *Noturus gyrinus* (Mitchill). *Stone cat*. West Liberty, rare; anal, 15 rays; caudal fin continuous with adipose; dorsal spine not serrated; head, $3\frac{1}{2}$ in length of body; top of head flattish. Waverly (Cedar River), rare; anal, 15; head, $3\frac{3}{4}$; depth, 4; pectoral spine entire, $2\frac{1}{2}$ in head. Dumont, Dry Creek, and Indian Creek, rare.
14. *Carpiodes velifer* (Rafinesque). *Quillback; Carp sucker*. Cedar Rapids, very abundant in still bays along the sides of the river. Most of the specimens taken are small. Different individuals show considerable variation, but I have not been able to detect any constant characters by which to separate them. Prairie Creek, abundant; Dumont, Austin, Indian Creek, and West Liberty, common; Waverly (Shellrock and Cedar rivers), not common.
15. *Catostomus teres* (Mitchill). *Common sucker*. Dry Creek at Palo, Prairie Creek, and Cedar Rapids, abundant; Waverly (Shellrock River), Dumont, Austin, Indian Creek, and West Liberty, common; Cedar River at Palo, rare.
16. *Catostomus nigricans* (Le Sueur). *Hog sucker; Stone-roller; Hog mullet*. Dry Creek, at Palo, abundant; Dumont, common; Austin, and Cedar River at Waverly, not common; Cedar Rapids, Prairie Creek, Indian Creek, and Mount Vernon, rare.
17. *Erimyzon sucetta* (Lacépède). *Chub sucker; Sweet sucker*. West Liberty, two specimens were taken from a bayou near the river. Scales, 38; dorsal rays, 12; anal, 7; depth, $3\frac{1}{2}$; head, 4; longest specimen, $7\frac{1}{2}$ inches. This species seems rare in Iowa, and I have taken no specimens from other localities than the above.
18. *Moxostoma anisurum* (Rafinesque). *White-nosed sucker*. Austin, rare; dorsal, 15 rays; body deeper than in *M. duquesnei*; depth, $3\frac{1}{2}$; dorsal region arched more than in *M. duquesnei*; color, more silvery, and lower lip thinner and with sharper angle. Waverly, Shellrock, rare; depth, $3\frac{1}{2}$; dorsal rays, 15.
19. *Moxostoma duquesnei* (Le Sueur). *Common rethorse; "Mullet"*. West Liberty, common; lower fins red; dorsal rays, 14. Cedar Rapids, Prairie Creek, and Palo (Dry Creek), common. Waverly (Shellrock River), common; dorsal rays, 12 to 13; depth, $4\frac{1}{2}$ in the length of the body. Dumont, common; scales, 44; dorsal rays, 13; upper lip with a dark margin; color darker and less silvery than in specimens taken elsewhere. Austin, not common; dorsal rays, 12 to 11; color less silvery than usual; depth scarcely more than length of head.
- 19 $\frac{1}{2}$. *Minytrema melanops* Rafinesque. *Striped sucker*. Cedar River, scarce.

20. *Campostoma anomalum* (Rafinesque). *Stone tigger; Stone-roller*. West Liberty and Prairie creeks, rare. Indian Creek, not common; head, 4½ in the length of the body; dorsal rays, 7 or 8; anal rays, 7 or 8; snout, 3 in length of the head; first dorsal ray midway between base of caudal and tip of snout. Palo (Dry Creek), Waverly (Cedar and Shellrock rivers), Dumont, common; scales, 47 to 53. Austin, not common.
21. *Chrosomus erythrogaster* Rafinesque. *Red-bellied minnow*. This species is seldom found in Iowa except in spring brooks, and is nowhere abundant. It was common in a small brook at Mount Vernon, and rare at the following localities: Palo, Dry Creek, Waverly, taken in a small spring brook, tributary to the Cedar River; Austin.
22. *Hybognathus nuchalis* Agassiz. *Silvery minnow*. Prairie Creek, common; Indian Creek, Dumont and Waverly (Shellrock River), rare.
23. *Hybognathus nubila* (Forbes). Waverly (Shellrock River) and Austin, not common.
24. *Pimephales promelas* Rafinesque. *Flat-head*. Cedar rapids, very abundant. Nearly all the specimens were taken in a ditch along the Illinois Central Railroad near Cedar Rapids, where no fishes had been found the previous summer. No other species, moreover, were observed in this ditch, which is in communication with the Slough in times of high water. Only two species of *Pimephales* occur in Iowa. *P. promelas* prefers sluggish or stagnant pools with a muddy bottom, while *notatus* always inhabits clear water. This species was also obtained at the following localities: Indian Creek, common; Palo, Dry Creek, not common. West Liberty, Prairie Creek, Waverly (Shellrock River), Dumont, and Austin, rare.
25. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Indian Creek, abundant; West Liberty, Cedar Rapids, Prairie Creek, Palo, Dry Creek, Waverly (Cedar River and Shellrock River), Dumont, and Austin, common; Palo, Cedar River, rare.
26. *Cliola vigilax* (Baird and Girard). *Bullhead minnow*. Palo and Cedar Rapids, common.
27. *Notropis anogenus* Forbes. Austin, Minnesota, rare. This species very much resembles *N. heterodon*, from which it differs in having a smaller and more oblique mouth.
28. *Notropis heterodon* (Cope). West Liberty; dorsal nearer tip of snout than base of caudal; dark lateral band prominent. Found near the shore where there is little current and an abundance of weeds. Cedar Rapids, not common; Dumont, rare; Waverly (Shellrock River).
29. *Notropis cayuga* Meek. Indian Creek, rare. Head, 4 in the length of the body; depth, 4½; dorsal (origin of first ray) slightly nearer tip of snout than base of caudal fin; 14 or 15 scales in a series before dorsal fin; lateral line complete; scales, 35 or 36; anal rays, usually 8, seldom 9; snout blunt; mouth small. Color, dark above; outline of scales on upper part of body very distinct; dark lateral band present, passing around snout on upper jaw only. Waverly (Shellrock River), Austin (Minnesota), Dumont, Prairie Creek, and West Liberty, rare. This species is usually found with *Notropis heterodon* Cope, and *Notropis anogenus* Forbes, and is nowhere abundant. These three species are among the most feeble and insignificant of our fresh-water fishes.
30. *Notropis deliciosus* (Girard). Indian Creek, Cedar Rapids, and Dumont, common; Waverly (Shellrock and Cedar rivers), not common; West Liberty, Prairie Creek, and Palo, rare.
31. *Notropis topeka* Gilbert. Waverly (Cedar River) and Shellrock (Waverly), rare. This species resembles *Notropis deliciosus*, but has smaller eyes and a more compressed body.
32. *Notropis gilberti* Jordan and Meek. Palo, abundant; Shellrock River, at Waverly, very common; Waverly (Cedar River) and Dumont, common; Cedar Rapids, not common; Prairie Creek, rare; West Liberty. This species is one of the most abundant in Iowa, and is found in clear, running water.
33. *Notropis whipplei* (Girard). West Liberty and Prairie Creek, abundant; Cedar Rapids, common; head, 4; depth, 4 to 4½; scales, 36 to 38. Waverly, Cedar River, and Dumont, common; Waverly (Shellrock River), rare; lateral line, 35.
34. *Notropis megalops* (Rafinesque). *Common shiner*. West Liberty, Shellrock River at Waverly, Palo, and Dumont, abundant; Waverly (Cedar River), Indian Creek, Prairie Creek, and Cedar Rapids, common. This species is variable. The scales before the dorsal fin are usually small. In most of the specimens from Missouri and Arkansas the scales before the dorsal are large.

35. *Notropis jejunus* (Forbes). Cedar Rapids, rare. Head, 4 in length of the body; depth, $4\frac{1}{2}$ to $4\frac{3}{4}$; body robust; snout bluntish; mouth a little oblique; dorsal (origin of first ray) nearer tip of snout than base of caudal fin; 14 or 15 scales before the dorsal; scales in the lateral line, 36 or 37; diameter of the eye equal to the length of the snout; $3\frac{1}{2}$ in the length of the head; anal rays, 6 or 7, usually 7; lateral line slightly decurved. As regards form and color this species very much resembles *H. nuchalis* Agassiz.
36. *Notropis ardens* (Cope). *Iedfin*. Indian Creek, common; scales, 43 to 49; anal rays, 11 or 12; depth, $3\frac{3}{4}$ to $4\frac{1}{4}$; the larger specimens are the deeper; occasionally one is found whose depth is 5. Dumont, not common; scales, 45 to 48; anal rays, 10 or 11. Prairie Creek, Waverly (Shellrock River), and Palo, rare. Austin, rare; scales, 42 to 49. This species is rather rare in Iowa. It is very variable and seems to vary greatly with age. The smaller specimens are light-colored and slender, the larger very dark. The number of scales in the lateral line vary much. The dark at the base of the dorsal fin is always present, but in some specimens it is more distinct than in others.
37. *Notropis dilectus* (Girard). *Emerald minnow*. Waverly (Cedar River); head, $4\frac{1}{2}$; depth, $5\frac{1}{2}$; specimens rather darker than usual. Austin (Minnesota) and Waverly (Shellrock River), common; Indian Creek and West Liberty, rare; Dumont, common. Diameter of eye equals the length of the snout, $3\frac{1}{2}$ in the head. Cedar Rapids, common; head, $4\frac{1}{2}$; depth, $4\frac{1}{2}$; scales in the lateral line, 38; dorsal midway between the pupil and base of caudal fin; anal rays, 10 or 11.
38. *Notropis atherinoides* Rafinesque. Waverly (Shellrock River), rare; some specimens are very slender. Indian Creek, common; the longest specimens are $3\frac{1}{2}$ inches in length; anal rays, 9 to 11, usually 10; base of first dorsal ray midway between base of caudal fin and eye; 18 to 20 scales before dorsal fin; eye $3\frac{1}{2}$, equal to the snout; mouth large; maxillary reaching past the front of the orbit; snout pointed; lower jaw slightly the longer; scales in lateral line, 40 to 43. Cedar Rapids, common. These specimens agree with the above. The body is usually deeper than in *N. dilectus*; sides with a broad plumbeous band. This species is closely related to the preceding.
39. *Phenacobius mirabilis* (Girard). Indian Creek, West Liberty, Palo, and Cedar Rapids, rare.
40. *Rhinichthys atronanus* (Mitchill). *Black-nosed dace*. Palo and Mount Vernon, rare.
41. *Hybopsis dissimilis* (Kirtland). Cedar Rapids and Waverly (Shellrock River), rare. Waverly (Cedar River), common. Near the shore in shallow water many specimens were taken, but none were obtained from other points in the stream.
42. *Hybopsis storerianus* (Kirtland). Prairie Creek, rare.
43. *Hybopsis kentuckiensis* (Rafinesque). *Hornycad*; *River chub*; *Jerker*. Waverly (Shellrock River) and Palo, common. Indian Creek, West Liberty, Waverly (Cedar River), Dumont, and Cedar Rapids, rare.
44. *Semotilus atromaculatus* (Mitchill). *Horned dace*; *Creek chub*. Indian Creek, West Liberty, Palo, Dumont, Mount Vernon, and Cedar Rapids, rare.
45. *Leuciscus elongatus* ? (Kirtland). Palo (Dry Creek). Only one specimen, measuring $4\frac{1}{2}$ inches in length was taken. Teeth, 5-5, slightly hooked at the tip, no grinding surface; edges beveled, making a cutting edge. Body elongate, slender; dorsal fin midway between tip of snout and base of caudal fin; mouth terminal, oblique, rather large, but smaller than in *L. elongatus* from Yellow River. Scales on anterior portion of the body smaller than rest of scales. About 35 scales in a series before dorsal fin; lateral line decurved; scales in the lateral line, 54; dorsal fin above ventrals; dorsal rays, 8; anal rays, 8; maxillary reaching to the front of the orbit. Diameter of eye nearly equal to length of snout, 4 in the head; head, $3\frac{1}{2}$ in length of body; depth, $4\frac{1}{2}$. Color, plain olivaceous, lighter below; fins with a tinge of yellowish.
46. *Notemigonus chrysoleucus* (Mitchill). *Golden shiner*; *Bream*; *Roach*. Indian Creek, rare; anal rays, 13; dorsal, 8; scales in the lateral line, 41. West Liberty, Waverly (Shellrock River), Palo, Dumont, and Cedar Rapids, rare.
47. *Hiodon tergisus* Le Sueur. *Moon-eye*; *Toothed herring*. Cedar Rapids, rare.
48. *Dorosoma cepedianum* (Le Sueur). *Gizzard shad*; *Hickory shad*; *Mud shad*. Palo (Cedar River), one specimen taken from a bayou; Cedar Rapids, rare.

49. *Salvelinus fontinalis* (Mitchill). *Brook trout*. A few specimens are occasionally caught in McCloud Run, near Cedar Rapids, which is fed by a large spring. In former years a great many fishes were hatched artificially at this place, and the trout now taken were probably introduced at that time.
50. *Fundulus zebrius* Jordan and Gilbert. *Dumont*, rare.
51. *Zygonectes notatus* (Rafinesque). *Top-minnow*. Indian Creek, rare; anal rays, 11 to 13; scales, 34. Cedar Rapids, rare. This species is always found sparingly, sometimes in clear water, but usually among weeds.
52. *Zygonectes dispar* Agassiz. West Liberty, common in bayou. Anal rays, 11; dorsal, 7 or 8; scales, 33; head, 3 $\frac{1}{2}$; depth, 4, with 10 bars; dark blotch on side of head includes eye in all specimens.
53. *Umbra limi* (Kirtland). *Mud minnow*; *Dogfish*. Dumont, rare. This species is found in isolated ponds near the streams.
54. *Lucius vermiculatus* (Le Sueur). *Little pickerel*. West Liberty, common in bayou; Palo, rare, taken in a small bayou; Cedar Rapids, common in the Slough.
55. *Lucius lucius* (Linnaeus). *Pike*; *Northern pickerel*. Waverly (Cedar and Shellrock rivers), common; found along the banks of the stream among the weeds and grass; Dumont, abundant, taken from the lake; Cedar Rapids, common in the river and Slough.
56. *Anguilla chrysypa* (Rafinesque). *Common eel*. This species is occasionally taken by anglers near Cedar Rapids, and during last summer one angler is said to have captured over 40 specimens at that place. Rev. Mr. Parmont informs me that quite a number have been obtained from the Cedar River near Waterloo during the past spring (1891). Many specimens have also been planted in the Cedar River by Mr. Shaw, of Cedar Rapids.
57. *Eucalia inconstans* (Kirtland). *Brook stickleback*. Waverly, rare, taken from a small spring brook tributary to the Cedar River; Mount Vernon, a few specimens from a small pond.
58. *Labidesthes sicculus* Cope. *Brook silverside*. West Liberty, Cedar Rapids, and Cedar River at Waverly, common; Shellrock River at Waverly, Mount Vernon, and Indian Creek, rare.
59. *Pomoxis sparoides* (Lacépède). *Calico bass*; *Grass bass*; *Strauberry bass*. West Liberty, Waverly (Shellrock River), Cedar Rapids, and Dumont, common; Palo (bayou), not common; Indian Creek, rare.
60. *Pomoxis annularis* Rafinesque. *Crappie*; *Bachelor*. Cedar Rapids, not common; Waverly (Shellrock River), rare. This species is much less abundant than the preceding in the Cedar basin, but in the Des Moines River at Des Moines the opposite is true.
61. *Chænobryttus gulosus* (Cuv. and Val.). *War-mouth*; *Red-eyed bream*. West Liberty and Cedar Rapids, common; taken from grassy bayous.
62. *Ambloplites rupestris* (Rafinesque). *Rock bass*; *Red-eye*; *Goggle-eye*. Cedar Rapids and Dumont, common; Waverly (Cedar River) and Shellrock River, rare.
63. *Lepomis cyanellus* (Rafinesque). *Green sunfish*. Prairie Creek, abundant; West Liberty, Palo, Dumont, and Cedar Rapids, common; Indian Creek and Waverly (Cedar and Shellrock rivers), rare.
64. *Lepomis macrochirus* Rafinesque. Waverly (Cedar River) and Dumont, rare.
65. *Lepomis humilis* (Girard). *Red-spotted sunfish*. Cedar Rapids, rare.
66. *Lepomis pallidus* (Mitchill). *Blue sunfish*. Indian Creek, West Liberty, Waverly (Cedar River), Palo, and Cedar Rapids, common; Waverly (Shellrock River), rare.
67. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish*. Dumont, rare. "Ear-flap" with pale margin; cheeks with blue stripes; yellow spots on the soft dorsal; scales in lateral line, 35.
68. *Lepomis holbrooki* (Cuv. and Val.). Cedar Rapids, rare; West Liberty, common. Body deep, much as in *L. megalotis*, but more compressed; mouth small; maxillary reaching to the front of the eye; opercular flap small, its posterior margin red; teeth blunt, almost paved; brownish and bluish stripes on the checks; dorsal, 10-11; scales, 40 to 42; head, 3; depth, 2 to 2 $\frac{1}{2}$; sides with brownish or orange spots; unpaired fins spotted; eye, 3 $\frac{1}{2}$ to 3 $\frac{1}{2}$ in head. This species was quite common in the large bayou near the river.
69. *Lepomis gibbosus* (Linnaeus). *Common sunfish*; *Pumpkin-seed*. Indian Creek, not common; lateral line, 40. Waverly (Shellrock River), rare. Cedar Rapids, rare in the river, common in the Slough.

70. *Micropterus dolomieu* Lacépède. *Small-mouthed black bass*. Cedar Rapids, Dumont, Indian Creek, and Waverly (Shellrock River), common; Palo, rare. This species usually lives in clear, running water. The next species is more abundant in sloughs or in water with sluggish current.
71. *Micropterus salmoides* (Lacépède). *Large-mouthed black bass*. Palo, Cedar Rapids, Waverly, (Shellrock and Cedar rivers), and West Liberty (slough), common; Indian Creek, rare.
72. *Etheostoma pellucidum clarum* (Jordan and Meek). Cedar River, rare. The specimens agree very well with the description of individuals taken at Ottumwa by Jordan and Meek in 1884.
73. *Etheostoma nigrum* Rafinesque. *Johnny darter*. Indian Creek, West Liberty, Waverly (Shellrock and Cedar rivers), Palo, Dumont, Prairie Creek, and Cedar Rapids, abundant. This is by far the most abundant darter in Iowa.
74. *Etheostoma caprodes* (Rafinesque). *Log perch*. Waverly (Shellrock) and Cedar Rapids, rare. Dorsal, 14 or 15; lateral line with 85 scales.
75. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter*. Indian Creek, not common; some specimens have a very large head and slender body. West Liberty, Waverly (Shellrock and Cedar rivers), and Dumont, rare. Prairie Creek and Cedar Rapids, common.
76. *Etheostoma phoxocephalum* Nelson. Palo and Cedar Rapids, rare.
77. *Etheostoma evides* Jordan and Copeland. Cedar Rapids, rare.
78. *Etheostoma zonale* (Cope). Indian Creek, common. Breast, cheeks, opercles, and nape scaly; dorsal, XI-11; scales, 43. Cedar Rapids, Waverly (Cedar and Shellrock rivers), and Dumont, rare.
79. *Etheostoma flabellare* Rafinesque. Indian Creek, Palo, and Cedar Rapids, not common. The lateral stripes are very distinct on all Iowa specimens.
80. *Etheostoma cœruleum* Storer. Indian Creek, common. Cedar Rapids, not common. Scales, 45; dorsal, IX-X, 12. Waverly (Cedar and Shellrock rivers), not common. A few specimens of *spectabile* form.
81. *Etheostoma jessie* Jordan and Brayton. Indian Creek and Cedar Rapids, rare. Scales, 49; cheeks scaly; dorsal, X-12; scales in the lateral line, 49.
82. *Etheostoma iowæ* Jordan and Meek. Indian Creek, common. Color of male, light yellowish or olivaceous, very light below, dark above; upper two-thirds of body specked; sided with twelve dark vertical bars. The first bar is above and behind the opercle, the last one (very faint) at base of caudal fin. Between these dark bars are golden bars, which extend rather irregularly on sides of belly. Cheeks mottled with dark, a dark band extending downward and forward from the eye, and also upward and backward from the eye. Spinous dorsal dark at base and margin; the rest of the fin is red; soft dorsal with about five rows of brownish spots; caudal and pectoral fins also barred, golden at base of the latter; ventrals and anal white. Color of females similar to males, but the dark bars are less conspicuous, the markings more reticulated; no golden bars; all fins except ventrals barred with brown spots. Dorsal fin, cheeks, and opercles scaly; breast naked; scales in the lateral line, 55 to 58; head, 4; D., $5\frac{1}{2}$ to $5\frac{1}{2}$. Shellrock River, Waverly, and Dumont, rare. This species is common in Iowa, but so far as known its distribution is limited to the State whose name it bears.
83. *Etheostoma microperca* Jordan and Gilbert. *Least darter*. West Liberty, rare. D., VII-9.
84. *Stizostedion vitreum* (Mitchill). *Wall-eyed pike*; *Jack salmon*. This species is known in Iowa by the name of pike.
85. *Stizostedion canadense* (C. H. Smith). *Sauger*; *Sand pike*. Both this and the preceding species are occasionally taken in the Cedar River, but I have only observed the former. They are less abundant now than formerly.
86. *Perca flavescens* (Mitchill). *Yellow perch*. Dumont, common in the lake; Cedar Rapids, rare.
87. *Aplodinotus grunniens* Rafinesque. *Fresh-water drum*. This species seems to be quite common near Cedar Rapids in the spring. I have never caught any with the seine, but have seen many specimens that were taken with hook and line below the dam at Cedar Rapids.

VI.—CLEAR LAKE.

Clear Lake is situated near the source of the Cedar and Iowa rivers, its outlet being a tributary of the Shellrock River. Its greatest length is about $5\frac{1}{2}$ miles and its greatest width about 2 miles. Its longest diameter is east and west. The lake is quite shallow, not exceeding 20 feet in depth, while the greater part of it is less than 10 or 12 feet deep. Portions of the lake contain considerable vegetation. At the time of our visit the water was about 4 feet lower than usual, and no water was flowing in or out. The inlets are very small streams and the water in the lake was below the level of their sources. The chief game fishes are both species of the black bass, the wall-eyed pike, perch, and the pickerel. We collected at different points near the shore.

THE FISHES OF CLEAR LAKE.

1. *Notemigonus chrysoleucus* (Mitchill). *Roach; Golden shiner; Bream.* Rare.
2. *Fundulus zebrinus* Jordan and Gilbert. Rare.
3. *Labidesthes sicculus* Cope. *Brook silverside.* Common.
4. *Lucius lucius* (Linnæus). *Pickerel.*
5. *Poxomis sparoides* (Lacépède). *Calico bass; Grass bass; Strawberry bass.* Not abundant; said to be taken frequently by anglers.
6. *Ambloplites rupestris* (Rafinesque). *Rock bass; Red-eye; Goggle-eye.* About as common as the preceding.
7. *Lepomis pallidus* (Mitchill). *Blue sunfish.* Not common.
8. *Ameiurus melas* (Rafinesque). *Bullhead.* Not abundant.
9. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow.* Abundant.
10. *Notropis hudsonius* (De Witt Clinton). *Spawen-eater.* Abundant. Snout blunt; mouth moderate and slightly oblique; back arched; dorsal over ventrals and nearer snout than base of caudal; eye large, its diameter three in the head and nearly twice the length of the snout; 15 to 17 scales before dorsal fin; head, $4\frac{1}{4}$ in length of body; depth, 4 to $4\frac{1}{2}$; scales, 38 to 40; teeth, 2, 4-4, 2, or 2, 4-4, 1, hooked at tips with grinding surface. This species is found in large numbers in Clear Lake, Spirit Lake, and the Okobojis, and is the minnow used as bait by the anglers. I have taken it in the Big Sioux River at Sioux City, but not elsewhere than in the localities above mentioned.
11. *Micropterus dolomieu* Lacépède. *Small-mouthed black bass.* This species and the next are frequently taken by anglers. We caught many young specimens in our small nets.
12. *Micropterus salmoides* (Lacépède). *Big-mouthed black bass.* About as abundant as the preceding. Specimens taken by us were small and came from the shallow and warmer water.
13. *Etheostoma nigrum* Rafinesque. *Johnny darter.* Abundant.
14. *Etheostoma flabellare* Rafinesque. Rare.
15. *Perca flavescens* (Mitchill). *Yellow perch.* Abundant.
16. *Stizostedion vitreum* (Mitchill). *"Pike."* Said to be common. A few were caught by a fisherman the day of our visit.

VII.—THE WAPSIPINICON RIVER.

The Wapsipinicon is the next river of importance north and east of the Cedar River and has the same general trend. It also closely resembles the Cedar River in physical characteristics, but is only one-half to two-thirds as large. At Independence the current is about as strong as in the Cedar River at Cedar Rapids. The bottom is rocky just below the dam, but farther down becomes sandy. Our collections were made on sandy bottom. At Anamosa the river is larger and deeper, the current more moderate, and the bottom is sandy and muddy. At the time of our visit the water was too high to permit of seining in the main river, and our collections at this point were obtained in a tributary called Buffalo River. The latter is a moderately large creek, about 30 to 50 feet wide, with sandy and muddy bottom, the depth seldom exceeding 4 feet. The smaller fishes (minnows) were very abundant. Minnow Creek is a small brook, flowing into Buffalo Creek; it has a rocky and sandy bottom, with much grass; only a few fishes were found in it and they were combined with those obtained from Buffalo River. Not far from Buffalo River there is a small bayou which is connected with it at times of high water; in this bayou young sunfishes (*L. pallidus*) were very abundant. At Wheatland the bottom of the river is very sandy, and in a few places near where it was visited it was shallow enough to permit of fording. Several bayous near the river were also examined.

FISHES OF THE WAPSIPINICON RIVER.

1. *Lepisosteus osseus* (Linnaeus). *Common gar-pike; Long-nosed gar; Bill-fish*. Wheatland, common in bayous. A few specimens were also taken in the river.
2. *Ictalurus punctatus* (Rafinesque). *Channel cat; White cat; Silver cat*. Wheatland, common in the river. All the specimens were small.
3. *Ameiurus nebulosus* (Le Sueur). *Common catfish*. Independence, common in bayous. Anal rays, 22.
4. *Ameiurus melas* (Rafinesque). *Bullhead*. Wheatland, very abundant in bayous; Independence, abundant in bayous; Anamosa, common.
5. *Ictiobus cyprinella* (Cuv. and Val.). *Red-mouthed buffalo*. Wheatland, common in bayous.
6. *Carpiodes velifer* (Rafinesque). *Quillback; Carp sucker*. Wheatland, abundant in bayous and common in the river. Independence, common; dorsal rays, 23 to 27. Anamosa, common; scales, 36; the specimens taken were all small.
7. *Catostomus teres* (Mitchill). *Common sucker*. Wheatland, a few specimens from bayous and creek. Anamosa, abundant. Scales, 63 to 65.
8. *Catostomus nigricans* Le Sueur. *Hog sucker; Stone-roller; Hog mullet*. Independence, common; Anamosa, not common. Scales, 54.
9. *Moxostoma duquesnei* (Le Sueur). *Common redhorse; Mullet*. Wheatland, Independence, and Anamosa, not common. At Independence, dorsal rays, 14; scales, 40 to 43. At Anamosa, scales, 54.
10. *Hybognathus nuchalis* Agassiz. *Silvery minnow*. Wheatland, abundant; Independence, rare.
11. *Hybognathus nubilus* (Forbes). *Fat-head*. Anamosa, common. Scales, 36 to 38; eye, 3 in head; about 13 scales before dorsal fin.
12. *Pimephales promelas* Rafinesque. *Fat-head*. Wheatland, rare; Independence, rare, taken only in the slough.
13. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Anamosa, abundant; Wheatland, not common; Independence, rare.

14. *Cliola vigilax* (Baird and Girard). *Silver-fn.* Wheatland, rare.
15. *Notropis cayuga* Meek. Wheatland, rare.
16. *Notropis deliciosus* (Girard). Independence, common; 15 to 17 scales before dorsal fin. Anamosa, abundant.
17. *Notropis gilberti* Jordan and Meek. Wheatland, common; Independence, rare; Anamosa, abundant.
18. *Notropis whipplei* (Girard). Wheatland, common; Independence, abundant; scales, 37 to 40; depth, $3\frac{1}{2}$ to $4\frac{1}{2}$ in length. Anamosa, abundant; scales, 38 to 40.
19. *Notropis megalops* (Rafinesque). *Shiner.* Anamosa, abundant; scales, 40 to 45; scales before dorsal, small.
20. *Notropis ardens* (Cope). *Redfin.* Wheatland and Anamosa, not common.
21. *Notropis dilectus* (Girard). *Emerald minnow.* Wheatland, abundant; Independence and Anamosa, rare.
22. *Hybopsis dissimilis* (Kirtland). Independence, rare; scales, 43 to 45; body with irregular dark markings.
23. *Hybopsis storerianus* (Kirtland). Wheatland, common; found only in the river current.
24. *Hybopsis kentuckiensis* (Rafinesque). *Hornyhead.* Anamosa, common; scales, 45.
25. *Notemigonus chrysoleucus* (Mitchill). *Golden shiner; Bream; Roach.* Wheatland, common in bayous; anal rays, 12 to 13. Independence, abundant in a small bayou; anal rays, 12 to 14; scales, 47 to 51; largest specimens, $3\frac{1}{2}$ inches in length. Anamosa, common; anal rays, 11 to 14; scales, 50.
26. *Dorosoma cepedianum* (Le Sneur). *Gizzard shad; Hickory shad; Mud shad.* Wheatland (bayous), rare.
27. *Zygonectes notatus* (Rafinesque). *Top-minnow.* Wheatland (bayous), rare.
28. *Lucius lucius* (Linnæus). *Pike; Northern pickerel.* Independence, common.
29. *Labidesthes sicculus* Cope. *Brook silverside.* Wheatland, not common.
30. *Pomoxis sparoides* (Lacépède). *Calico bass; Grass bass; Strawberry bass.* Wheatland, not common; Independence, common; Anamosa, rare.
31. *Pomoxis annularis* (Rafinesque). *Crappie; Bachelor.* Wheatland, common in bayous.
32. *Ambloplites rupestris* (Rafinesque). *Rock bass; Red-eye; Goggle-eye.* Wheatland, rare.
33. *Lepomis cyanellus* (Rafinesque). *Green sunfish.* Wheatland, abundant in bayous. Independence, common; anal rays and dorsal fins margined with yellow. Anamosa, abundant in a bayou.
34. *Lepomis pallidus* (Mitchill). *Blue sunfish.* Wheatland, common in bayous; Independence and Anamosa, abundant. The young were very abundant in a slough at last-mentioned place.
35. *Lepomis gibbosus* (Linnæus). *Common sunfish; Pumpkin-seed.* Wheatland, common in bayous. Ear flap with a red blotch; cheeks with wavy blue lines; scales, 38 to 40; dorsal rays, X-10.
36. *Micropterus dolomieu* Lacépède. *Small-mouthed black bass.* Wheatland, common; Independence and Anamosa, rare.
37. *Micropterus salmoides* (Lacépède). *Large-mouthed black bass.* Wheatland, less common than the above; Independence, not common; Anamosa, rare.
38. *Etheostoma pellucidum clarum* Jordan and Meek. Wheatland, rare; Independence, one specimen.
39. *Etheostoma nigrum* Rafinesque. *Johnny darter.* Wheatland and Independence, not common. Anamosa, abundant; dorsal, VII or IX-12 to 14, usually IX-13; scales, 48 to 50.
40. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter.* Anamosa, rare.
41. *Etheostoma oceruleum* Storer. Anamosa, common in Minnow Creek.
42. *Etheostoma flabellare* Rafinesque. Anamosa, common; stripes conspicuous.

VIII.—THE MAQUOKETA RIVER.

The Maquoketa River lies north and east of the Wapsipinicon. It is somewhat smaller than the latter, but has about the same physical characteristics. We visited the North Fork near Worthington and the South Fork near Manchester and Hopkinton. The bottom in both was sandy, with very little mud.

Spring Branch, near Manchester, is a small spring brook, the temperature of which is said not to exceed 60° F. Many brook trout are caught in it every year.

Spring Creek at Delhi is a small brook of no special importance. It becomes nearly dry in summer and has a very muddy bottom.

FISHES OF THE MAQUOKETA RIVER.

1. *Ameiurus melas* (Rafinesque). *Bullhead*. Worthington and Manchester, not common.
2. *Catostomus teres* (Mitchill). *Common sucker*. Hopkinton and Worthington, rare; Delhi and Manchester, common.
3. *Catostomus nigricans* Le Sueur. *Hog sucker*; *Stone-roller*; *Hog mullet*. Hopkinton, not common; Manchester, common.
4. *Moxostoma duquesnei* (Le Sneur). *Common redbhorse*; "*Mullet*." Hopkinton, not common; Worthington, common; Manchester, abundant.
5. *Campostoma anomalum* (Rafinesque). *Stone-lugger*; *Stone-roller*. Hopkinton, rare; scales, 50. Delhi and Worthington, not common; Manchester, rare.
6. *Chrosomus erythrogaster* Rafinesque. *Red-bellied minnow*. Worthington, rare; Delhi, very common; Manchester (Spring Branch), common.
7. *Hybognathus nuchalis* Agassiz. *Silvery minnow*. Delhi, common.
8. *Pimephales promelas* Rafinesque. *Fat-head*. Hopkinton, abundant; Worthington, common; Delhi, not common; Manchester, common in small bayou near Spring Branch.
9. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Hopkinton and Worthington, rare; Delhi, not common; Manchester, rare.
10. *Notropis heterodon* (Cope). Manchester, rare.
11. *Notropis cayuga* Meek. Hopkinton, rare.
12. *Notropis deliciosus* (Girard). Worthington, abundant; eye large, 3 to 3½ in head; snout very short and blunt. Manchester and Hopkinton, rare.
13. *Notropis gilberti* Jordan and Meek. Hopkinton, abundant; Worthington, not common; Delhi and Manchester, common.
14. *Notropis whipplei* (Girard). Hopkinton, rare; Manchester, common.
15. *Notropis megalops* (Rafinesque). *Common shiner*. Hopkinton, not common; Worthington, common; scales before dorsal small. Delhi and Manchester, common.
16. *Notropis ardens* (Cope). *Redfin*. Hopkinton, not common; dorsal fin tipped with red, all other fins red, red on opercle region; body bluish, tinted with red. Worthington, rare. Delhi, rare; length, 2½ inches; scales, from 45 to 54; about 30 scales before the dorsal; anal rays, 11; dorsal, 8; head, 4½; depth, 4 to 4½. This species seems exceedingly variable and is nowhere abundant. Manchester, rare.
17. *Notropis dilectus* (Girard). *Emerald minnow*. Hopkinton, common; Worthington, abundant; 18 to 22 scales before dorsal. In some specimens, the scales nearest the nape are smaller than those on other parts of the body. Scales, 40; anal rays, 10-11, usually 10, sometimes 9; plumbeous band very distinct; head, 4 to 4½; depth, 5½; eye, 3½. There are probably included under this name more than one species from Iowa. A careful study of more specimens than I have at present is needed to determine this fact.

18. *Rhinichthys atronasmus* (Mitchill). *Black-nosed dace*. Worthington, rare; Delhi, common in Spring Branch; no distinct, dusky bands on sides; scales, 60 to 63.
19. *Hybopsis kentuckiensis* (Rafinesque). *Hornyhead*; *River chub*; *Jerker*. Worthington, rare; Manchester, common.
20. *Semotilus atromaculatus* (Mitchill). *Horned dace*; *Creek chub*. Hopkinton and Worthington, rare; Delhi, common; Manchester, more abundant in Spring Branch than in the river; scales, 63.
21. *Notemigonus chrysoleucus* (Mitchill). *Golden shiner*; *Bream*; *Roach*. Hopkinton, common; taken in a large bayou. Manchester, rare.
22. *Eucalia inconstans* (Kirtland). *Brook stickleback*. Hopkinton, rare; Worthington, common; dorsal spines usually 5, occasionally 4 or 6. Delhi common; dorsal spines 4 or 6, usually 5. Manchester, rare; taken in a small bayou near Spring Branch.
23. *Lepomis cyanellus* (Rafinesque). *Green sunfish*. Hopkinton, abundant; Worthington, common; Delhi, rare; Manchester, common in small bayou near Spring Branch.
24. *Lepomis pallidus* (Mitchill). *Blue sunfish*. Worthington, rare.
25. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish*. Hopkinton, rare.
26. *Micropterus dolomieu* Lacépède. *Small-mouthed black bass*. Manchester, rare; said to be abundant in the lake above the dam.
27. *Etheostoma nigrum* Rafinesque. *Johnny darter*. Hopkinton, rare; Worthington, not common; Delhi, abundant; Manchester, common.
28. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter*. Hopkinton and Manchester, rare.
29. *Etheostoma zonale* (Cope). Manchester, rare; scales, 50.
30. *Etheostoma flabellare* Rafinesque. Worthington, not common; Delhi, common; stripes on sides conspicuous.
31. *Etheostoma microperca* (Jordan and Gilbert). *Least darter*. Delhi, common; Manchester, rare.

IX.—THE TURKEY RIVER.

The Turkey River at Elkport flows through a much broken country. Its current is strong and its bottom sandy or rocky, with very little mud. In this region the river is bordered in many places by cliffs. Its temperature was 74° F.

Bear Creek is a spring brook, which has a temperature of 65° F. It also flows through a very broken region. In several large springs near the creek the temperature was 50° F. Some trout were planted in the creek a few years ago, but they have not been seen since.

At Fort Atkinson the Turkey River has a sandy bottom and flows through a much less heavily timbered and uneven country than at Elkport.

The Volga River is a large tributary of the Turkey, which at Fayette has a sandy bottom with a few rocks and little mud. Its temperature was 70° F.

FISHES OF THE TURKEY RIVER.

1. *Ameiurus melas* (Rafinesque). *Bullhead*. Fort Atkinson, rare.
2. *Ictiobus* sp. Elkport, common; scales, 43; dorsal rays, 26; color, silvery.
3. *Catostomus teres* (Mitchill). *Common sucker*. Elkport, rare; Bear Creek and Fort Atkinson, common.
4. *Catostomus nigricans* Le Sueur. *Hog sucker*; *Stone-roller*; *Hog mullet*. Elkport, not common; Bear Creek, Fort Atkinson, and Fayette, common.
5. *Moxostoma duquesnei* (Le Sueur). *Common redborse*; "*Mullet*." Elkport, rare; very slender; depth, 5; head, $4\frac{3}{4}$; scales, 48; dorsal rays, 14; eye, 4 in head; caudal fin with faint dark margin; color light silvery below, bluish silvery above. Fort Atkinson, not common. Fayette, common; dorsal rays, 12; scales, 43.
6. *Camptostoma anomalum* (Rafinesque). *Stone-lugger*; *Stone-roller*. Elkport, not common; Bear Creek, Fort Atkinson, and Fayette, common.
7. *Chrosomus erythrogaster* Rafinesque. *Red-bellied minnow*. Bear Creek, abundant.
8. *Hybognathus nubila* (Forbes). Fayette, not common.
9. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Elkport, Fort Atkinson, and Fayette, common; Bear Creek, rare.
10. *Pimephales promelas* Rafinesque. *Fat-head*. Fort Atkinson, not common.
11. *Notropis heterodon* (Cope). Bear Creek and Fayette, rare.
12. *Notropis deliciosus* (Girard). Elkport and Fayette, common; Fort Atkinson, rare.
13. *Notropis gilberti* Jordan and Meek. Elkport and Fort Atkinson, common; Fayette, rare.
14. *Notropis whipplei* (Girard). Elkport, not common.
15. *Notropis megalops* (Rafinesque). *Common shiner*. Elkport, common. Bear Creek, common; scales before dorsal fin small. Fort Atkinson and Fayette, abundant.
16. *Notropis jejunus* (Forbes). Elkport, common; form and appearance of *H. nuchalis*; side with prominent plumbeous lateral band; no caudal spot; head, 4; depth, $4\frac{3}{4}$ to 5; snout bluntish; mouth oblique; diameter of eye equal to length of snout, $3\frac{1}{2}$ in the length of the head; origin of first dorsal ray slightly nearer tip of snout than base of caudal; scales in lateral line, 38; anal rays, 7. Fayette, rare.
17. *Notropis ardens* (Cope). *Redfin*. Elkport, rare; Fort Atkinson, common; anal rays, 11 or 12; scales, 50.
18. *Notropis dilectus* (Girard). *Emerald minnow*. Elkport, abundant; Fort Atkinson, common.
19. *Rhinichthys atronasus* (Mitchill). *Black-nosed dace*. Bear Creek, abundant.
20. *Hybopsis dissimilis* (Kirtland). Elkport, rare.
21. *Hybopsis storerianus* (Kirtland). Elkport, rare.
22. *Hybopsis kentuckiensis* (Rafinesque). *Hornyhead*; *River chub*; *Jerker*. Elkport, common.
23. *Semotilus atromaculatus* (Mitchill). *Horned dace*; *Creek chub*. Bear Creek, abundant; Fort Atkinson, rare; Fayette, common.
24. *Eucalia inconstans* (Kirtland). *Brook stickleback*. Fort Atkinson, rare; dorsal spines, 5.
25. *Lepomis cyanellus* (Rafinesque). *Green sunfish*. Fort Atkinson, common; Fayette, rare.
26. *Micropterus dolomieu* Lacépède. *Small-mouthed black bass*. Fort Atkinson, common; Fayette, scarce; said to be more frequently taken since the dam was washed out.
27. *Etheostoma nigrum* Rafinesque. *Johnny darter*. Elkport, Bear Creek, and Fayette, rare; Fort Atkinson, common.
28. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter*. Fort Atkinson, rare.
29. *Etheostoma zonale* (Cope). Elkport, rare; Fort Atkinson, common.
30. *Etheostoma flabellare* Rafinesque. Bear Creek, common; Fayette, rare.
31. *Cottus bairdi* (Girard). *Blob*; *Miller's thumb*. Bear Creek, common; dorsal, VII-16 to VIII-17.

X.—THE YELLOW RIVER.

Yellow River is a small stream in northeastern Iowa, whose source is only about 35 miles west of its mouth. It drains a comparatively small area, but flows through a very broken and picturesque portion of the State. The river is usually bordered on one side or the other with high cliffs of limestone and sandstone. The current is swift and the bottom sandy, gravelly, or rocky. We visited the river northeast of Postville, at which place it is from 20 to 40 feet wide and, except in an occasional hole, does not exceed 4 feet in depth. The temperature was 70° F. Fishes are very abundant in Yellow River, although the number of species observed was small.

Hickory Creek is a small southern tributary of the Yellow River, rising on the upland (prairie) near Postville. In the lower part of its course it is fed by many springs, some of which are quite large. The creek never goes dry except on the upland. The bottom is muddy in the upper part and very rocky in the lower. Its temperature was 56° F.; the temperature of a large spring near by was 48° F. The creek did not contain many fishes, as every rain caused it to become very muddy. Were it not for this fact it could be made an excellent trout stream.

FISHES OF YELLOW RIVER.

1. *Catostomus teres* (Mitchill). *Common sucker*. Yellow River, common.
2. *Catostomus nigricans* Le Sueur. *Hog sucker*; *Stone-roller*; *Hog mallet*. Yellow River, common; Hickory Creek, rare.
3. *Camptostoma anomalum* (Rafinesque). *Stone-lugger*; *Stone-roller*. Yellow River and Hickory Creek, common.
4. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Yellow River, common.
5. *Pimephales promelas* Rafinesque. *Fat-head*. Yellow River. Many specimens were taken from a small bayou, but none from the stream.
6. *Chrosomus erythrogaster* Rafinesque. *Red-bellied minnow*. Yellow River, common; Hickory Creek, abundant.
7. *Notropis megalops* (Rafinesque). *Common shiner*. Yellow River, more abundant than any other species.
8. *Notropis dilectus* (Girard). *Emerald minnow*. Yellow River, not common; anal rays, 10; eye small; about 20 scales before the dorsal fin.
9. *Hybopsis kentuckiensis* (Rafinesque). *Hornyhead*; *River chub*; *Jerker*. Yellow River, common.
10. *Rhinichthys atronasus* (Mitchill). *Black-nosed dace*. Hickory Creek, rare. Scales, 60 to 64; blackish and somewhat mottled above the lateral line, pale below.
11. *Leuciscus elongatus* (Kirtland). *Red-sided shiner*. Yellow River, rare. Longest specimen, 3½ inches; head, 3¼ in length of body; lower jaw the longer; scales small, 65 to 70 in the lateral line; anal rays, 8 or 9. The specimens taken were all males, crimson on the sides.
12. *Semotilus atromaculatus* (Mitchill). *Horned dace*. Hickory and Yellow Creek, not common.
13. *Eucalia inconstans* (Kirtland). *Brook stickleback*. Hickory Creek, common; some specimens are black.
14. *Etheostoma nigrum* Rafinesque. *Johnny darter*. Yellow river, common.
15. *Etheostoma flabellare* Rafinesque. Yellow River, common.
16. *Etheostoma cœruleum* Storer. Yellow River, rare.
17. *Cottus bairdi* Girard. *Blob*; *Miller's thumb*. Hickory Creek, common.

XI.—THE UPPER IOWA RIVER.

The Upper Iowa is a small river which rises in the northeastern part of Iowa, the distance from its source to its mouth being not more than 80 miles. In the upper half of its course it is a typical prairie stream, but farther down it passes through a much broken and timbered country and resembles somewhat a mountain stream. At Chester it is little more than a small creek, with a sandy and muddy bottom. There is a dam across the river at this place, above which the river widens out to form a shallow lake having a muddy bottom. There is considerable vegetation in the lake, which seems to be fairly stocked with pickerel, black bass, and various species of sunfishes. We were told that angling had greatly improved since the building of the dam. We collected both above and below the dam. The temperature was 70° F.

At Decorah, the country is very broken, the river is more than twice as large as at Chester, and there is an abundance of timber along its banks; the current is strong and the bottom rocky or sandy. There are some caves near Decorah in which blind fishes are said to occur. I was unable, however, at the time of my visit, to explore any of them. Across the river from Decorah there is a high bluff or cliff, in which a fracture, parallel with the face of the cliff, has formed a cave, known as the Ice Cave. Ice is produced in this cave during the warm days of summer, but not at other times of the year. Its formation is due, no doubt, to evaporation from the cliff. I visited the cave in June, 1889, with Mr. Joseph White. The temperature of the air outside was 90° F.; in the cave, about 100 feet from the entrance, it was 32° F. Considerable ice was observed. Tradition says that the old Winnishiek chief utilized the cave to preserve meats and other food.

The upper Iowa River was formerly a trout stream, but of late years, so far as I can learn, no trout have been taken from it. The collections at Chester were made on July 24, 1890, and at Decorah, in June, 1889. The species enumerated below are from both places, unless otherwise stated.

FISHES OF THE UPPER IOWA RIVER.

1. *Ameiurus melas* (Rafinesque). *Bullhead*. Decorah, rare.
2. *Catostomus teres* (Mitchill). *Common sucker*. Not common.
3. *Moxostoma duquesnei* (Le Sueur). *Common redhorse*. Chester, not common. Dorsal rays, 14; scales, 45; color darker and less silvery than usual.
4. *Campostoma anomalum* (Rafinesque). *Stone-lugger*; *Stone-roller*. Not common.
5. *Pimephales promelas* Rafinesque. *Fat-head*. Common.
6. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Common.
7. *Chiola vigilax* (Baird and Girard). *Silver-fin*. Rare.
8. *Notropis deliciosus* (Girard). Decorah, rare.
9. *Notropis whipplei* (Girard). Decorah, rare.
10. *Notropis megalops* (Rafinesque). *Common shiner*. Common.
11. *Notropis ardens* (Cope). *Redfin*. Common.
12. *Notropis dilectus* (Girard). *Emerald minnow*. Common.
13. *Hybopsis kentuckiensis* (Rafinesque). *Hornyhead*; *River chub*; *Jerker*. Rare.
14. *Rhinichthys cataractæ* (Cuv. and Val.). *Long-nosed dace*. Decorah, rare.
15. *Rhinichthys atronasus* (Mitchill). *Black-nosed dace*. Rare.
16. *Eucalia inconstans* (Kirtland). *Brook stickleback*. Chester, rare.
17. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish*. Chester, rare.
18. *Etheostoma nigrum* Rafinesque. *Johnny darter*. Decorah, common.

DRAINAGE OF THE MISSOURI RIVER.

I.—THE MISSOURI RIVER.

The Missouri River at Sioux City is wide and shallow, with a rapid current, the bottom being composed of shifting quicksand. There are also many islands at this point, some composed of hard and others of soft materials. The water has a whitish or creamy tint, due to the fine silt held in suspension. The fishes when taken from the river have a pale or sickly appearance, but if placed for a time in clear water they assume their normal colors. The seining was done close by some islands, near the mouth of the Big Sioux River.

FISHES OF THE MISSOURI RIVER.

1. *Polyodon spathula* (Walbaum). *Paddle-fish*; *Spoon-bill*; *Duck-billed cat*. One specimen of this species is preserved in the agricultural college at Ames, Iowa. It was taken from the Missouri River in Harrison County, by E. G. Taylor, of Logan, Iowa. Specimens are occasionally caught near Sioux City.
2. *Scaphirhynchus platyrhynchus* (Rafinesque). *Shorcl-nosed sturgeon*. Common.
3. *Ictalurus punctatus* (Rafinesque). *Channel cat*; *White cat*; *Silver cat*. Common.
4. *Nocturus flavus* (Rafinesque). *Stone cat*. Common. Anal rays, 15; head, 4; depth, 6½; width of head, 4½.
5. *Carpoides velifer* (Rafinesque). *Quillback*; *Carp sucker*. Rare.
6. *Hybognathus nuchalis* Agassiz. *Silvery minnow*.
7. *Notropis dilectus* (Girard). *Emerald minnow*. Rare. The specimens secured in this locality were small and differed somewhat from those obtained elsewhere in the State. The first dorsal ray is midway between the nostril and the base of the caudal. Diameter of eye very large, 3 in the head; snout short, two-thirds diameter of the eye; body more compressed than usual in this species; scales 37, about 28 scales before the dorsal; head, 4½; depth, 4½; color, bright olivaceous with faint plumbeous band overlaid with silvery. This species very much resembles *N. atherinoides caddoensis* Meek, of the Ozark region, but the specimens at hand are too small for positive comparison.
8. *Hybopsis gelidus* (Girard). Abundant; the longest specimens measure 3 inches in length. Body elongate, robust, not much compressed; dorsal region in front of dorsal fin compressed to an edge; profile curved (convex) from snout to dorsal fin; snout bluntish, overhanging the large horizontal mouth; barbels at posterior end of maxillary, long; eye small, high up, its diameter 5 in head; caudal peduncle slender. Caudal fin deeply forked, the middle rays less than half the length of the longest rays, the lower lobe dusky. Dorsal fin with first ray rudimentary and less than half the height of the fin; the second ray produced into a filament, which is from one-third to one-fourth as long as the entire ray. Dorsal rays, 8; anal rays, 8. Head, 4½ in length; depth, 5½ to 5½; scales 45, about 18 scales before the dorsal fin. The scales are smaller in this region than on the rest of the body. Teeth, 1, 4-1, 1, hooked and erenate. Lateral line complete; color, light olivaceous with a very faint plumbeous band on sides, overlaid by silvery, silvery luster very faint.
9. *Platygobio gracilis* (Richardson). *Flat-headed chub*. Common; length, 3½ inches; scales, 50 to 54; teeth, 2, 4-1, 2, without grinding surface, hooked at the tips, the first tooth rather more slender than the others; eye, 4 in the head; head, 4½; depth, 5½; barbel well developed; color, light olivaceous, silvery, no markings at all.
10. *Dorosoma cepedianum* (Le Sneur). *Gizzard shad*; *Hickory shad*; *Mud shad*. Rare.
11. *Hiodon alosoides* (Rafinesque). *Moon-eye*; *Toothed herring*. Rare.

II.—THE BIG SIOUX RIVER.

The Big Sioux River, at Sioux Falls, South Dakota, has a very rocky bed above the falls, while below the falls the bottom is both muddy and rocky. At Sioux City the river is much larger and has a very muddy bottom. A short distance above its mouth it widens into a sort of lake. There is some timber along the shores and considerable vegetation in the lake. Our collections were made below the falls, at Sioux Falls, in July, 1889, and near the mouth of the river, in the neighborhood of Sioux City, in August, 1890.

FISHES OF THE BIG SIOUX RIVER.

1. *Ictalurus punctatus* (Rafinesque). *Channel cat*, *White cat*; *Silver cat*. Sioux City, common.
2. *Noturus flavus* (Rafinesque). *Stone cat*. Sioux Falls, one specimen. Dorsal rays, 14; pectoral spine with retrorse serræ in front, grooved behind; head, $3\frac{1}{2}$; depth, 6. Sioux City, rare.
3. *Noturus gyrinus* (Mitchill). *Stone cat*. One specimen; anal, 14; body short; adipose fin continuous with caudal; posterior part of adipose fin raylike; head, $3\frac{1}{2}$; depth, 4; pectoral spine entire.
4. *Catostomus teres* (Mitchill). *Common sucker*. Sioux City, common.
5. *Carpoides velifer* (Rafinesque). *Quillback*; *Carp sucker*. Sioux City, common.
6. *Moxostoma duquesnei* (Le Sueur). *Common redhorse*; *Mullet*. Sioux Falls, rare; Sioux City, common.
7. *Hybognathus nuchalis* Agassiz. *Silvery minnow*. Sioux City, rare.
8. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Sioux Falls, common; Sioux City, rare.
9. *Notropis cayuga* Meek. Sioux City, rare.
10. *Notropis deliciosus* (Girard). Abundant.
11. *Notropis topeka* Gilbert. Sioux City, rare.
12. *Notropis hudsonius* (DeWitt Clinton). Sioux City, common.
13. *Notropis whipplei* (Girard). Sioux City, rare.
14. *Notropis atherinoides* Rafinesque. *Rosy minnow*. Sioux City, rare.
15. *Notropis megalops* (Rafinesque). *Common shiner*. Six specimens obtained.
16. *Notropis dilectus* (Girard). *Emerald minnow*. Sioux Falls, common.
17. *Hybopsis kentuckiensis* (Rafinesque). *Hornyhead*. Sioux Falls, common.
18. *Notemigonus chrysoleucus* (Mitchill). *Golden shiner*; *Bream*; *Roach*. Sioux City, rare.
19. *Hiodon alosoides* (Rafinesque). *Moon-eye*; *Toothed herring*. Sioux City, rare.
20. *Dorosoma cepedianum* (Le Sueur). *Gizzard shad*; *Hickory shad*; *Mud shad*. Sioux City, abundant.
21. *Fundulus zebrinus* Jordan and Gilbert. Sioux City, rare.
22. *Percopsis guttatus* Agassiz. *Trout perch*. Sioux City, rare.
23. *Ambloplites rupestris* (Rafinesque). *Rock bass*; *Red-eye*; *Goggle-eye*. Sioux Falls, rare; Sioux City, common.
24. *Lepomis cyanellus* (Rafinesque). *Green sunfish*. Sioux Falls, common; Sioux City, abundant.
25. *Lepomis humilis* (Girard). *Red-spotted sunfish*. Sioux Falls; Sioux City. Palatine teeth well developed; scales, 35; opercular flap long and surrounded by a red margin. Abundant.
26. *Etheostoma nigrum* Rafinesque. *Johnny darter*. Sioux City, common; Sioux Falls, abundant.
27. *Etheostoma zonale* (Cope). Sioux City, rare.
28. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter*. Two specimens obtained.
29. *Perca flavescens* (Mitchill). *Yellow perch*. Sioux Falls, rare; Sioux City, common.
30. *Stizostedion vitreum* (Mitchill). *Wall-eyed pike*; *Jack salmon*; *Pike*. Rare.
31. *Stizostedion canadense* (C. H. Smith). *Pike*; *Sand pike*. Common.
32. *Roccus chrysops* (Rafinesque). *White bass*. Sioux City, common.
33. *Aplodinotus grunniens* Rafinesque. *Fresh-water drum*. Sioux City, common.

III.—SILVER LAKE.

Silver Lake is one of the sources of the Little Sioux River. It is about 2 miles long, 1 mile wide, and very shallow, its depth seldom exceeding 6 feet. It contains very few game fishes. The larger game fishes are supposed to have been destroyed by the cold winters of a few years ago. On the northern side of the lake there is a small inlet with a very muddy bottom. We collected in the inlet and on the northern shore of the lake, where the bottom is sandy.

FISHES OF SILVER LAKE.

1. *Ameiurus melas* (Rafinesque). *Bullhead*. Abundant, especially in the inlet.
2. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Common.
3. *Pimephales promelas* Rafinesque. *Flat-head*. Very abundant.
4. *Notropis megalops* (Rafinesque). *Shiner*. Not common.
5. *Notropis heterodon* (Cope). Common. Mouth small, oblique, terminal; black on tip of both jaws; back elevated; first ray of dorsal fin nearer snout than base of caudal by diameter of eye; eye, 3 in head; head, 4; depth, 4; dark band on sides; scales, 37 to 38; scales on upper part of body edged with black; lateral line incomplete.
6. *Notemigonus chrysoleucus* (Mitchill). *Golden shiner*; *Bream*; *Roach*. Abundant in the inlet.
7. *Fundulus zebrinus* Jordan and Gilbert. Abundant; with 12 to 16 bands on the sides.
8. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish*. One specimen obtained; flap with pale margin; scales, 38.
9. *Etheostoma iowæ* Jordan and Meek. Common.
10. *Perca flavescens* (Mitchill). *Yellow perch*. One specimen obtained.
11. *Roccus chrysops* (Rafinesque). *White bass*. One specimen obtained.

IV.—THE SOLDIER RIVER.

The Soldier River is a small tributary of the Missouri River in western Iowa. We visited the East Fork of the Soldier River at Charter Oak, where it is a small creek with very muddy bottom. Only the following fishes were obtained.

FISHES OF THE SOLDIER RIVER.

1. *Ameiurus melas* (Rafinesque). *Bullhead*.
2. *Hybognathus nuchalis* Agassiz. *Silvery minnow*.
3. *Pimephales promelas* Rafinesque. *Fat-head*.
4. *Notropis gilberti* Jordan and Meek.
5. *Semotilus atromaculatus* (Mitchill). *Horned dace*.
6. *Lepomis cyanellus* (Rafinesque). *Green sunfish*.

V.—THE BOYER RIVER.

The Boyer River was visited at Arion Station, at which point it is a slow-flowing stream with a very muddy bottom. The water is seldom clear. But few fishes were found in the stream, but in a small bayou near by a number of species were obtained.

FISHES OF THE BOYER RIVER.

1. *Ameiurus melas* (Rafinesque). *Bullhead*. Rare.
2. *Catostomus teres* (Mitchill). *Common sucker*. Rare.
3. *Pimephales promelas* Rafinesque. *Fat-head*. Common in the bayou.
4. *Notropis deliciosus* (Girard). Abundant in the bayou.
5. *Notropis topeka* Gilbert. Common in the bayou.
6. *Notropis gilberti* Jordan and Meek. Abundant in the bayou. Scales before dorsal very small in some specimens, the number being 16 to 20.
7. *Notropis lutrensis* (Girard). Rare.
8. *Notropis megalops* (Rafinesque). *Shiner*. Abundant in the bayou.
9. *Semotilus atromaculatus* (Mitchill). *Horned dace*. Rare.
10. *Phenacobius mirabilis* (Girard). Rare. Scales, 44.
11. *Percopsis guttatus* Agassiz. *Trout perch*. Rare. Scales, 48; dorsal, XI-7 or 8.
12. *Lucius lucius* (Linnaeus). *Pike*; *Northern pickerel*. Rare.
13. *Lepomis cyanellus* (Rafinesque). *Green sunfish*. Abundant in the bayou. The specimens obtained were mostly very small.
14. *Lepomis humilis* (Girard). *Red-spotted sunfish*. Less abundant than *L. cyanellus*.
15. *Etheostoma nigrum* Rafinesque. *Johnny darter*. Rare.

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