

8.—REPORT OF AN EXAMINATION OF THE RIVERS OF KENTUCKY, WITH LISTS OF THE FISHES OBTAINED.

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INTRODUCTION.

The explorations described in this report were carried on by the writer during the summer of 1890, under instructions from the U. S. Commissioner of Fish and Fisheries, Hon. Marshall McDonald, and were executed under the direction of Dr. David S. Jordan, president of the University of Indiana. In conducting the fieldwork able assistance was rendered by Mr. Hiram W. Monical, of Brooklyn, Indiana, and Mr. Charles O. Chambers, of Van Wert, Ohio, students in the University of Indiana. The inquiry had reference to the several river basins of Kentucky, especially the head waters of the different rivers, and the fishes which inhabit them. The principal objects were to determine as fully as possible the physical characteristics and present conditions of the streams, the variety and abundance of their fishes, and such other natural-history features connected with them as might have a bearing upon fishery matters or fish-culture.

Owing to the shortness of the season, the work as originally planned could not be entirely completed. The lower Kentucky and Licking rivers received but little attention, and most of the time was spent in the mountainous parts of the State. The party being small, it was also necessary to obtain assistance along the route, but no difficulty was encountered in that respect. The people generally manifested deep interest in our investigations and did whatever they were able to advance the work. Until August 13 the writer was accompanied only by Mr. Monical, but Mr. Chambers joined the party on that date, and continued with it until the end of the season. The fieldwork was begun July 23, and was completed September 10.

A number of collections of fishes had previously been obtained in Kentucky by Dr. Charles H. Gilbert, of the University of Indiana, Dr. James A. Henshall, of the Cincinnati Society of Natural History, and Prof. Philip H. Kirsch, of Corydon, Kentucky. These collections were kindly placed at the disposition of the writer, who has made use of them in the preparation of his lists.

In the description of species all measurements are expressed in millimeters. In giving the length of specimens and comparative measurements the same should be understood to extend only to the base of the caudal fin, unless otherwise stated.

The report has been classified in accordance with the different river basins examined, as explained in the following list:

1. Rolling Fork of Salt River, at Boothe, New Haven,* and New Market.*
2. Lower Green River, Rough Creek, and Pond Creek.
3. Upper Green River:
 - a. Big Barren River: The main river at Bowling Green; Drake Creek; Beaver Creek, north of Glasgow, Barren County; Little Barren River, at Osceola, Barren County.
 - b. Upper Green River proper: The main river, south and east of Greensburg; Pitman Creek, northwest of Greensburg.
4. Tradewater River, at Dawson Springs.
5. Lower Cumberland River, at Kuttawa.
6. Upper Cumberland River: Clear Creek, at Wildie; Little Rockcastle River, at Hazel Patch; Rockcastle River, near Hazel Patch, 3 miles east of Livingston and at Livingston; * Cumberland River, at Barbourville; Richland Creek, near Barbourville; Smoky Fork, near Barbourville; Cumberland River, at Pineville; Straight Creek, near Pineville; Clear Fork of the Cumberland, in Whitley County; * Wolf Creek * and Briar Creek,* in Whitley County; Albany Branch,* Spring Creek,* and Indian Creek,* in Clinton County.
7. Lower Tennessee River, at Paducah.
8. Upper Tennessee River: Powell River, south of Cumberland Gap, Tennessee; Yellow Creek, at Middlesboro, Kentucky.
9. Mayfield Creek, at Hickory Grove.
10. Obion River, near Cypress.
11. Bayou de Chien, near Moscow.
12. Upper Kentucky River.
 - a. South Fork, Horse Creek, near Garratsville; Goose Creek, at Garrat's salt works; Hector Creek, near Big Creek post-office; Redbird (South Fork), near Big Creek post-office; Big Creek, at Big Creek; Sturgeon Creek, near Travelers Rest.
 - b. Middle Fork: Bull Creek, west of Hyden; Middle Fork, at crossing of the Hazard Road; Cutshin Creek, west of Hyden.
 - c. North Fork, at Hazard; Lot Creek, west of Hazard; Troublesome Creek; Left Troublesome Creek, at Hindman.
13. Big Sandy River: Beaver Creek, at Lackey; Shelby Creek and Robinson Creek, near Robinson Creek post-office; Island Creek, east of Pikeville; Levisa Fork, at Pikeville; John Creek and Coon Creek, at Zebulon; Blain Creek, at Catalpa.
14. Licking River, at Farmers; Triplet Creek, at Farmers.
15. Little Sandy River, near its mouth.

ROLLING FORK OF SALT RIVER.

This river was examined at a point $1\frac{1}{4}$ miles east of the railroad station at Boothe, July 24; water temperature, 76° F. Rolling Fork is one of the largest tributaries of Salt River, and rises near the central part of the State; flowing in a northwesterly direction for 100 miles, it joins Salt River 10 miles from its mouth. The station at Boothe is about 15 miles from the junction of Rolling Fork and Salt River. At the former place the stream is from 40 to 45 yards wide, and has low banks fringed with willows which overhang and shade the edges of the stream. The bottom is composed of gravel and mud, and the water is never perfectly clear, even when very low. At the time of our visit, when the stream was slightly swollen from recent rains, the water was about 2 feet deep on the rapids, with a depth of 4 to 10 feet between them. Crayfishes and unios were common, the latter attaining a very large size. *Unio multiplicatus* was the most abundant species taken and specimens frequently measured 6 to 8 inches across the shell. The land is low and studded with ridges and isolated points of knob stone of the Waverly or Lower Carboniferous group, which rise above the surrounding country to the height of 100 to 150 feet. The soil is of clay; the most common forest trees are hickory, maple (*Acer dasycarpum*), several species of oak, elm, and ash. The knobs are covered with post oak (*Quercus obtusiloba*). In addition to our examination at Boothe, collections were made in this stream by Profs. Gilbert and Swain at New Market and New Haven, in 1884.

* Localities marked by an asterisk have been visited by other collectors.

In the following list Boothe is indicated by B; New Haven by NH, and New Market by NM.

FISHES OF THE ROLLING FORK OF SALT RIVER.

1. *Noturus miurus* Jordan. *Mud cat*. (B, NH, NM.) Several small specimens were obtained.
2. *Leptops olivaris* (Rafinesque). *Mud cat*; *Yellow cat*. (B.) Quite common. The specimens were well marked in color, differing in a few minor points from the Western variety.
3. *Ictalurus punctatus* (Rafinesque). *Channel cat* or *Blue cat*. (B, NH.) Common, but not so plentiful as the former.
4. *Carpiodes carpio* (Rafinesque). *Carp sucker*. (B.) Common.
5. *Catostomus nigricans* Le Sueur. *Hog sucker*. (B, NH, NM.) Not common; only young specimens were taken.
6. *Moxostoma duquesnei* (Le Sueur). *White sucker*. (B, NH, NM.) Common.
7. *Campostoma anomalum* (Rafinesque). *Stone-toter*. (B.) Common. Lateral line, 52 to 55.
8. *Pimephales notatus* (Rafinesque). (B, NH.) Plentiful.
9. *Cliola vigilax* (Baird and Girard). *Bullhead minnow*. (B.) Not common.
10. *Notropis deliciosus* (Girard). (B, NM.) Common. Deeper and lighter in color than specimens from the mountainous district. No lateral band; lateral line, 36, 35, 34, 34, 36, 35; scales before dorsal, 13 to 15.
11. *Notropis whipplei* (Girard). *Blue minnow*. (B, NH, NM.) Common. Lateral line, 38, 36, 38, 35.
12. *Notropis megalops* (Rafinesque) *Common shiner*. (B, NH, NM.) Only three specimens were obtained.
13. *Notropis ariommus* (Cope). *Big-eyed shiner*. (NM.)
14. *Notropis umbratilis cyanocephalus* Copeland. (NM.)
15. *Notropis atherinoides* Rafinesque. *Rosy minnow*. (B, NM.) Not common; small, the three largest specimens taken measuring 57, 52, and 51 millimeters. Head, $4\frac{1}{2}$ in length; depth, 5 in length; lateral line, 42, 41, and 42; back somewhat compressed; no vertebral line.
16. *Ericymba buccata* Cope. (B.) Not common.
17. *Hybopsis storerianus* (Kirtland). *Spawn-eater*. (B, NH.) Common; scales, 40.
18. *Hybopsis amblops* (Rafinesque). *Silver chub*. (B.) Common; lateral line from 35 to 38.
19. *Hybopsis dissimilis* (Kirtland). *Spotted shiner*. (B.) Very rare.
20. *Semotilus atromaculatus* (Mitchill). *Chub*. (NH.)
21. *Hiodon alosoides* (Rafinesque). *Moon-eye*. (B.) Five specimens taken.
22. *Hiodon selenops* Jordan and Bean. *Southern moon-eye*. (B.) Not as common as *H. alosoides*.
23. *Dorosoma cepedianum* (Le Sueur). *Shad*; *Hickory shad*. (B.) Abundant.
24. *Zygonectes notatus* (Rafinesque). *Top minnow*. (B.) Rare. Specimen small; from 40 to 60 millimeters long.
25. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish*. (B, NH, NM.) Not common. Taken in quiet water, under overhanging willows.
26. *Micropterus dolomieu* Lacépède. *Small-mouthed black bass*. (NH.)
27. *Etheostoma pellucidum* Baird. *Sand darter*. (B, NH.) Common. Scaled below the lateral line; scales 67 to 69.
28. *Etheostoma blennioides* Rafinesque. *Green-sided darter*. (B, NH, NM.) Only a few small specimens were obtained.
29. *Etheostoma caprodes* (Rafinesque). *Log perch*. (B, NH.) Quite common.
30. *Etheostoma phoxocephalum* Nelson. (B, NH.) Abundant. Specimens all small and light in color. This is apparently the only darter that is common in the stream.
31. *Etheostoma zonale* (Cope). (B, NH, NM.) Not common.
32. *Etheostoma cœruleum* Storer. *Rainbow darter*. (B, NH, NM.) Rare.
33. *Aplodinotus grunniens* Rafinesque. *Fresh-water drum*; *White perch*. (B.) Quite common. Some large specimens were taken.

LOWER GREEN RIVER.

Green River is one of the largest streams in the State and it is very deep throughout most of its course. It rises in the foothills of the mountains near the central part of the State and flows in a general westerly and northwesterly direction until it joins the Ohio River in Henderson County, 15 miles above Evansville, Indiana. At Rockport, Kentucky, some 50 or 60 miles from its mouth, it has a depth, at low water, of 20 to 25 feet. Its entire length is about 250 miles and the average width 200 to 210 yards. There is no perceptible current, a very slight breeze being sufficient to float driftwood up stream. Considering its sluggish current the water is very clear, which, together with its great depth and the abundance of small fishes, such as minnows and darters, makes it an excellent stream for food-fishes.

The banks of the stream are low and very steep, and fringed with willows, sycamores (*Platanus occidentalis*), elms, and birches (*Betula nigra*). At a distance back from the river of a quarter to a half-mile is a low line of hills with outcrops of a light sandstone. Several specimens of the young of *Necturus maculatus* were taken, and also several turtles (*Aspionectes spinifer* and *Aromochelys odoratus*). On account of the depth of the water and the entire absence of sandbars no fishes were collected from the river proper at this place. The temperature of the water was 70° F.

1. *Pond Creek*, 2 miles from Rockport, July 25: The collecting station was one-half mile from the mouth of the creek; temperature of the water, 68° F. Pond Creek is a small southern tributary of Green River, probably about 25 miles in length, but very narrow, deep, and sluggish. The bottom is composed of fine mud, several feet deep, and the water is very impure and muddy. There is but little vegetation in the stream and but few varieties of fishes. Several specimens of the young of *Necturus maculatus* were taken, and also a few turtles, *Aspionectes spinifer* (Le Sueur) and *Aromochelys odoratus* (Latreille).

2. *Rough Creek*, at Hartford, July 25: Collections were made below the mill, where the water temperature was 74° F. Rough Creek is one of the largest northern tributaries of Green River, rising in Hardin County and flowing in a southwesterly direction about 75 or 80 miles, where it joins the main river. Hartford, the county seat of Ohio County, is about 20 miles from its mouth. Here the channel is from 40 to 45 yards wide. At low water the stream is broken up into ponds by numerous ripples, the water being from 3 to 5 feet deep in the former and only a few inches on the latter. The ripples flow over beds of coarse gravel, while between them the bottom consists of stone with more or less mud, there being also large stones in the more quiet places, which furnish excellent hiding-places for fishes. The stream is well stocked with fish, several species of minnows and darters being especially abundant. It also furnishes a variety of good food species, such as suckers, black bass, and white perch (*Aplodinotus grunniens*). The bottom lands are low and are overflowed during high water. They are covered with gum, ash, swamp ash, black and red oak, water birch, elm, and cherry. The bed of the stream is almost devoid of vegetation.

Species marked "P," in the following list, are from Pond Creek; those marked "R" are from Rough Creek.

FISHES OF THE LOWER GREEN RIVER.

1. *Ictalurus punctatus* (Rafinesque). *Blue cat.* (R, P.) Abundant in Rough Creek.
2. *Noturus miurus* (Jordan). *Mud cat.* (R.) Reported quite common, but only a few specimens were taken.
3. *Noturus gyrinus* (Mitchill). (R.) Less common than either of the preceding; three specimens taken.
4. *Catostomus nigricans* Le Sueur. *Hog sucker.* (R.) Only three small specimens taken.
5. *Moxostoma duquesnei* (Le Sueur). *Redhorse.* (R, P.) Quite plentiful in Rough Creek.
6. *Campostoma anomalum* (Rafinesque). *Sto c-toter.* (R.) Very abundant, and much valued for bait.
7. *Hybognathus nuchalis* Agassiz. *Silvery minnow.* Common in Pond Creek and by far the most abundant minnow taken in Rough Creek.
8. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow.* (R.) Common.
9. *Notropis whipplei* (Girard). *Blue minnow.* (R, P.) Very abundant.
10. *Notropis megalops* (Rafinesque). *Shiner.* (R.) Common.
11. *Notropis umbratilis cyanocephalus* Copeland. Rare in Pond Creek, but more common in Rough Creek.
12. *Notropis atherinoides* Rafinesque. *Silvery minnow.* (R.) Common.
13. *Hybopsis storerianus* (Kirtland). *Spawn-eater.* (R.) Not common. Lateral line, 40.
14. *Hybopsis amblops* (Rafinesque). *Silver chub.* (R, P.) Common in Rough Creek.
15. *Hybopsis kentuckiensis* (Rafinesque). *Chub; Hornyhead.* Common in both streams. Specimens from Pond Creek were very large.
16. *Dorosoma cepedianum* (Le Sueur). *Mud shad.* (P.) Very plentiful in the muddy water; specimens small.
17. *Labidesthes sicculus* Cope. *Brook silverside.* (R, P.) Not common. Only a few specimens found in either creek.
18. *Aphredoderus sayanus* (Gilliams). *Pirate perch.* (P.) Very abundant. Some of the specimens have a length of 75 millimeters. Scales in five specimens, 49, 49, 50, 49, 48. Vent beneath a point about half way between the anterior edge of the dorsal and the posterior margin of opercle.
19. *Chænobryttus gulosus* (Cuv. and Val.). *War-mouth.* (P.) Common. Large; lateral line, 42, 39, 40; vent below anterior margin of dorsal.
20. *Lepomis pallidus* (Mitchill). *Blue sunfish.* (P.) Several specimens taken. Anal dusty, almost black; pectorals reaching the third anal spine; lateral line, 45.
21. *Lepomis cyanellus* Rafinesque. *Blue-spotted sunfish.* (P.) Rare. Color, dark brown; not green.
22. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish.* (R.) Quite common; specimens very large.
23. *Micropterus dolomieu* Lacépède. *Small-mouthed black bass; trout.* (R.) Common, furnishing fine sport for the angler.
24. *Micropterus salmoides* (Lacépède). *Large-mouthed black bass.* (R.) Common.
25. *Etheostoma pellucidum* Baird. *Sand darter; Sand crawler.* (R.) Not common. Specimens quite dark; lateral line, 75.
26. *Etheostoma nigrum* (Rafinesque). *Johnny darter.* (R, P.) Common only in Rough Creek. Specimens not more than 58 millimeters long; lateral line, 47 to 50.
27. *Etheostoma copelandi* (Jordan). (R.) Not common. Lateral line, 45, 48, 47.
28. *Etheostoma histrio* Jordan and Gilbert. (R.) Two specimens taken, measuring as follows: Length, 28, 28; head, $6\frac{1}{2}$, $6\frac{1}{2}$; depth, $4\frac{1}{2}$, $4\frac{1}{2}$; dorsal, IX-12, X-12; anal, II-7, II-7; lateral line, 50, 52. The color agrees perfectly with the description of this species by Dr. C. H. Gilbert, in the Proc. U. S. Nat. Mus., 1887, p. 47. This is the second time that this species has been found east of the Mississippi River, as it had previously been taken by Prof. B. W. Evermann, in 1888, from the Patoka River, at Patoka, Indiana.
29. *Etheostoma shumardi* (Girard). (R.) One specimen taken. Length, 50; head, 14; depth, $9\frac{1}{2}$; dorsal, XI-13; anal, II-12; lateral line, 58.
30. *Etheostoma caprodes* (Rafinesque). *Striped perch; Hickory.* (R.) Common. Lateral line, 89 or 90.

31. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter*. (R.) Not common; specimens small.
32. *Etheostoma ouachitæ* Jordan and Gilbert. (R.) Not a widely distributed species. It was also taken in Indiana in 1888, by Prof. Evermann, whose specimens are a little larger than those found in Rough Creek. Five of the largest of the latter measure as follows: Length, 44 millimeters, 47, 46, 45, 43; head, 11, 12, 12, 11, 11; depth, 6, 6½, 6½, 6, 6½; lateral line, 51, 55, 52, 52, 53; dorsal, X-12, X-12, XI-12, X-12, X-12; anal, II-10, II-10, II-10, II-10, II-10.
33. *Etheostoma phoxocephalum* Nelson. (R, P.) Common; only young specimens taken.
34. *Etheostoma cœruleum* Storer. *Rainbow darter*. (P.) Rare. Three small specimens taken.
35. *Aplodinotus grunniens* Rafinesque. *White perch*; *fresh-water drum*. Common in both streams.

UPPER GREEN RIVER.

The Upper Green River and its tributaries flow, for the most part, over a Subcarboniferous area, cutting down to the Devonian in places. The stream is less deep here and has a good current; the banks are not so precipitous, and the bottom is covered with sand and gravel. At intervals the sand is piled up in large banks or bars, which form islands, or jut out into the river, making excellent places for collecting. Two regions were visited: (1) The Big Barren River and two of its tributaries, Drake Creek and Beaver Creek, in the neighborhood of Bowling Green, Warren County, where the surface rocks are chiefly Upper Subcarboniferous. (2) The Upper Green River proper, and one of its tributaries, Pitman Creek, on which the Lower Subcarboniferous rocks crop out.

BIG BARREN RIVER.

1. *Big Barren River*, at Bowling Green: The collecting station was three-fourths of a mile northeast of the city; water temperature, 80° F. The Big Barren River rises in Monroe County, and flows in a northwesterly direction for 75 or 80 miles to the Green River, which it joins at the northwest corner of Warren County. The stream at Bowling Green, about 20 miles from its mouth, is from 100 to 125 feet wide, clear and deep, and with considerable current. Most of the specimens were taken on or near a large shoal or sandbank above the water works. Here the bottom was of coarse gravel and sand, with a rock bottom which in the deeper places was covered with mud. There were no algae or other water plants in the stream, but crayfishes, clams (*Unio*), and turtles (*Aspidonectes*) were common. The stream is an excellent one for fish, the water being clear and pure; the specimens taken were fine, being very active and with the colors bright and fresh. It is well stocked with good food-fishes, and contains an abundance of minnows and darters. The surrounding country is rolling and has a limestone soil, producing good crops of grain and fruit. Forest trees of ash, elm, sycamore, and birch were noticed on the banks of the river.

2. *Drake Creek*: Collections were made, August 2, 8 miles southeast of Bowling Green, just below the "Shaker Mill," and about 5 miles from the point where this creek flows into Big Barren River. The temperature of the water was 74° F. At the place visited the stream is about 15 yards wide, the bottom composed of loose, flat stones on the rapids, with stretches of mud bottom between them.

There was considerable coarse gravel or broken and rounded stones piled up at intervals, with but little sand. A species of *Veronica* and a mint were growing in large quantities in the edges of the water and shallow places; some algæ and *Fontinalis* were also noticed. The banks of the stream are from 150 to 200 feet high, the stream having cut its way to that extent through the soft spongy limestone. The creek is fed by numerous large, cold springs, the outlets of the numerous sinks of the uplands.

3. *Beaver Creek*: The examination was made about 6 miles north of Glasgow, the county seat of Barren County, August 6, the water temperature being 80° F. Beaver Creek is a small northern tributary of the Big Barren River, about 20 miles in length, and at this place, 15 miles from its mouth, is about 20 yards wide. The locality was not a good one for collecting, but is the only place for several miles where the seine could be used, on account of the mill ponds. At this point there is a short ripple about 50 yards long, between the falls of one mill dam and the back water of the one below. The stream has a considerable current over rock bottom at the ripple, but in the more quiet water the bottom is of mud. Some of the rocks were dotted with *Oscillaria*, while *Spirogyra* and other algæ were found in quiet places. The soil in the narrow valley is fertile, but the surrounding country is of a poor limestone soil, colored very red from the iron which it contains.

The banks of the stream are fringed with willows, locusts, and hawthorns (*Crataegus*). On the uplands grow red and white oak, walnut, cherry, and poplar, while the tops of the hills are covered with post oak. The soil is underlaid by a soft limestone, easily eroded, and the whole surface of the country is covered with sinks. The stream is well stocked with a variety of fishes, and the specimens taken were large and fine.

4. *Little Barren River*, at Osceola, August 6: The locality examined extended from the mill, one-half mile downstream; temperature of the water, 84° F. Little Barren River rises in the southern part of Metcalf County and flows northwesterly for about 40 miles, joining the Green River between Hart and Green counties. At this station, 5 or 6 miles from its mouth, the river is about 80 yards wide and flows over a bottom composed of stone, slate, and coarse gravel. The water on the long ripples was very shallow, being broken up into several small streams with small grassy islands between them. The low sloping bars of these islands were covered with knotgrasses and mints. Darters were found in abundance on the clear, swift ripples, while minnows and sunfishes were plentiful in the more quiet places. The station is a good one for collecting, and we obtained a fair representation of what the stream contains.

UPPER GREEN RIVER PROPER.

5. *Green River*, 5 miles southwest of Greensburg, August 7; temperature, 83° F. Here the river is about 200 yards wide, flowing over very large beds of gravel and sand. Where this material has been cut out the bottom is of smooth, flat stone, while in the deeper places some mud has been deposited. The river was fished at a ripple where the water varied in depth from 2 to 4 feet, but between the ripples the water reaches a depth of from 4 to 12 feet. The stream contained but little vegetation, which grew on the small islands or low sloping shores. The fine, smooth bars afford excellent places for collecting; not infrequently one haul of the seine would land as many as 75 darters and many more minnows and other soft-rayed fishes.

6. *Green River*, one-half mile east of Greensburg, August 8; temperature, 85°. The character of the stream here is much the same as at the last station, the distance between them being probably 8 miles by water. Fewer fishes were taken here, however, owing to the less favorable conditions for collecting, the water being swift and the ripples covered with large stones. Black bass and "Jack" (*Stizostedion vitreum*) were reported very common, although but few were taken. Forty-three species were collected at this station.

7. *Pitman Creek*, 3 miles west of Greensburg and 8 miles from the mouth of the stream; August 9; water temperature, 85° F. Pitman Creek rises in the northwestern part of Taylor County, flows in a southwesterly direction, and is about 25 miles long. At this station it is about 40 yards wide and has but few ripples. The bottom is of stone, covered in places with fine mud; at the ripples the bottom is of coarse gravel and small stones. The water is not deep, being only from 2 to 5 feet in the more quiet and deeper places. The valley is narrow, of alluvial deposits, covered with elms, sycamores, cottonwoods, and water birch. There were no *Unios*, crayfishes, or water plants in the stream. The station was not a good one for collecting, the ripple being short and deep. But few varieties of fishes were taken, the most abundant being *Ambloplites rupestris* and *Etheostoma evides*.

In the following list the different stations on the Upper Green River and its tributaries are designated as follows: Big Barren River, by B; Drake Creek, by D; Beaver Creek, by Bea; Little Barren River, by LB; Green River, 5 miles southwest of Greensburg, by G; Green River, one-half mile east of Greensburg, by GE; Pitman Creek, by P.

FISHES OF THE UPPER CREEK RIVER.

1. *Lepisosteus osseus* (Linnæus). *Common gar.* (B, G, GE.) Not common; only 4 specimens were taken.
2. *Noturus miurus* Jordan. *Mud cat.* (B, LB, P.) Not common; only young specimens were taken.
3. *Noturus eleutherus* Jordan. (GE.) This species was taken from an offshoot or bayou of the Green River at Greensburgh. The largest specimen was 55 mm. long; head, 16; depth, 10; eye, 3+; anal rays, 11; upper jaw projecting slightly. The specimens agree in all essential particulars with Dr. Jordan's description of the species.
4. *Ictalurus punctatus* (Rafinesque). *Blue cat.* (B, D, G, GE.) Common in Big Barren and Green rivers, but most abundant in the former. A much valued and very excellent food-fish, especially when taken from clear running water. Unlike most other members of the family, it prefers the running to the more sluggish water.
5. *Leptops olivaris* (Rafinesque). *Mud cat; Yellow cat.* (B, G, GE, P.) Rare in the Big Barren, but more common in the Green River. Those taken from the bayou have the colors much blended.
6. *Ameiurus natalis* (Le Sueur). *Yellow cat.* (B, GE.) Not very common; specimens dark, almost black.
7. *Ameiurus nebulosus* (Le Sueur). *Bullhead.* (B, GE.) Found only in the muddy waters of the bayou. Specimens of the *Siluridæ* were generally very scarce, being common only in the bayou at Greensburg. This bayou is a small narrow neck of water overhung with willows and with a very muddy bottom. Five species were taken there.
8. *Ictiobus bubalus* (Rafinesque). *Buffalo sucker.* (B.) Only a few young specimens taken, but reported common in the deeper waters of the Big Barren.
9. *Moxostoma duquesnei* (Le Sueur). *Common or white sucker.* Taken at every station, and common at nearly all of them. Some very large specimens were obtained in the Big Barren, where it was particularly abundant.

10. *Catostomus nigricans* (Le Sueur). *Hog sucker*. The young were abundant at every station.
11. *Minytrema melanops* (Rafinesque). *Striped sucker*. (Bea.) Found only at one station. Four specimens were taken, 3 small and 1 large. The lateral line was complete in the young and entirely absent in the adult. Scales 46.
12. *Campostoma anomalum* (Rafinesque). "*Dough-belly*." Common at every station, but most abundant in the headwaters of rivers.
13. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. (B, D, Bea.) Common at the first two stations named, but only a few taken at the last.
14. *Hybognathus nuchalis* (Agassiz). *Silvery minnow*. (Bea.) Not common; sides not punctate.
15. *Notropis deliciosus* (Girard). (GE.) A very widely distributed minnow, but taken at only one place in the Green River system. Rare.
16. *Notropis whipplei* (Girard). *Blueminnow*. Taken at every station; found abundantly in nearly all the streams in this section, but more abundant in the larger ones.
17. *Notropis megalops* (Rafinesque). *Silverside; Shiner*. Taken at every station, but much more common in the Big Barren and its tributaries than in the Green River; only a few very young specimens were taken in the latter.
18. *Notropis ariommus* (Cope). *Big-eyed shiner*. (B, LB, G, GE, D.) Not found in the streams farther west, but not uncommon in the Upper Green River and its tributaries. The specimens agree in most particulars with Cope's description* of *Photogenis ariommus*, especially in the broad faint lateral band, but the specimens from the Green River have a dark vertebral band. The largest specimens from Drake Creek measured 70 millimeters long; head, 16; depth, 16; eye, 5½; anal rays, 9; lateral line, 37; snout very short, little more than half of eye. Twelve specimens were taken at the first station on the Green River, six of which measured as follows (in millimeters):

Length.	Head.	Eye.	Lateral line.	Eye in head.
61	16	7	40	2.3
61	16	7	39	2.3
59	15.5	6.5	39	2.3
54	15	6.5	40	2.3
60	16	7	36	2.3

19. *Notropis umbratilis cyanocephalus* (Copeland). *Redfin*. Taken at every station except Pitman Creek, and generally common. No variation noticed except in color.

20. *Notropis dilectus* (Girard). *Emerald minnow*.

Alburnus rubrifrons Cope, Proc. Acad. Nat. Sci. Phila. 1865, p. 85.

Leuciscus rubrifrons Günther, VII, 225. (B, D, G, GE.) Common at the stations named and very abundant in Drake Creek. A very handsome little minnow, varying in color in different localities. In this region it is of a very dark olive-green above, with a wide, thin, silvery lateral band, overlying a very dark plumbeous stripe that is sharply defined, especially on its upper margin. Vertebral band distinct; caudal peduncle slender. Careful measurements of several specimens from different localities in this creek system show but little variation. Specimens from this locality are much more slender than those described by Cope from the Alleghany region; his measurement of depth in length, including caudal fin, was only 5.5. Six specimens from Drake Creek measure as follows (in millimeters):

Length.	Depth.	Head.	Eye.	Anal rays.	Lateral line.	Head in length.	Depth in length.	Eye in head.
49	9	11+	4	10	37	4.45	5.44	2.75
49	8.5	11	4	10	38	4.45	5.16	
49	9	11.5	4	10	40	4.26	5.44	2.75
49	9	11	4	10	37	4.24	5.22	
47	8.5	11	4-	10	37	4.24	5.25	
48	9	12	4+	10	38	4	5.33	

* Synopsis Cyprinidae of Pennsylvania, p. 378.

21. *Notropis atherinoides* Rafinesque. *Rosy minnow*. Taken at all the stations except Beaver Creek; more abundant in the larger streams.

Length.	Head.	Depth.	Eye.	Anal rays.	Lateral line.
68	16	11	6	11	39
75	18	13	7	11	38
74	18	14	7	11	40

22. *Notropis arge* (Cope). Common in large clear streams. I have followed Professors B. W. Evermann and O. P. Jenkins in the identification of this species, but find some variation between what we have called *arge* and Cope's *Alburnellus arge*, described in his Synopsis of the Cyprinidae of Pennsylvania. Cope gives the length of *A. arge* as 2.75 inches, less than that of *atherinoides* (*Alburnellus jaculus*), while the specimens I have examined have generally been much larger. Cope describes the lateral line of *A. arge* as straight, which is not true in what we recognize as *N. arge*. The silver band on the sides of *N. arge* extends below the lateral line, while the interorbital space is about equal to the orbit.
23. *Notropis* sp. (LB.) Not common.
24. *Notropis telescopus* (Cope). (LB.) Rare.
25. *Phenacobius uranops* Cope. (B, D, G, GE.) Not common. No caudal spot; lateral line, 60.
26. *Hybopsis hyostomus* Gilbert. (B, LB, G, GE.) Not rare. Found in clear water, ordinarily in the swift water of the ripples. The largest specimen from Green River measured 57 mm. long; lateral line, 39.
27. *Hybopsis amblops* (Rafinesque). *Silver chub*. (G, GE, P.) Not common, being poorly represented at each station.
28. *Hybopsis watauga* Jordan and Evermann. (B, LB, D, G, GE.) Very abundant in the clear swift water of Big Barren River and Drake Creek. The scales in the lateral line of a few specimens are as follows: 48, 47, 48, 50, 49, 51, 49, 50. Scales before dorsal, 20 and 21. The scales in the lateral line of *H. dissimilis* (Kirtland) are 43, 44, 47, 46, 43, 45, 46, 44; scales before dorsal, 17, 17, 18, 17, 17, 16, 16. The large spots, so conspicuous on the sides of *H. watauga*, are a distinguishing feature. *H. watauga* is ordinarily much larger than *H. dissimilis*, and often reaches 100 mm. in length.
29. *Hybopsis kentuckiensis* (Rafinesque). *Chub*. (B, LB, D, GE.) Common. Lateral line, 42 to 44.
30. *Semotilus atromaculatus* (Mitchill). *Hornyhead*. (D, Bea.) Not common. Lateral line, 57.
31. *Hiodon selenops* Jordan and Bean. *Moon-eye*. (P.) Very rare; only one specimen was taken.
32. *Zygonectes notatus* (Rafinesque). *Top-minnow*. (D.) Rare; only three very small specimens were obtained.
33. *Fundulus catenatus* (Storer). *Studfish*. (GE.) Very rare.
34. *Labidesthes sicculus* Cope. *Brook silverside*. (B, D, LB, G, GE.) Found to be most abundant about the large sandbars in Green River; only a few were taken in Big Barren River.
35. *Pomoxis annularis* Rafinesque. *Calico bass*. (B, G, B, GE.) Not common in the Big Barren; abundant in the bayou of the Green River. Specimens very large.
36. *Ambloplites rupestris* (Rafinesque). *Goggle-eye*. (LB, G, GE, P.) Small specimens common in the bayou of the Green River; several large ones taken in Pitman Creek.
37. *Lepomis pallidus* (Mitchill). *Bluc sunfish*. (GE.) Very rare. Lateral line, 44.
38. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish*. Very generally distributed, but not many specimens were taken at any one station.
39. *Micropterus dolomieu* Lacépède. *Small-mouthed black bass*. Taken in all streams visited and plentiful in all the larger ones.
40. *Micropterus salmoides* (Lacépède). *Large-mouthed black bass*. Not nearly so common as *M. dolomieu*.
41. *Etheostoma nigrum* (Rafinesque). *Johnny darter*. (B, D, GE.) Common in Big Barren River and Drake Creek, but only a few small specimens obtained in the Green River. Lateral line, 48, 48, and 44.

42. *Etheostoma blennioides* Rafinesque. *Green-sided darter*. (B, LB, D.) Common in the Big Barren River and Drake Creek, and the most abundant darter in the Little Barren River. A few very small specimens were taken at the first station on the Green River and several large ones at the second station.
43. *Etheostoma pellucidum* Baird. *Sand darter*. (G, GE, LB.) Common only at the first station on the Green River, where about 75 specimens were taken. These specimens varied considerably both in color and squamation.
44. *Etheostoma asprellus* (Jordan). (G, GE.) Not widely distributed, nor common anywhere. Lateral line, 96.
45. *Etheostoma copelandi* (Jordan). (G, GE.) Very abundant at the first station on the Green River and common at the second. *E. copelandi* and *E. putnami* are closely allied, and may be identical, the chief differences occurring in the number of spines in the dorsal and anal fins and in the size of the scales. *E. copelandi* has dorsal XI-10; anal II-9; lateral line, 56. *E. putnami* has dorsal X-11; anal II-8; lateral line, 44. In thirteen specimens from this locality the dorsal is X-11, X-12, XI-11, XI-10, X-11, XI-12, X-11, X-12, X-12, X-12, X-11, X-12; anal, II-9, II-8, II-9, II-9, II-8, II-8, II-8, II-9, II-9; lateral line, 51, 48, 51, 49, 52, 51, 50, 48, 51, 48, 50, 50, 54. In these specimens the lateral line does not go as high as the average given for *E. copelandi*, nor as low as in *E. putnami*, while the number of fin rays seems to indicate nothing. I was also unable to find any constant difference in the relative proportion of head and depth.
46. *Etheostoma caprodes* (Rafinesque). *Log perch*; *Jack minnow*; *Hickory*. (B, D, LB, G, GE.) Not so abundant as in the western part of the State.
47. *Etheostoma macrocephalum* (Cope). (B, LB, D, Bea, G, GE.) A large handsome darter, but little known and not widely distributed. Rather plentiful in the Holston, but more abundant probably in this region than any other yet visited by the collector. The measurements of a few of the largest specimens are as follows:

Length.	Head.	Depth.	Eye.	Lateral line.	Dorsal.	Anal.
73	21	11	5	81	XII-13	II-11
69	20	11	4.5	83	XII-13	II-11
64	19	10	4	82	XII-13	II-11
65	19	10	4	83	XII-12	II-11

Three of the largest specimens out of twelve taken from the second station on the Green River measure as follows:

Length.	Head.	Depth.	Eye.	Lateral line.	Dorsal.	Anal.	Remarks.
70	20.5	12	5	79	XII-13	II-9	Checks with a few irregular patches of scales.
69.5	20	12	5	83	XIV-14	II-10	
65	19.5	10	5	79	XV-13	II-10	

48. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter*. (B, G.) Not abundant. Several specimens were taken from the Big Barren River, and only two from the Green. Lateral line, 62, 68, 65.
49. *Etheostoma phoxocephalum* Nelson. (D, G, P.) Not common. Only one small specimen taken from Pitman Creek.

50. *Etheostoma cymatotænia* Gilbert and Meek. (B, D, Bea, LB, G, GE.) A very rare darter, related to *E. macrocephalum*, never before taken east of the Mississippi River.* A few of the largest specimens measure as follows:

Length.	Head.	Depth.	Eye.	Lateral line.	Dorsal.
42	12	7+	3	63	XII-12
49	13	9	4.5	60	XII-13
44	12	7.5	4	62	XII-12
55	15	10	4.5	61	XII-12

51. *Etheostoma scierum* (Swain). (B.) Rare, only one specimen having been obtained.
52. *Etheostoma simoterum* (Cope). Very rare, specimens all young.
53. *Etheostoma evides* Jordan and Copeland. (C, G, GE, P.) Common only at Pitman Creek, where it was taken in abundance; most of the specimens, however, were small. Compared with specimens from White River, Indiana, they were not so deep in proportion to their length; stripes more narrow and not so well defined; back less elevated, and scales smaller. Twelve specimens afforded the following measurements: 58, 63, 62, 69, 59, 62, 61, 63, 63, 62, 60, 61. Pectorals unmarked.
54. *Etheostoma zonale* (Cope). (B, LB, Bea, G, GE.) Common wherever taken; most abundant in the clear ripples of the larger streams. The dark-green markings on the sides not arranged in well-defined bars; pectorals crossed by faint-green bars; cheeks with irregular patches of scales; lateral line from 56 to 62.
55. *Etheostoma camurum* (Cope). (G, GE.) Neither distributed generally nor taken in large numbers. Always found in swift water. General color brown, with a number of faint, narrow, green lines running longitudinally, and broader ones running vertically; 20 or 30 small orange spots, about one-half millimeter in diameter, scattered promiscuously over the sides, numerous on the caudal peduncle. Two specimens from the first station on Green River were 43 and 45 millimeters long; scales in lateral lines, 48 and 53. Two from the second station measured 45, 47; scales, 49, 41.
56. *Etheostoma rufolineatum* (Cope). (B.) Rare. Color, light olive, striped with brown and green, with a few orange spots on caudal peduncle and about mouth and cheeks; dorsal light, bordered with the same orange color.
57. *Etheostoma flabellare* (Rafinesque). (G, GE.) Not common.
58. *Etheostoma cceruleum* Storer. *Rainbow darter*. (B, Bea, LB, G, GE.) Common.
59. *Etheostoma stigmæum* (Jordan). *Speck*. (B, LB, D, G, GE.) Widely distributed and very abundant at all the stations. According to Dr. Gilbert, the types of *Etheostoma stigmæum* are identical with those of *E. saxatile*.
60. *Etheostoma virgatum* (Jordan). Rare.
61. *Etheostoma microperca* Jordan and Gilbert. *Least darter*. (LB.) Very rare.
62. *Stizostedion vitreum* (Mitchill). *Jack*; *Jack salmon*; *White-eye*. (G, GE, P.) Most common in the Green River. A very excellent food-fish.
63. *Aplodinotus grunniens* (Rafinesque). *Fresh-water drum*; *White perch*; *Campbellite*. (B, GE.) Common in Big Barren River; much valued as food.
64. *Cottus bairdi* Girard. *Miller's thumb*. (LB.) Rare.

* A full description can be found in a paper entitled "New and Little-known Etheostomoids," by Dr. C. H. Gilbert; Proc. U. S. Nat. Mus. 1887, 51.

TRADEWATER RIVER.

Tradewater River rises in Christian County, Ky., and flows in a northwesterly direction to the Ohio River, which stream it joins in Union County, 60 miles above Paducah. It is about 70 miles long, flowing for most of its length just inside of the western coal region. Dawson Springs is probably 45 miles from its mouth. The stream at this place is from 20 to 30 yards wide; the banks are low and steep, without sand or gravel. The bottom is composed almost entirely of mud, but there is an outcrop of rock at the mill affording a rocky bottom for a few yards. The river is warm and sluggish, and never very clear, apparently not receiving a very large supply of spring water, although several springs were noticed at the mill. It is well stocked with several varieties of fishes, one of the most abundant being the small-mouthed black bass, or "trout", as it is commonly called in Kentucky. This locality is not favorable for collecting, as the stream is full of logs, brush, and roots. The examination was made at the mill, one-half mile southeast of Dawson, and at the railroad bridge, three-quarters of a mile south of Dawson, July 26; water temperature, 82° F.

FISHES OF THE TRADEWATER RIVER.

1. *Lepisosteus osseus* (Linnaeus). *Common garfish*. Very abundant, as many as four, measuring from 2 to 3 feet long, being taken at one haul of the seine.
2. *Lepisosteus platystomus* (Rafinesque). *Duck-billed gar*. Not so common; only one specimen was taken.
3. *Carpion s carpio* (Rafinesque). *Carp sucker*. Several specimens were taken.
4. *Catostomus nigricans* (Le Sueur). *Hog sucker*. Not common. Scales, 47.
5. *Erimyzon sucetta oblongus* Mitchill. *Striped sucker*. Only one specimen taken. Lateral line, 47.
6. *Moxostoma duquesnei* (Le Sueur). *Common sucker, redhorse*. Common.
7. *Campostoma anomalum* (Rafinesque). *Dough-belly*. Rare. Specimens all small.
8. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Abundant.
9. *Notropis deliciosus* (Girard). Not common. Three specimens were taken, the largest measuring 54 millimeters. A faint spot before dorsal; snout broad, with a dark band passing around it; eye, 2½ in head; lateral line, 34; 13 scales before dorsal.
10. *Notropis megalops* (Rafinesque). *Shiner*. Rare; five specimens taken.
11. *Notropis umbratilis cyanocephalus* Copeland. Quite common. Spot before dorsal indistinct.
12. *Notropis atherinoides* (Rafinesque). *Silvery minnow*. Common. The largest measured as follows: Length, 80 millimeters; head, 16; depth, 15; eye, 5½; lateral line, 40. Silvery band extending above the lateral line over 2½ rows of scales.
13. *Hybopsis amblops* (Rafinesque). *Silver chub*. Not common. Largest specimen 56 millimeters in length.
14. *Zygonectes notatus* (Rafinesque). *Top minnow*. Rare; specimens all small.
15. *Labidesthes sicculus* Cope. *Brook silverside*. One specimen taken.
16. *Anguilla chrysypa* Rafinesque. *Common eel*. Common. Several specimens measuring at least 2 feet in length were taken.
17. *Pomoxis annularis* Rafinesque. *Crappie*. Common.
18. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish*. Abundant.
19. *Lepomis pallidus* (Mitchill). *Blue sunfish*. Rare.
20. *Lepomis macrochirus* Rafinesque. Two specimens taken. Length, 67 and 63 millimeters; depth, 28 and 25; head, 24 and 21. Dorsal spines high and rather slender; pectorals reaching third anal spine. The bars of bright orange spots were quite conspicuous in life, but fading in spirits, so that they are scarcely visible. Scales in lateral line, 41 and 42.
21. *Micropterus dolomieu* Lacépède. *Small-mouthed black bass*. Probably the most abundant of all the spiny-rayed fishes.
22. *Micropterus salmoides* (Lacépède). *Large-mouthed black bass*. Not so common as *M. dolomieu*.

23. *Etheostoma nigrum* (Rafinesque). *Johnny darter*. Common. Lateral line, 50, 48, 47, 49, 50.
 24. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter*. Common; only small specimens taken.
 25. *Etheostoma phoxocephalum* Nelson. Rare.
 26. *Etheostoma fusiforme* (Girard). Only one specimen taken. Length, 20 millimeters; head, 8; depth, 5; lateral line, 47; 21 scales with tubes; dorsal, X-11; caudal peduncle long and slender; color light, mottled with brown, apparently without any regularity.

LOWER CUMBERLAND RIVER.

This part of the Cumberland River was examined $1\frac{1}{2}$ miles south of the town of Kuttawa, Kentucky, July 26. The temperature of the water was 82° F. At this point the river runs over a broad sandbank half a mile long, that extends nearly across it. It was the only place in this part of the country where the river could be fished successfully with a small seine, the banks being generally precipitous and the water deep. The sand on the bar was covered in the more quiet water with fine mud a few inches deep, but nowhere was any vegetation found in the stream. Unios and crayfishes were taken, but they were not abundant. A few sunfishes and bass were obtained from a small artificial lake west of the river, but as the river frequently overflows into this lake I have included these with the river species.

FISHES OF THE LOWER CUMBERLAND RIVER.

1. *Acipenser rubicundus* Le Sueur. *Sturgeon*. Common; several specimens taken.
2. *Lepisosteus osseus* (Linnaeus). *Common gar*. Four specimens taken.
3. *Ictalurus punctatus* (Rafinesque). *Channel cat*, or *Blue cat*. Quite plentiful, and one of the most valued food-fishes at this place.
4. *Ictiobus bubalus* (Rafinesque). *Small-mouthed buffalo*. Common; specimens taken were small.
5. *Carpiodes difformis* Cope. Common.
6. *Catostomus nigricans* Le Sueur. *Hog sucker*. Not abundant.
7. *Moxostoma duquesnei* (Le Sueur). *Redhorse*; *White sucker*. Quite common; lateral line, 44.
8. *Cycleptus elongatus* (Le Sueur). *Black horse*. One young specimen taken.
9. *Campostoma anomalum* (Rafinesque). *Dough-belly*. Not common.
10. *Hybognathus nuchalis* (Agassiz). *Silvery minnow*. A very common minnow.
11. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Only a few specimens taken.
12. *Cliola vigilax* (Baird and Girard). *Bull-head minnow*. Rare; lateral line, 43.
13. *Notropis whipplei* (Girard). *Blue minnow*. One of the most abundant of the minnows, apparently preferring clear, running water.
14. *Notropis jejunos* (Forbes). Common. Two of the largest specimens taken afford the following measurements: Length, 50 and 52 millimeters; head, 12 and 12.5; depth, 12 and 12; lateral line, 32 and 33; scales before dorsal, 15. Snout broad and dusky; back somewhat elevated, with dark vertebral stripe; caudal peduncle wide; side with a broad, silvery lateral band.
15. *Notropis megalops* (Rafinesque). *Shiner*. Quite common.
16. *Notropis atherinoides* Rafinesque. *Silvery minnow*. Measurements (in millimeters) of five of the largest are as follows:

Length.	Head.	Depth.	Lateral line.	Anal rays.
65	13	13	37	10
63	13.5	12	38	11
71	15.5	14	38	11
68	14.5	13.5	37	11
66	14	13	38	11

Making head in length 4.7, 4.6, 4.58, 4.68, 4.6; and depth in length, 5, 5.25, 5, 5, 5; back compressed; color light.

17. *Hybopsis storerianus* (Kirtland). *Spawn-eater*. Common; the specimens were large.
18. *Opsopæodus emiliæ* Hay. One specimen was taken. It has a clear, well-defined, black lateral band, 1 millimeter wide, which passes around the snout and touches the lower lip, leaving two black spots, and passing back well over the caudal rays. There is also a well-defined vertebral band; dorsal dusky, and anal black at base.
19. *Hiodon alosoides* (Rafinesque). *Moon-eye*. One specimen taken. Length, 170 millimeters; depth, 45; lateral line, 60; dorsal rays, 9.
20. *Dorosoma cepedianum* (Le Sueur). *Mud shad*. Quite common, especially in the lake. Length from 50 to 70 millimeters.
21. *Zygonectes notatus* (Rafinesque). *Top-minnow*. Not common.
22. *Fundulus catenatus* (Storer). *Studfish*. Not common. The largest specimen measures 61 millimeters.
23. *Gambusia patruelis* (Baird and Girard). Not common; taken only in the lake.
24. *Labidesthes sicculus* Cope. *Brook silver-side*. Common.
25. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish*. Found very abundant in the lake, and also taken in the river.
26. *Lepomis cyanellus* Rafinesque. *Green sunfish*. Found only in the lake. Lateral line, 45.
27. *Lepomis pallidus* (Mitchill). *Blue sunfish*. Taken in both the river and the lake; very abundant in the latter; specimens very dark. Lateral line, 38 to 41.
28. *Micropterus dolomieu* Lacépède. *Small-mouthed black bass*. Common; abundant in the lake.
29. *Micropterus salmoides* (Lacépède). *Large-mouthed black bass*. Less common than *M. dolomieu*.
30. *Etheostoma pellucidum* Baird. *Sand darter*. Common, but taken only in the river.
31. *Etheostoma shumardi* (Girard). Not common. Eleven dark bands on sides, and a dark curved line back of opercle. Lateral line, 58.
32. *Etheostoma phoxocephalum* Nelson. Common. Specimens small, light in color.
33. *Etheostoma caprodes* (Rafinesque). *Log perch*. Common. Lateral line, 90, 91, 89, 90; specimens, large.
34. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter*. Rare; only three specimens taken from river.
35. *Stizostedion vitreum* (Mitchill). *Jack*; *Jack salmon*. Common in the river.
36. *Roccus chrysops* (Rafinesque). *White bass*. Common. Lateral line, 60.
37. *Aplodinotus grunniens* Rafinesque. *Fresh-water drum*; *White perch*. Common.

UPPER CUMBERLAND RIVER.

The Upper Cumberland River was examined in Rockcastle, Laurel, and Knox counties, just within the mountains, and consequently in the eastern coal region. The streams in this part of the country have cut deep through strata of sandstone, shale, and slate, so that the banks on either side rise high and steep, leaving, however, in some places, a narrow strip of level land near the water. The streams are swift, flowing almost entirely over rocky beds with, here and there, banks of small eroded stones and gravel, but in some of the more quiet places the bottom is muddy. The water is clear and cold, with considerable current at all times. Unios and crayfishes were scarce; no algæ were found, and but little vegetation of any kind was noticed in the stream. A species of mint, however, was found along the edges of the water and in the more shallow ripples. No great variety of fishes was noticed, the more active and alert varieties being by far the most common. Small species, and especially the soft-rayed fishes, were very scarce. The sides of the mountains are covered with a heavy growth of hard-wood timber, such as ash, oak, beech, and tulip tree (*Liriodendron tulipifera*). Examinations were made at the following localities:

1. *Clear Creek*, near Wildie, 1 mile west of the railroad station, which is 10 miles northwest of Livingston, on the Kentucky Central Railroad; temperature of the water, 72° F. Clear Creek is tributary to Round Stone, and this again to the Rockcastle River. Round Stone receives Clear, Brush, and Crooked creeks above the "Sinks," and, after flowing under ground for a distance of 4 miles, joins the Rockcastle River at the "Boils," near Livingston. Clear Creek is a smooth, open stream, offering a good opportunity for collecting. It is not more than 20 miles long, and throughout its lower course is about 10 yards wide. The crooked valley through which it flows is narrow and low, the immediate banks being but a few feet above the water, so that they are easily overflowed. The water is quite clear. The ripples are short and shallow, flowing over piles of gravel, between which the depth is nearly uniform (about 3 feet) and the bottom bed of rock. Little or no vegetation was found growing in the bed of the creek; the banks were lined with willows, sycamores, and cottonwoods. The stream contains an abundance of fishes, such as bass, suckers, and minnows, *Campostoma anomalum* being the most abundant. *Notropis megalops* and *Notropis umbratilis* were also very abundant.

2. *Little Rockcastle River*, 6 miles northeast of Livingston, August 12; water temperature, 62° F. Little Rockcastle River is a small, shallow, but comparatively wide stream, tributary to Rockcastle River; a number of coal shafts open into its valley. The bed of the stream is covered in places with the slack coal from the mines, to a depth of 1 to 3 feet, and this in turn is sometimes covered with sand, through which the collector makes his way with difficulty. The water has a decided bluish tinge, caused probably by the copperas (FeSO_4) from the mines. The stream was seined in several places, but not a specimen of fish was taken or seen, the stream seeming to be devoid of both animal and vegetable life, due probably to the poisonous salts of iron.

3. *Rockcastle River*, one-half mile above the mouth of the Little Rockcastle River, August 12; water temperature, 64° F. The Rockcastle River rises in the mountains of Jackson County, flows southwesterly 50 or more miles to the Cumberland, and is the largest northern tributary of that river coming from the mountains. It has all the characteristics of a mountain stream, being swift, rocky, and in places deep. The hills on either side are composed principally of sandstone, which, during heavy rains, split off in large land-slides and fall into the water. At this station the river is 25 or 30 yards wide, and rushes over a very rocky ripple. The water was from 2 to 3 feet deep, being slightly swollen by recent rains. Near the shore were a few small sandbanks, on which grew some wild grasses and mints. No unios or crayfishes were taken, and but few fishes. The stream is a favorite resort for the angler, black bass being taken in large numbers.

4. *Rockcastle River*, 2 miles from Livingston, August 13; water temperature, 63° F. The character of the stream was much the same as at the last station above described. It was not, however, a good place for collecting. More soft-rayed fishes were taken here than at the former place, suckers (*Moxostoma duquesnei*) being comparatively plentiful.

5. *Cumberland River* at Barbourville, August 14; water temperature, 62° F. Collections were made just south of the town, both above and below the mill. The stream at this point, 80 miles above the falls, is more than a hundred yards wide, rapid and rocky. The deeper places have a smooth rock bottom, with a greater or less

quantity of large, loose sandstones scattered over it. The ripples were very rocky and the water was very swift. Only a few species of fishes were taken, bass and sunfishes being the most common. A few varieties of minnows were also comparatively plentiful. The soil is composed of a yellow clay; the bottom lands, where they are uncleared, are covered with willows, birch (*Betula nigra*), elms, and cottonwoods (*Populus monilifera*).

6. *Richland Creek*, 1½ miles west of Barbourville and near the mouth of Smoky Fork, August 14; water temperature, 68° F. The creek is small, only about 15 miles long, and at this point about 25 feet wide. It is quite rapid, flowing over a rocky bottom which is covered with mud in places. The water is from 1 to 4 feet in depth. But few species of fishes were taken.

7. *Smoky Fork*, a small tributary of Richland Creek, was fished half a mile from its mouth. This stream has a sandy bottom, and the deeper water stood in small deep pools. The chub (*Hybopsis kentuckiensis*) was the most abundant species obtained.

8. *Cumberland River*, Pineville, August 15; water temperature, 65° F. The examination was made just below the bridge between the railroad station and the town. At this place the river flows over a fine ripple more than a quarter of a mile long. The bottom of the ripple is comparatively smooth, composed of well-worn sandstones, partially imbedded in gravel and shale, with a few small bars of sand near the shore. The imbedded stones were fringed with an alga and *Fontinalis*. The water was swift and of a uniform depth, about 2 feet. This place offered the best facilities for collecting that were found in the river, but fish were very scarce. Black bass and goggle-eye were the most common species, but even these were not plentiful. Haul after haul was made without securing a single soft-rayed fish, but a few specimens of *Ericymba buccata* were taken.

9. *Straight Creek*, Pineville, August 15; water temperature, 67° F. The collecting station was 2 miles above the mouth of the creek. Straight Creek is about 30 miles long, flowing just at the foot of, and parallel with, the Pine Mountains, and joins the Cumberland River at Pineville. It is neither rapid nor deep, but very broad and shallow for a mountain stream. The banks are low, but steep; the bed of the creek is composed principally of sand, with large sandstones lying loose in the stream. The deepest water is not more than 5 feet, while in the more shallow places sandbars rise to the surface. The stream is a good one for collecting in, and was seined thoroughly for nearly a mile, but with little success. Only a small number of species and but few specimens were taken. The only soft-rayed fish obtained in any number was *Notropis whipplei*.

It is noticeable that fishes were more abundant in the Rockcastle River and its tributaries than in the Upper Cumberland and its tributaries. The reason for this is, probably, that the Rockcastle joins the Cumberland below the falls.

In the following list of fishes, Clear Creek is designated by the letters Cl; Rockcastle River, by R; Richland Creek, by Ri; Smoky Fork, by S; Cumberland River at Barbourville, by CB; Cumberland River at Pineville, by CP; and Straight Creek, by St. Species marked with an asterisk (*) were collected in the Rockcastle River just below the railroad bridge, by Dr. Charles H. Gilbert, in 1884; those marked with a dagger (†) were obtained in the same river near Livingston, by Drs. Jordan and Gilbert, in 1876.

FISHES OF THE UPPER CUMBERLAND RIVER AND ITS TRIBUTARIES.

1. *Ameiurus nebulosus* (Le Sueur). *Common bullhead*. (CP.) One large specimen taken.
2. *Leptops olivaris* (Rafinesque). † *Mud cat*; *Yellow cat*. (CB.) Not common.
3. *Catostomus nigricans* (Le Sueur). *† *Hog sucker*. Taken at every station; abundant in Clear Creek and Richland Creek, but rather rare in other places.
4. *Catostomus teres* (Mitchill). † *Fine-scaled sucker*. (R, S.) Rare; only two specimens taken.
5. *Moxostoma duquesnei* (Le Sueur). *† *Common sucker*. Taken at every station and very abundant in Clear Creek.
6. *Lagochila lacera* (Jordan and Brayton). *Hare-lip*. (Cl, R.) Not widely distributed; abundant in Clear Creek.
7. *Erimyzon sucetta* (Lacépède). † *Chub sucker*.
8. *Campostoma anomalum* (Rafinesque). *† (Cl, R, CB, Ri, St.) Very abundant in Clear Creek; common at most of the other stations except Straight Creek. One specimen from Straight Creek measured as follows: Length, 75 millimeters; head, 13; depth, 13; teeth, 1, 4-4, 1; lateral line, 1.52. Snout broad and blunt. Color dark, gradually shading to light below; a very dark line behind opercle and under eye.
9. *Pimephales notatus* (Rafinesque). † *Blunt-nosed minnow*. (Cl, R, CB.) Common. One of the most common minnows at the stations named.
10. *Notropis deliciosus* (Girard). *† (R, CB, St.) Common at the first station on the Cumberland; one specimen only was taken in Straight Creek.
11. *Notropis spectrunculus* (Cope). (CB.) Only five specimens taken.
12. *Notropis whipplei* (Girard). * *Blue minnow*. Taken at every station except the second one on the Cumberland. Very abundant in Clear Creek. All the specimens from these clear mountain streams were especially fine and brightly colored.
13. *Notropis galacturus* (Cope). † *Milky-tailed shiner*. (Cl, R.) Not widely distributed, but abundant where taken. At Clear Creek it was much more common than *N. whipplei*; also quite common in Rockcastle River.
14. *Notropis megalops* (Rafinesque). *Common shiner*. Taken at all stations except the second on the Cumberland; common in Clear and Smoky creeks.
15. *Notropis umbratilis cyanocephalus* Copeland. *† *Redfin*. (Cl, CB, CP, Ri, S, St.) Common in Clear and Richland creeks.
16. *Notropis dilectus* (Girard). * (R.)
17. *Notropis atherinoides* Rafinesque. * *Silvery minnow*. Rather common. L., 59, 62, 62, 58, 55, 71.
18. *Chrosomus erythrogaster* (Rafinesque). † *Red-bellied dace*.
19. *Ericymba buccata* Cope. (CB, Ri, S, St.) Common only at the first station on the Cumberland; several specimens were taken in Richland and Smoky creeks, but only two in Straight Creek. Specimens all small.
20. *Semotilus atromaculatus* (Mitchill). *† *Chub*; *Horned dace*. (CB, Ri, S.) Common only in Richland and Smoky creeks, and much more abundant in the latter, which is the more sluggish stream. Lateral line, 52 to 56.
21. *Hybopsis amblops* (Rafinesque). *Silver chub*. (CB.) Common.
22. *Hybopsis kentuckiensis* (Rafinesque). * *Chub*; *Hornyhead*. (Cl, R, CB.) Common.
23. *Phenacobius uranops* Cope. *† (R.) Rare. Lateral line, 58 to 60.
24. *Anguilla chrysypa* Rafinesque. † *Eel*.
25. *Fundulus catenatus* (Storer). *Studfish*. (St.) Only one specimen taken.
26. *Ambloplites rupestris* (Rafinesque). *Rock bass*; *Goggle-eye*. (CB, CP.) Relatively common.
27. *Lepomis megalotis* (Rafinesque). *† *Long-eared sunfish*. (Cl, R, S, CB, CP, St.) Common in Clear Creek and at the first station on the Cumberland.
28. *Lepomis pallidus* (Mitchill). † *Blue sunfish*.
29. *Lepomis garmani* Forbes. (CB.) Rare.
30. *Lepomis cyanellus* Rafinesque. *Green sunfish*. (S.) Very rare.
31. *Micropterus dolomieu* Lacépède. "*Trout*;" *Small-mouthed black bass*. Abundant at every station except Straight Creek.
32. *Micropterus salmoides* (Lacépède). *Large-mouthed black bass*. (CB.) Not nearly so common as *M. dolomieu*.

33. *Etheostoma pellucidum* Baird. *Sand darter*. (St.) The most common darter wherever taken.
34. *Etheostoma caprodes* (Rafinesque). * † *Log perch*. (R, Cl, CP, St.) Common in Clear Creek and relatively common in the Cumberland.
35. *Etheostoma aspro* (Cope and Jordan). * † *Black-sided darter*. (Cl, R, CB, St.) Not common. Specimens from Clear and Straight creeks were large.
36. *Etheostoma blennioides* Rafinesque. * *Green-sided darter*. (R.) Not common; four fine specimens taken.
37. *Etheostoma zonale* (Cope.) * (R.) Not common.
38. *Etheostoma cœruleum* Storer. * *Rainbow darter*. (R.) Only a few specimens taken.
39. *Etheostoma stigmæum* Jordan. *Speck*. (St.) Very common.
40. *Etheostoma camurum* (Cope). * *Blue-breasted darter*. (R.) One fine large specimen taken.
41. *Etheostoma maculatum* Kirtland. * †
42. *Etheostoma phoxocephalum* Nelson.
43. *Etheostoma simoterum* (Cope). * †
44. *Etheostoma virgatum* (Jordan). * †

FISHES OF CLINTON COUNTY.

During the spring of 1889 and the autumn of 1890 Prof. Philip H. Kirsch made an interesting collection of fishes from the streams of Clinton County, Kentucky. The writer has been permitted to examine this collection and to make a list of the species in advance of the publication of Prof. Kirsch's report. Several forms, abundant in Clinton County, were not obtained in other parts of the State. A new species of *Etheostoma* is the most common representative in that region of the family to which it belongs. The following list is important as affording the means of comparing the faunas above and below the falls of the Cumberland River. Species marked S are from Smith Creek; those marked Sp, from Spring Creek; A, from Albany Branch; I, from Indian Creek, and P, from a pond near Albany.

1. *Ameiurus nebulosus* (Le Sueur). *Common bullhead*. (Sp.) One specimen taken.
2. *Catostomus nigricans* Le Sueur. *Hog sucker*. (I, A.)
3. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. (I.) Not common; specimens all large.
4. *Campostoma anomalum* (Rafinesque). (S, Sp, A, P.) Common; abundant in Smith Creek.
5. *Notropis telescopus* (Cope). (I.) Rare.
6. *Notropis deliciosus* (Girard). (S, A.)
7. *Notropis megalops* (Rafinesque). *Common shiner*. (S, Sp, A, P.) Very common.
8. *Notropis umbratilis cyanocephalus* (Copeland). (S, Sp, A, I, P.) Common. Quite variable; colors very bright.
9. *Notropis galacturus* (Cope). *Milky-tailed shiner*. (S, Sp, A, I.) Especially abundant in Spring Creek. Specimens very fine.
10. *Chrosomus erythrogaster* Raf. *Red-bellied dace*. (S, Sp, A, I.) Common. Colors very bright.
11. *Hybopsis kentuckiensis* (Rafinesque). *Chub*; *Hornyhead*. (S, Sp, A, P.) Not abundant.
12. *Hybopsis amblops* (Rafinesque). *Silver chub*. (I.) Rare.
13. *Rhinichthys atronasus* (Mitchill). *Black-nosed dace*. (Sp, A, I.) Common. Specimens very variable.
14. *Semotilus atromaculatus* (Mitchill). *Chub*; *Horned dace*. (Sp, A, P.) Common.
15. *Ambloplites rupestris* (Rafinesque). *Rock bass*; *Goggle-eye*. (S, Sp, A, I.) Common.
16. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish*. (I.) Only three adult specimens taken.
17. *Etheostoma blennioides* Rafinesque. *Green-sided darter*. (S, Sp, I.) Common; very abundant in Spring Creek. Specimens very large.
18. *Etheostoma flabellare* (Rafinesque). (S, A, I.) Abundant in Albany Branch.
19. *Etheostoma cœruleum* Storer. *Rainbow darter*. (A, I.) Common. Markings peculiar.
20. *Etheostoma*, probably *rufolineatum*.
21. *Etheostoma* sp. nov. (S, Sp, A, I.) Very abundant. *E. obeyense*, described by Prof. Kirsch in article No. 9, U. S. Fish Commission Bulletin, 1890.
22. *Stizostedion canadense* (C. H. Smith). *Sauger*. One specimen taken.

FISHES COLLECTED BY DR. DAVID S. JORDAN IN WHITLEY COUNTY.

The following is a list of fishes collected by Dr. David S. Jordan, in 1883, in the Clear Fork of the Cumberland River, Wolf Creek, and Briar Creek, near Pleasant View, Whitley County, Kentucky:

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| <ol style="list-style-type: none"> 1. <i>Ameiurus natalis</i> (Le Sueur). 2. <i>Catostomus teres</i> (Mitchill). 3. <i>Catostomus nigricans</i> Le Sueur. 4. <i>Moxostoma velatum</i> (Cope). 5. <i>Moxostoma duquesnei</i> (Le Sueur). 6. <i>Campostoma anomalum</i> (Rafinesque). 7. <i>Chrosomus erythrogaster</i> Rafinesque. Very abundant in small streams. 8. <i>Pimephales notatus</i> (Rafinesque). 9. <i>Ericymba buccata</i> Cope. Abundant. 10. <i>Notropis umbratilis cyanocephalus</i> Copeland. Common. 11. <i>Notropis megalops</i> Rafinesque. | <ol style="list-style-type: none"> 12. <i>Rhinichthys atronasmus</i> (Mitchill). Common in clear cold streams. 13. <i>Ambloplites rupestris</i> (Rafinesque). 14. <i>Lepomis megalotis</i> (Rafinesque). 15. <i>Lepomis cyanellus</i> Rafinesque. 16. <i>Lepomis macrochirus</i> Rafinesque. 17. <i>Micropterus dolomieu</i> Lacépède. 18. <i>Etheostoma aspro</i> (Cope and Jordan). 19. <i>Etheostoma blennioides</i> Rafinesque. Taken only in river channel. 20. <i>Etheostoma susanna</i> Jordan. (Type.)* 21. <i>Etheostoma sagitta</i> Jordan. (Type.)* 22. <i>Etheostoma cumberlandicum</i> Jordan. (Type.)* |
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LOWER TENNESSEE RIVER.

Tennessee River, about 3 miles up the river from Paducah, July 28; water temperature, 82° F. At this place the river is about three-quarters of a mile wide, and the current is very swift except near the large sandbars. Some collecting was done on a very large sandbar, which sloped so gradually that one could easily wade 100 yards from the shore. The bottom is of smooth, fine gravel, covered to a depth of 2 to 4 inches with a fine mud. A few species of minnows were very abundant, especially *Hybognathus nuchalis*. Very few specimens of any kind of food-fish were taken.

FISHES OF THE LOWER TENNESSEE RIVER.

1. *Acipenser rubicundus* Le Sueur. *Shovel-fish; Sturgeon*. Very common in quiet water.
2. *Lepisosteus osseus* (Linnaeus). *Common or Needle-nosed gar*. Common.
3. *Lepisosteus platystomus* (Rafinesque). *Duck-billed or Wide-nosed gar*. Only one specimen taken.
4. *Ictalurus punctatus* (Rafinesque). *Blue, Spotted, or Channel cat*. Very abundant. Only small specimens taken.
5. *Carpionides velifer* (Rafinesque). *Quillback*. Common.
6. *Moxostoma duquesnei* (Le Sueur). *Redhorse*. Reported common, but few specimens were taken.
7. *Hybognathus nuchalis* (Agassiz). *Silvery minnow*. Abundant. Lateral line from 38 to 40.
8. *Notropis whipplei* (Girard). *Blue minnow*. Common.
9. *Notropis atherinoides* Rafinesque. *Rosy minnow*. Common. Three of the largest measure as follows: Length, 62 millimeters, 65, 64; head, 13½, 14, 13½; depth, 12, 12½, 11; eye, 4, 4, 4; lateral line, 46, 46, 48; anal, 11, 11, 11. Back compressed; no distinct vertebral band.
10. *Hybopsis storerianus* (Kirtland). *Spawn-eater*. Common.
11. *Dorosoma cepedianum* (Le Sueur). *Mud shad*. Not very common.
12. *Labidesthes sicculus* Cope. *Brook silverside*. Plentiful.
13. *Etheostoma nigrum* (Rafinesque). *Johnny darter*. Rare.
14. *Etheostoma caprodes* (Rafinesque). *Log perch*. Eight specimens taken.
15. *Stizostedion vitreum* Mitchill. *Jack*. Not common.
16. *Micropterus dolomieu* Lacépède. *Small-mouthed black bass; "Trout"*. Common; reported very abundant in several fine lakes near this place.
17. *Aplodinotus grunniens* Rafinesque. *Fresh-water drum; Grunter; White perch*. Common, and much used for food.
18. *Roccus chrysopterus* (Rafinesque). *White bass*. Quite common.

*For the original descriptions of these species, see Proc. U. S. Nat. Mus., 1883, 249-251.

UPPER TENNESSEE RIVER.

Powell River, 8 miles south of Cumberland Gap, Tennessee, August 16; water temperature, 69° F. Powell River is a fine mountain stream, flowing to the southwest, and parallel with the Cumberland Mountains for 100 miles or more. At the seining station, which was some 25 miles from its mouth, it is about 150 yards wide, with a rock bottom. At intervals there are large banks of sand jutting out into the river, making the landing of the seine comparatively easy. The water is clear, with a swift current; it varied in depth in the channel from 4 to 8 feet, but the stream was somewhat swollen from recent rains. Crayfishes and turtles (*Aromochelys carinatus*, *Aspidonectes spinifer*, *Malaclemmys geographicus*) were abundant, the last-named species being very common. A few unios were also taken; *U. plicatus*, *U. gracilis*, and *U. tuberculatus* were most common. No plant life was noticed in the bed of the river. This stream was very much better stocked with fishes than those on the north side of the mountains. Black bass, goggle-eye, sunfishes, and a few species of minnows and darters were common. Among the last mentioned the sand darter was the most abundant.

The stream is an excellent one for the more gamy or predatory species, and trout, presumably *Salvelinus fontinalis*, "regular spotted brook trout", were reported to have been formerly abundant, but no specimens were observed.

FISHES OF THE UPPER TENNESSEE RIVER.

1. *Lepisosteus ossæus* (Linnaeus). *Common gar-pike*. Common; several specimens taken.
2. *Ictiobus bubalus* (Rafinesque). *Buffalo*. Not common.
3. *Catostomus nigricans* Le Sueur. *Hog sucker*. Quite common.
4. *Moxostoma duquesnei* (Le Sueur). *Redhorse*; *Common sucker*. Only very small species taken, but these were quite common.
5. *Campostoma anomalum* (Rafinesque). *Dough-belly*. Not common.
6. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Only about a dozen specimens taken.
7. *Notropis whipplei* (Girard). *Blue minnow*. The most abundant of all the minnows. Specimens large and highly colored.
8. *Notropis dilectus* (Girard). Not common.
9. *Notropis deliciosus* (Girard). Rare; color light.
10. *Notropis megalops* (Rafinesque). *Shiner*. Not common.
11. *Hybopsis amblops* (Rafinesque). *Silver chub*. Comparatively plentiful.
12. *Hybopsis watauga* Jordan and Evermann. Only a few small specimens taken.
13. *Hybopsis kentuckiensis* (Rafinesque). *Chub*; *River chub*.
14. *Fundulus catenatus* (Storer). Rare.
15. *Labidesthes sicculus* Cope. *Brook silverside*. Only one specimen taken.
16. *Ambloplites rupestris* (Rafinesque). *Goggle-eye*; *Rock bass*. Common, not large.
17. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish*. Quite common.
18. *Micropterus dolomieu* Lacépède. *Black or Green bass*; "*Trout*." Plentiful.
19. *Etheostoma pellucidum* Baird. *Sand darter*. The most common of the darters.
20. *Etheostoma caprodes* (Rafinesque). *Hickory*. Common.
21. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter*. Not common.

MAYFIELD CREEK.

Mayfield Creek at Hickory Grove, July 28; water temperature, 75° F. The collecting station was $\frac{1}{2}$ mile east and $\frac{3}{4}$ miles south of the railroad station, at "The Old Mill Pond" and "The Basin." Mayfield Creek rises near the southern boundary of the State, in Calloway County. It is about 60 miles long, flows in a northwesterly and then in a westerly direction to the Mississippi River, which it joins in Carlisle County. The place examined is about 20 miles from its source. Here the stream is not more than 20 yards wide. The banks are low and steep, and the bottom is composed of sand and gravel, with a light coat of mud in places. The water, at the time the stream was visited, was very low and turbid, there having been no rain in that locality for eight weeks. Crayfishes were abundant, and a few unios were also found, but there was no plant life of any kind in the bed of the stream. The creek is well provided with a good variety of fishes, but no large food species were obtained, the places fished having recently been seined. The stream is said to be quite well stocked, considering its size. The soil is of a recent geological formation (Quaternary), consisting of a poor white clay mixed with fine sand. The low, level country is densely covered with forest trees, the most common of which are hickory, oaks, ash, sweet gum, and birch, with some cypress, tulip trees, and cherry.

FISHES OF MAYFIELD CREEK.

1. *Ictalurus punctatus* (Rafinesque). *Fork-tailed cat; Blue cat.* Very abundant, but the specimens taken were all small.
2. *Ameiurus nebulosus* (Le Sueur). *Common bullhead.* Not common.
3. *Ameiurus natalis* (Le Sueur). *Yellow cat.* Five specimens taken.
4. *Noturus gyrinus* (Mitchill). The most common variety taken.
5. *Noturus miurus* Jordan. Only three specimens taken.
6. *Catostomus nigricans* Le Sueur. *Spotted or Hog sucker.* Rare; one specimen taken.
7. *Catostomus teres* (Mitchill). *Fine-scaled sucker; Brook sucker.* Quite abundant. Lateral line 68, 67, and 71. Although widely distributed and generally very common this is the only place in this part of the country where this species was taken in large numbers.
8. *Carpiodes velifer* (Rafinesque). *Quillback; Bony carp.* One specimen taken.
9. *Moxostoma duquesnei* (Le Sueur). *Common redhorse; White sucker.* By far the most common species of this family.
10. *Erimyzon sucetta* (Lacépède). *Chub sucker.* Common; but not found in other streams in this locality. Lateral line 43, crowded anteriorly; back and shoulders broad and heavy.
11. *Hybognathus nuchalis* (Agassiz). *Silvery minnow.* Very abundant; specimens large; lateral line, 40 or 41.
12. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow.* Common.
13. *Notropis umbratilis cyanocephalus* Copeland. *Redfin.* Common; the only species of this genus taken. The specimens averaged 58 millimeters long; color rather light for this species; spot before the dorsal very pale; lateral line, 46 to 48.
14. *Hybopsis amblops* (Rafinesque). *Silver chub.* Rare; three specimens taken. Plumbeous band on sides pale; lateral line, 38.
15. *Semotilus atromaculatus* (Mitchill). *Creek chub.* Not common. Lateral line, 55.

16. *Opsopœodus emiliæ* Hay. One large specimen taken. Length, 50 millimeters; head, 11; depth, 11; lateral line, 40, little decurved, no very distinct lateral band, no vertebral line nor dark markings on the dorsal. The color of this species seems to be extremely variable. One specimen from New Harmony, Indiana, shows a light lateral band, caused by each scale having a dark edge; lateral line, 38. Another specimen from the same locality shows a well-defined lateral line, with no vertebral line nor black markings on the fins. Length, 38 millimeters; 39 scales. A specimen from Mount Vernon, Indiana, has no dark markings along the lateral line, but has a very dark vertebral band, with first rays of the dorsal and base of anal dusky. Lateral line complete, with 34 scales. Three specimens from Pearl River, Missouri, each 30 millimeters long, have a well-defined lateral band, one scale in width, but no dark markings on fins. Lateral line, 36. Two specimens from the Maumee River, Ohio, the northernmost locality for this species, each 45 millimeters in length, have a very indistinct lateral band, no vertebral line, but a large black spot on the first rays of the dorsal. (See Plate LI, Fig. 1.) Other specimens in the Museum measured:

Length.	Head.	Depth.	Eye.	Lateral line.
39	9	9	3	38
34	8	8+	2.5	40
30	7	7.5	2+	40

17. *Lucius vermiculatus* (Le Sueur). *Pike; Pickerel*. Only two specimens taken.
18. *Notemigonus chrysoleucus* (Mitchill). *Roach*. Quite common. Anal rays, 13, 13, 14, 14.
19. *Zygonectes notatus* (Rafinesque). *Top-minnow*. Quite common. Largest specimen 61 millimeters long.
20. *Labidesthes sicculus* Cope. *Brook silverside*. Only one specimen taken.
21. *Aphredoderus sayanus* (Gilliamus). *Pirate perch*. Very abundant. Lateral line, 50.
22. *Centrarchus macropterus* (Lacépède).
23. *Pomoxis annularis* Rafinesque. *Calico bass; Strawberry bass*. Common; several large specimens taken.
24. *Chænobryttus gulosus* (Cuv. & Val.). *War-mouth*. Common; several specimens taken.
25. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish*. Plentiful; the most common species of this family.
26. *Lepomis cyanellus* Rafinesque. *Green sunfish*. Not common; only three specimens taken. Lateral line, 48.
27. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter*. The most common darter at this place. Specimens very large and stout; depth in length (four specimens) $4\frac{1}{2}$, $5\frac{1}{2}$, $5\frac{1}{2}$, and $5\frac{1}{2}$. The black blotches on the sides reach well under the belly; lateral lines from 63 to 65.
28. *Etheostoma nigrum* (Rafinesque). *Johnny darter*. Not common; only a few small specimens taken.
29. *Etheostoma phoxocephalum* Nelson. Rare. Specimens small.
30. *Etheostoma fusiforme* (Girard). One specimen taken. Length 30 millimeters; head in length, $3\frac{3}{8}$; depth, $3\frac{1}{4}$; lateral line, 46 (15 pores). Color light, mottled above with brown.

OBION RIVER.

Obion River, near Cypress, July 30; water temperature, 76° F. The examination was made 12 miles northeast of Moscow and about 20 miles from the mouth of the stream. Obion River rises in Graves County, and flows north and then west to the Mississippi River. The stream is narrow and deep and about 65 miles long. It is much larger than the "Bayou", but of very much the same character. The bottom is of mud, from 2 to 4 feet deep, resting on a stratum of quicksand, and it is therefore nearly impossible to wade over it. Numerous springs along the banks of the river keep the mud always soft and miry, so that it is very dangerous for cattle to approach the water. There is but one place in its entire course where gravel is found in the bed of the stream; this is known as the "Gravel Ford", and is at the foot of McLeod's Bluff. The bluff rises to a height of more than 100 feet above the stream, while 30 feet above the water there is a layer of gravel, 18 inches thick, running horizontally through the hill. As the face of the bluff wears away, the gravel drops down and is washed into the water, but does not extend entirely across the stream. The gravel is coarse and well worn. The stream is reported, by those living near it, to contain an abundance of fishes, but, owing to the depth of the mud and the great quantities of drift that are everywhere present, it was impossible to make a satisfactory collection. Turtles (*Malaclemmys geographicus* and *Aspionectes spinifer*) were common, but no unios were taken.

FISHES OF OBION RIVER.

1. *Lepisosteus osseus* (Linnaeus). *Gar*; *Gar-pike*. Quite common.
2. *Ictalurus punctatus* (Rafinesque). *Spotted* or *Channel cat*. Reported as being common, but very few specimens were taken.
3. *Carpiodes difformis* Cope. *Buffalo sucker*. Common; specimens small.
4. *Carpiodes velifer* (Rafinesque). *Quillback*; *Bony carp*. Quite common.
5. *Hybognathus nuchalis* (Agassiz). *Silvery minnow*. Very common.
6. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Rare.
7. *Notropis megalops* (Rafinesque). *Common shiner*. Very common.
8. *Notropis deliciosus* (Girard). Common. Specimens without dark markings.
9. *Notropis jejunus* (Forbes). Not common.
10. *Notropis umbratilis cyanocephalus* Copeland. *Redfin*. Not common; much less abundant than in the Bayou de Chien.
11. *Notropis atherinoides* Rafinesque. *Rosy minnow*. But few specimens taken, all small.
12. *Opsopœodus bollmani* Gilbert. Three specimens were taken, two males and one female. This species has been obtained in only two localities, namely: in the Satilla River, Waycross, Georgia, in 1889, by Mr. Charles H. Bollman,* and at this place. The specimens from Obion River agree perfectly with the description of Dr. Gilbert. (See Plate LI, Fig. 2.)

* C. H. Gilbert, see Notes on Fishes from the Lowlands of Georgia, Bull. U. S. Fish Commission, 1888, page 226.

13. *Dorosoma cepedianum* (Le Sueur). *Mud shad; Hickory shad*. Abundant in the sluggish waters of this stream.
14. *Zygonectes notatus* (Rafinesque). *Top-minnow*. Common.
15. *Gambusia patruelis* (Baird and Girard). *Top-minnow*. Plentiful.
16. *Lucius vermiculatus* (Le Sueur). *Pickarel*. Not common.
17. *Labidesthes sicculus* Cope. *Brook silverside*. Only five specimens taken.
18. *Aphredoderus sayanus* (Gilliams). *Pirate perch*. Only one specimen taken. Scales, 46.
19. *Pomoxis annularis* Rafinesque. *Calico bass*. Common.
20. *Pomoxis sparoides* (Lacépède). *Crappie; Calico bass*. Common.
21. *Chænobryttus gulosus* (Cuv. & Val.). *War-mouth*. Plentiful; specimens all small.
22. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish*. Very common.
23. *Lepomis macrochira* (Rafinesque). Several specimens were taken, all smaller than those from the Tradewater River. Length, 30 millimeters.
24. *Micropterus dolomieu* Lacépède. "*Trout*." Common.
25. *Micropterus salmoides* (Lacépède). *Big-mouthed trout*. Less common than *M. dolomieu*.
26. *Etheostoma shumardi* (Girard). Not common.
27. *Etheostoma caprodes* (Rafinesque). *Log perch*. Rare.
28. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter*. Only three small specimens taken.
29. *Etheostoma ouachitæ* Jordan and Gilbert (?). One specimen, too small to be positively identified.
30. *Aplodinotus grunniens* (Rafinesque). *White perch; Drum*. A common and much valued food-fish.

BAYOU DE CHIEN.

Bayou de Chien, near Moscow, July 29; water temperature, 68° F. One collecting station was just north of Moscow, and another about 3 miles west of that place. Bayou de Chien is a large, sluggish stream, rising in the southern part of Graves County, and flowing in a westerly direction for about 20 miles, to the Mississippi River. Moscow is about midway of its course, and it is there about 15 yards wide, with low, precipitous banks. The stream is very crooked, and is almost filled with logs, brush, and roots. The bottom consists of a fine soft mud, varying from a few inches to a few feet in depth. No vegetable life whatever was found growing in it. The low temperature of the water can be accounted for by the facts that the stream flows for nearly its entire length through woods and that it is fed chiefly by cold springs. The depth of the water varies from 3 to 5 feet between the ripples. On either side of the stream, from a quarter to a half mile, the country is very low, overflowing in the winter and spring with back water from the Mississippi River. This tract is covered with a dense growth of oaks, hickories, cypress, and water-birch. Its soil is a hard white clay, unfit for cultivation. Beyond this strip of lowland the country is undulating and has a rich soil, well adapted to agriculture, and producing fine crops of corn, wheat, clover, tobacco, and, formerly, cotton.

The stream is well stocked with fishes, but is much better adapted to the more sluggish varieties, such as suckers, carp, catfish, etc. Sunfishes were also found in abundance; black bass were plentiful but they lacked the alertness and activity of those living in clear swift streams. I wish to acknowledge my indebtedness to the citizens of Moscow for their kindness and assistance while working there.

FISHES OF THE BAYOU DE CHIEN.

1. *Amia calva* Linnæus. *Dogfish; Grinnel*. Reported to be very abundant. No specimens were obtained, but a very large one was seen that had been taken by some fishermen. Said to take a minnow the same as a bass and to be equally difficult to land, jumping from the water and fighting vigorously for several minutes; frequently reaches a weight of 10 or 12 pounds, and furnishes much sport for the angler, but is seldom used for food.
2. *Lepisosteus platystomus* (Rafinesque). *Gar*. Quite common, and said to be very destructive to other fish.
3. *Ictalurus punctatus* (Rafinesque). *Channel or Spotted cat*. Not common. Members of this family were reported to be especially abundant during the spring months, but at this time of the year much difficulty was experienced in finding specimens.
4. *Ameiurus nebulosus* (Le Sueur). *Bullhead*. But few specimens were taken.
5. *Noturus gyrinus* (Mitchill). Not common.
6. *Ictiobus bubalus* (Rafinesque). *Buffalo; Small-mouthed buffalo*. Very abundant.
7. *Moxostoma duquesnei* (Le Sueur). *Redhorse; White sucker*. Not abundant; specimens small.
8. *Hybognathus nuchalis* (Agassiz). *Silvery minnow*. Very abundant; found in the deeper water. Anal rays, 7.
9. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Rare; about five specimens were taken.
10. *Notropis whipplei* (Girard). *Blue minnow*. One specimen taken.
11. *Notropis atherinoides* Rafinesque. *Rosy minnow*. Not abundant. Head in length, 4.2; depth in length, 4.8; eye, 3 in head; back compressed; color very light.
12. *Hybopsis storerianus* (Kirtland). *Spawn-eater*. Quite common. Specimens large; scales in lateral line, 41 to 44.
13. *Opsopœodus emiliæ* Hay. One large specimen taken. Length, 39 mm.; depth, 9; head, 9; eye, 3; a faint lateral band; dorsal with a small black spot on first rays; scales in lateral line, 38.
14. *Dorosoma cepedianum* (Le Sueur). *Hickory shad; Gizzard shad*. The stagnant waters in this region swarm with this species, especially the bayous and lagoons.
15. *Zygonectes notatus* (Rafinesque). *Top-minnow*. Not nearly so abundant as the preceding species; but few taken.
16. *Lucius vermiculatus* (Le Sueur). *Pike; Pickerel*. Very plentiful.
17. *Labidesthes sicculus* Cope. *Brook silverside*. Rare; specimens young.
18. *Anguilla chrysypa* Rafinesque. *Eel*. Reported very common; 3 specimens were taken.
19. *Aphredoderus sayanus* (Gilliams). *Pirate perch*. Common; specimens taken were all small.
20. *Notemigonus chrysoleucus* (Mitchill). Very abundant. Anal rays, 14.
21. *Chænobryttus gulosus* (Cuv. & Val.). *Big-mouthed sunfish*. Abundant.
22. *Pomoxis annularis* Rafinesque. *Crappie*. Common.
23. *Pomoxis sparoides* (Lacépède). *Calico bass*. Quite common, and a good fish for the table.
24. *Lepomis megalotis* (Rafinesque). *Common sunfish*. Very abundant; specimens large.
25. *Lepomis pallidus* (Mitchill). *Blue sunfish*. Abundant and large. Spot on dorsal frequently indistinct.
26. *Lepomis garmani* Forbes. Only one specimen taken.
27. *Lepomis heros* (Baird and Girard). Only one specimen taken. Lateral line, 34.
28. *Micropterus dolomieu* Lacépède. *Trout; Jumper; Green trout*. Abundant in the deeper waters.
29. *Micropterus salmoides* (Lacépède). *Big-mouthed trout*. Less common than the preceding.
30. *Etheostoma nigrum* (Rafinesque). *Johnny darter*. Quite plentiful, considering the character of the stream, but variable.
31. *Etheostoma caprodes* (Rafinesque). *Log perch; Hickory; Striped perch*. Not common.
32. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter*. Rare; specimens small.
33. *Etheostoma fusiforme* (Girard). Only one specimen taken.
34. *Aplocheilichthys grunniens* Rafinesque. *White perch; Silvery perch; Drum; Croaker*. Very common; and extensively used for food.

UPPER KENTUCKY RIVER.

The Upper Kentucky River is formed by the union of three streams, namely: the South, Middle, and North Forks, and their tributaries. These branches all rise on the northern slope of the Pine Mountains, flow in a northwesterly direction, and unite in Lee County. The country is mountainous throughout. The steep hills are composed chiefly of sandstone, and contain great quantities of coal; veins from a few inches to a few feet in thickness can be seen everywhere along the streams and mountain sides. The slopes of the mountains are covered with a heavy growth of timber; small yellow pine, beech, maple, oak, walnut, birch, and tulip tree are the most common. Among the shrubs are the cucumber (*Magnolia macrophylla*), dogwood, papaw, wild plum, and two or three species of hawthorns; while water birch, sycamore, elm, and cottonwood grow along the streams. Collections were made in Clay, Leslie, Perry, and Knott counties.

THE SOUTH FORK.

1. *Horse Creek*, Garratsville, August 20; water temperature, 72° F. Horse Creek is a long, narrow stream, tributary to Goose Creek, in which collections were made about 2 miles from its mouth. At the collecting station the stream is only about 25 feet wide, shallow, and with but little current. It is composed of a series of short ponds, varying from 2 to 4 feet in depth, and connected by shallow ripples. The bottom is of sand and mud, the banks are low and steep, and the water is overhung with willows, sedges, and grasses. The station was not a good one for collecting, and but few species of fishes were taken.

2. *Goose Creek*, Garratsville, August 20; water temperature, 70° F. Goose Creek is the largest western tributary of South Fork, and flows almost parallel with that river for 40 miles. At the point visited, which is about 15 miles from its mouth, the stream is from 15 to 20 yards wide. The bottom consists of shale and slate, with mud and sand in places. The ripples are short, swift, and rough. No plant life was discovered in the stream; no unios and only a few crayfishes and smaller crustaceans were taken. The creek was well stocked with fishes; suckers (*Moxostoma duquesnei* and *Catostomus nigricans*) being especially abundant.

3. *Hector Creek*, 5 miles west of Big Creek post-office; water temperature, 73° F. Hector Creek is a southern tributary of South Fork, or Redbird, as its upper course is called. The creek is narrow and rocky, nowhere reaching a width of more than 25 feet or a depth of more than 4 feet. The bottom consists either of smooth flat rock or of broken stones and gravel. The stream, small as it is, contains an abundance of small fishes, and in no place were the commoner species more plentiful. *Campostoma anomalum*, *Ericymba buccata*, *Catostomus nigricans*, two or three species of *Notropis*, and *Pimephales notatus* were especially abundant. Darters were also quite common, and some fine specimens of *Etheostoma spilotum* were taken, these being the second specimens that have been found.

4. *Redbird Creek* (South Fork), 1 mile west of Big Creek, August 22; water temperature 75° F. Collections were made at the crossing of the London road, and also about a mile farther down the stream. At the crossing there is a very long, shallow ripple, where most of the collecting was done. Redbird Creek is 75 or 80 miles long.

It is 35 or 40 yards wide at this station, which is 35 miles from its source. The bottom consists of rock, and the average depth of water is from 3 to 5 feet, with occasional deeper places, which generally have a muddy bottom. Several very large smooth sandbars were noticed, but they were not common. The ripples are shallow and smooth enough to make seining easy. The stream is well stocked with fishes, 28 species having been obtained. The commoner varieties of food-fishes were abundant. Darters were quite numerous on the ripples, especially *E. variatum*, a rare species in other localities. Ten specimens of *E. spilotum* were also taken, and *E. pellucidum* was common on the sandbars. The favorite method of fishing here is by means of the spear at night with the aid of a torch, while the fish are spawning in the shallow waters.

5. *Big Creek*, at Big Creek post-office, August 22; water temperature, 74° F. Big Creek is a small eastern tributary of Redbird, shallow and very rocky. For its entire length, about 15 miles, the bottom of the stream is one continuous bed of stones, containing no plant life and but few fishes. Collections were made one mile from the mouth of the stream. Very few specimens were obtained, *Notropis megalops* and *Catostomus nigricans* being about the only species that were common.

THE MIDDLE FORK.

6. *Bull Creek*, 4 miles west of Hyden, August 23; the water temperature was 68° F. This is a small western tributary of Middle Fork, about the same size as Big Creek, but of a different character. It is narrower and deeper and less rapid and stony. The bottom is of slate and stone, with short interspaces of gravel. Collections were made at the crossing of the Hazard road. The creek contains an abundance of small fishes, 18 species having been taken from the stream and from a small bayou. The bayou contained great numbers of minnows, *Cliola vigilax*, *Pimephales notatus*, and *Camptostoma anomalum*.

7. *Middle Fork*, August 23; water temperature, 70° F. The collecting station was 4 miles north of Hyden and three-quarters of a mile below the crossing of the Hazard road. Middle Fork is larger and deeper than Redbird, with less frequent ripples. At the seining station, about 40 miles from its mouth, the stream is 50 yards wide and very swift on the ripples. The ripple where the collecting was done is about half a mile long, and the upper part has a smooth stone bottom, thickly strewn with large loose stones. The entire bed of the stream and surface of the stones, where covered with water, are thickly overgrown with a species of *Potamogeton*. Hiding among these weeds were great numbers of small catfishes (*Noturus miurus*), small darters (*Etheostoma zonale*), and the young of *E. flabellare*. Several hundred specimens of the catfish and of *E. zonale* were taken in a few hauls of the seine. Nearer the middle of the ripple the bottom was composed of coarse gravel and broken stones, the weeds growing there only in small isolated bunches. Here the most common species obtained were black bass, minnows (especially *Notropis whipplei*), and darters (*E. aspro*, *E. variatum*, *E. spilotum*, and a few *E. nigrum* and *blennioides*). The gravel next gave way to a smooth sand bottom with deeper water, where *E. pellucidum* was taken in abundance, and several species of *Notropis*, especially *N. arge* and other soft-rayed fishes, were common. Twenty-nine species in all were obtained. The stream is an excellent one for many varieties of food-fishes, but fishing is reported to be carried on extensively by means of seines and spears, and also by the use of dynamite.

8. *Cutshin Creek*, August 24; water temperature, 68° F. The collecting station was 4 miles east of Hyden and 3 miles from the point where this creek flows into the Middle Fork. Cutshin Creek is probably the largest eastern tributary of the Middle Fork, and is 25 or 30 miles long. The stream is rocky and swift, but quite deep in places; the bottom is of rock, with low steep banks and with frequent sandbars. The ripples are broad and shallow and devoid of vegetation. The stream is well stocked with fishes. Black bass (*M. dolomieu*), minnows, and darters are common, the bass being especially abundant, and *Etheostoma spilotum* and *E. variatum* were also obtained. Twenty species in all were taken.

THE NORTH FORK.

9. *North Fork*, just south of Hazard, August 25; water temperature, 76° F. North Fork is the largest of the three rivers that unite to form the Kentucky. It is more open than either the South Fork or the Middle Fork, the valley being wider and the bed more sandy. It also contains many long sandbars and stretches of mud bottom. The water is clear and has considerable current. Crawfishes were more numerous than in the other streams, and unios were abundant, the most common species being *U. multiplicatus*, *U. ligamentinus*, and *U. anodontooides*. Fishes were not so plentiful as in the South and Middle Forks, nor were so many species taken. The station was not a good one for obtaining darters, as the ripple was full of rocks. Catfishes (*Ictalurus punctatus*) and suckers (*Moxostoma duguesnei*) were secured in large quantities by means of traps and trot lines. The writer was indebted to Mrs. Elhannen Combs, of Hazard, Kentucky, for assistance between Hazard and Pikeville.

10. *Lot Creek*, Hazard, August 26; water temperature, 74° F. This creek was examined 2 miles west of Hazard and 1 mile from its mouth. Lot Creek is a small eastern tributary of the North Fork, about 15 miles long and from 6 to 8 yards wide. The banks are low and steep, the bed is of sand and mud, with very little rock exposed. The stream is composed of a series of ponds, from 2 to 4 feet in depth, connected by short ripples running over fine gravel. The valley through which it flows is of loose soil; it is from a quarter to half a mile wide; willows, elms, and water birch overhang the stream. Bass, goggle-eyes, and sunfishes were very abundant; minnows, suckers, and darters were plentiful. The total number of species obtained was 21.

11. *Troublesome Creek*, Dwarf, August 27; water temperature, 76° F. The collecting station was at the crossing of the Hazard and Hindman road, 12 miles northeast of Hazard and 9 miles west of Hindman. Troublesome Creek, the largest eastern tributary of the North Fork, rises in the eastern part of Knott County and flows northwest for more than 100 miles before joining the North Fork. The stream is swift and rocky, with an occasional sandbank. There are numerous deeper places, the bottoms of which are covered with large sandstones. The water is clear, cool, and devoid of plant life, except a few scattered bunches of water moss (*Fontinalis*). Collecting was restricted entirely to the ripples on account of the great number of stones in the deeper water. Bass, sunfish, and darters were the most common species.

12. *Left Troublesome Creek*, at Hindman, August 28; water temperature, 68° F. This is a small stream with a sandy bottom, low sloping shores, and shallow water. But very few species of fishes were taken, *Pimephales notatus*, *Ericymba buccata*, and *Notropis deliciosus* being the most common. The darters were represented by only three species, the most abundant being *Etheostoma caeruleum*.

FISHES OF THE UPPER KENTUCKY RIVER.

1. *Lepisosteus osseus* (Linnaeus). *Common gar*. Horse, Big, Lot, and Troublesome creeks. Nowhere abundant in the Upper Kentucky, four being the greatest number taken at any one station.
2. *Ictalurus punctatus* (Rafinesque). *Spotted, Blue, or Channel cat*. North Fork. The most widely distributed species of this family; reported from every stream, but scarce at this season of the year.
3. *Noturus miurus* Jordan. Several of this species were taken in Horse Creek, but it was abundant only in Middle Fork. Specimens dark, almost black above, shading to light below.
4. *Carpiodes velifer* (Rafinesque). *Quillback*. Redbird, Middle Fork, and North Fork. Plentiful in the North Fork, the only stream in which it was found abundant. Only young specimens were taken, and these came from shallow water, over sandbars.
5. *Catostomus teres* (Mitchill). *Fine-scaled or Brook sucker*. Hector, Goose, and Bull creeks. Nowhere common. Scales much crowded in front, with a black spot on the side under dorsal and before caudal; scales in lateral line, 71.
6. *Catostomus nigricans* Le Sueur. *Hog sucker*. Abundant at every station except Goose Creek. Specimens with little variation, except in color, throughout the river system.
7. *Moxostoma duquesnei* (Le Sueur). *Common sucker*. Taken at every station, except in Hector Creek and Left Troublesome Creek. Horse Creek and Cutshin Creek were abundantly stocked with this species, and large specimens were obtained in both.
8. *Campostoma anomalum* (Rafinesque). *Dough-belly; Stone-lugger*. Common at every station except the first, where it was not taken. This species seems to prefer small and shallow streams, such as Hector Creek, where it was obtained in great numbers, but it was not so common in Redbird Creek or in Middle and North Forks.
9. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Obtained at every station. This species was also more abundant in the smaller streams. In an offshoot of Bull Creek some very large specimens were taken; the largest measured 80 millimeters long, and was very dark in color; lateral band especially broad and dark, passing over opercle and around snout; scales in the lateral line, 40.
10. *Notropis deliciosus* (Girard). Bull Creek, Middle Fork, Cutshin Creek, North Fork, and Troublesome Creek. Found principally in the larger streams, such as Redbird Creek, Middle and North Forks; never largely taken in small streams. This species was generally much more common here than in the western part of the State, especially than in the Green River system. Compared with specimens from other parts of the State and the Mississippi Valley, there is but little variation; the principal difference is in color and in the relative size of the eye. Eight specimens from the North Fork measure as follows:

Length.	Head.	Depth.	Eye.	Lateral line.
52	13—	11—	4	36
49	12—	11	4—	36
49	12	10	4	36
49	12	10	4	33
47	11+	9	4	35
47	11½	9½	4	35
45	10	8½	4—	35
46	10+	8½	4—	35

11. *Notropis whipplei* (Girard). *Blue minnow*. Found at every station, but evidently preferring large streams and clear running water.
12. *Notropis megalops* (Rafinesque). *Common silverside, shiner*. Taken at every station except the first, and very abundant in a few streams. Especially common in Big Creek, where the many variations due to age were very evident.
13. *Notropis ariommus* (Cope). Redbird Creek and Middle Fork. Taken at only these two stations; not common at either. Three specimens from Redbird measure as follows: Length, 64, 60, 55; head, 17, 16½, 14; depth, 14, 13½, 11; eye, 6½, 6½, 6; lateral line, 40, 38, 40.

14. *Notropis umbratilis cyanocephalus* Copeland. *Redfin*. Redbird and Bull Creeks. Although this is one of the most variable species of the genus, throughout this region the specimens obtained were all well defined, and when compared with specimens from other parts of the State they showed no constant differences.
15. *Notropis spectrunculus* (Cope?). Redbird. This identification is not positive; the only specimen is more slender and its mouth more terminal than in *N. deliciosus*. There is also a dark caudal spot.
16. *Notropis dilectus* (Girard). Redbird, Bull, and Cutshin creeks, North Fork, Lot, Troublesome, and Left Troublesome creeks. A very widely distributed and comparatively common little minnow, found in the clear running water of both large and small streams. Compared with specimens from other localities within the State, the color is about the only point of difference. Ten specimens from Redbird measure as follows (in millimeters):

Length.	Head.	Depth.	Eye.	Lateral line.
66	13	10+	4	41
60	12	9	3.5	41
62	12.5	10	4	41
59	11.5	9	3.5	41
61	12	8.5	4	40
58.5	11.5	9	3.5	41
58.5	11.5	8.5	3.5	40
57	11	8.5	3.5	41
65	12	9	3.5	41
56	11	8	3.5	41

17. *Notropis atherinoides* Rafinesque. *Rosy minnow*. Not common.
18. *Notropis arge* (Cope). Horse Creek, Redbird, and North Fork. Not common, but not so rare as the preceding. Four specimens from Middle Fork measured as follows:

Length.	Head.	Depth.	Eye.	Anal.	Lateral line.
93	21	16	7	11	42
93	21	16	7	11	41
81	19	14	6	11	42
82	19	15	6	11	41

One specimen from Redbird measures, 90; 20.5; 15.5; 6.5; 11; 42. Those from Redbird were smaller, but with the same markings, and the same heavy back and shoulders:

Length.	Head.	Depth.	Eye.	Anal.	Lateral line.
74.5	18	13	5	11	43
77	18.5	13	5.5	11	42
74	17	12	5	11	41
79	18	12	5.75	11	41
78.5	18	13	5	11	43
75	17.5	11.5	5.5	11	42

19. *Ericymba buccata* (Cope). Taken at every station. Much more plentiful in the eastern than the western part of the State, and more abundant in the tributaries of the North Fork than in those of the Middle Fork.
20. *Hybopsis amblops* (Rafinesque). *Silver chub*. Obtained at all stations except in Horse, Big, and Bull creeks. Widely distributed, but nowhere very abundant.
21. *Hybopsis kentuckiensis* (Rafinesque). *Chub*. Taken at all stations except in Goose and Left Troublesome creeks. Not abundant at any place, but rather common in Redbird and Big creeks, Middle Fork, and North Fork.
22. *Hybopsis watauga* Jordan and Evermann. Redbird. Very rare.

23. *Semotilus atromaculatus* (Mitchill). *Chub; Horned dace*. Goose, Redbird, and Left Troublesome creeks. Abundant in an old bayou of Bull Creek, but rare at other places. Lateral line from 52 to 56.
24. *Labidesthes sicculus* Cope. *Brook silverside*. Horse and Goose creeks, Redbird and Big Creek. Neither very generally distributed nor plentiful where taken.
25. *Ambloplites rupestris* (Rafinesque). *Rock bass; Goggle-eye*. Goose Creek, Redbird, Big Creek, and Middle Fork. Not common in any stream except Lot Creek.
26. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish*. Taken at every station and abundant in Troublesome Creek. This is the only species of *Lepomis* found in these mountain streams.
27. *Micropterus dolomieu* Lacépède. *Small-mouthed black bass*. Taken at every station, and generally quite common.
28. *Micropterus salmoides* (Lacépède). *Large-mouthed black bass*. Goose Creek, Redbird, Bull Creek, Middle Fork, and North Fork. Neither so widely distributed nor so common as *M. dolomieu*, and preferring more quiet water.
29. *Etheostoma pellucidum* Baird. *Sand darter*. Found most frequently in the larger streams, and most abundant on the sandbars of Redbird.
30. *Etheostoma nigrum* (Rafinesque). *Johnny darter*. Widely distributed; taken in every stream except Goose Creek, but common only in Horse Creek and Redbird. Specimens all small.
31. *Etheostoma blennioides* Rafinesque. *Green-sided darter*. Horse and Goose creeks, Redbird, Big Creek, Middle Fork, Cutshin, Lot, and Troublesome creeks. More common than *E. nigrum*, and larger and finer specimens were obtained.
32. *Etheostoma variatum* (Kirtland). Redbird, Middle Fork, Cutshin and Troublesome creeks. A very handsome darter taken at only a few places, but found in great quantities at some of them. At Redbird about 100 specimens were obtained from the long, gentle ripple at the crossing of the Hazard road. This species is not generally distributed, nor had it been taken previously in large numbers. It has been recorded only from a tributary of the Little Miami (Ohio), Brookville (Indiana), and the falls of the Ohio River at Jeffersonville (Indiana). Six of the largest specimens measured as follows:

Length.	Head.	Depth.	Lateral line.	Dorsal.	Anal.
62	13½	7	58	XIII-13	II-7
65	14	8	56	XIII-12	
63	13½	7	57	XIV-12	
60	13+	7--	59	XIII-13	
58	13	7-	55	XIII-11	
57	13	6.5	58	XIV-12	

33. *Etheostoma spilotum* (Gilbert). Hector Creek, Redbird, Big Creek, Middle Fork, Cutshin, Lot, and Troublesome creeks. This species (or variety of *E. nianquae*) has never been taken except from the waters of the Kentucky River. It was first obtained by Dr. Gilbert in Sturgeon Creek, Owsley County, Ky., in 1889. We did not find it common at any station, six specimens from the Redbird being the greatest number from any one place. Two of the largest specimens measure as follows: Length, 71, 80; head, 21, 23; depth, 13, 16; eye, 4, 4; lateral line, 58, 59; dorsal, XI-13, XI-13; anal, II-10, II-11. (See Plate LI, Fig. 3.) For a detailed description reference should be made to Proc. U. S. Nat. Mus. 1887, 53.
34. *Etheostoma simoterum* (Cope). Redbird, Bull Creek, Middle Fork, Troublesome Creek. Not common.

Length.	Head.	Depth.	Lateral line.	Dorsal.	Anal.
45	11	10.5	51	X-11	II-7
45	11	10.5	52	XI-11	II-7
45	11	10.5	54	XI-11	II-7
40	10	9	53	XI-11	II-7
40	10	9	50	XI-11	II-7

35. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter*. Goose and Big creeks, Middle Fork, and Troublesome Creek, very rare; only one specimen taken in each of the three streams first mentioned.
36. *Etheostoma zonale* (Cope). Taken in every stream except Hector, Troublesome, and Left Troublesome creeks, and very abundant in several of them. About 280 specimens were taken in one ripple of Middle Fork. Generally common wherever found.
37. *Etheostoma flabellare* (Rafinesque). Goose and Hector creeks, Redbird, Middle Fork, Cutshiu, Troublesome, and Left Troublesome creeks. Abundant only in Middle Fork, where 25 or 30 young specimens were taken.
38. *Etheostoma cceruleum* (Storer). *Rainbow darter*. Taken in all the streams except Horse and Goose creeks. Common where found.

BIG SANDY RIVER.

Eight miles east of Hindman, beyond the ridge that divides the Kentucky River system from that of the Big Sandy, a difference in the character of the country and of the streams is quite noticeable. The valleys grow wider, giving room for good farm lands between the hills. The soil produces good crops of corn and vegetables. Pastures of timothy and clover, which were not seen throughout the mountainous part of Kentucky, were here quite common. Fruits, apples especially, do well; many very large trees, apparently of great age, being still in bearing condition. The headwaters of the streams have much the same character as those of the Kentucky River, being rocky and swift; but as the valley widens the sand increases in the bed of the streams and the alluvial banks grow higher. Throughout their lower courses the water is less rapid and forms deeper ponds or pools.

1. *Right Fork of Beaver Creek, Lackey, August 29; water temperature, 68° F.* Beaver Creek is one of the largest western tributaries of the West or (Levisa) Fork of the Big Sandy River. It is about 75 or 80 miles long, and is navigable for 10 or more miles. Lackey is near the middle of its course, and at that place the stream is 30 or more yards in width, with an average depth between the ripples of about 4 feet. The course of the stream is interrupted by frequent ripples, having a depth of only a few inches. The bed is of sand, with rock or mud at intervals. A few crayfishes were taken, but no water plants, except mint, were found in the stream. The creek was well stocked with fishes, the soft-rayed species being most abundant. Suckers (*Moxostoma duquesnei*), sunfish, and bass were the most common food species. The suckers were especially abundant, and minnows and darters were also common.

2. *Shelby Creek, Robinson, August 30; water temperature, 70° F.* Shelby Creek is a small tributary of Robinson Creek, about 6 miles long, and is shallow and rocky throughout its entire length, except for about half a mile in its lower course, where the bed is of sand. Collections were made near its mouth.

3. *Robinson Creek, Robinson, August 30; water temperature, 68° F.* Robinson Creek is a stream of considerable importance, being about 40 miles long and 25 or 30 yards wide, with a depth of 2 to 5 feet at the place where it was visited. The bed is of rock and sand, the former occurring most frequently. The valley of the stream is narrow and the current quite swift. Collections were made at the mouth of Shelby Creek, on a long, deep ripple. Twenty-one species in all were obtained. Quillback (*Carpionodes velifer*), two or three species of *Notropis*, and *Etheostoma variatum* were quite common.

4. *Island Creek*, Pikeville, September 1; water temperature, 69° F. The collecting station was 2 miles east of Pikeville and 1 mile from the mouth of the creek. Island Creek is a small southern tributary of the Levisa Fork of the Big Sandy River, and is only a few miles long. The creek consists of a number of pools, connected by gravelly ripples. Nineteen species of fishes were obtained, minnows and suckers being most abundant.

5. *Levisa Fork of the Big Sandy River*, Pikeville, September 2; water temperature, 72° F. The river at Pikeville is broad and shallow, and yet with sufficient depth to be navigable for small boats during low water. The bed, except at the ripples, which are not numerous, is of light, fine sand, constantly changing its position, and forming large sandbars at intervals. There are long stretches of deep water, but these are the exception, and in such places the bottom is covered with large sandstones. The bottom of the ripples is of stone, on which grow species of *Potamogeton*, both the submerged and floating kinds, but in no great quantities. The stream was seined at the town, but the station was not a good one, and only nineteen species were obtained. A great many fish were brought to town by fishermen, *Ictalurus punctatus*, *Carpiodes velifer*, and *C. carpio* being the most common. Our stay in Pikeville was made pleasant and the work more effective by the kindness and help received from Mr. Parsons and Mr. Conally, of that place.

6. *John Creek*, Zebulon, September 5; water temperature, 69°. John Creek, the largest eastern tributary of the Levisa Fork, is about 80 miles long, and at the place visited, which is only about 20 miles from its source, it is 20 or 25 yards wide, crooked, very rocky, and swift. The greater part of the stream is composed of ripples, which are separated by short ponds with sandy bottoms. Darters (*Etheostoma caeruleum*, *E. blennioides*, *E. zonale*) were common, while among the minnows *Notropis whipplei*, *Ericymba buccata*, and *Hybopsis kentuckiensis* were the most abundant.

7. *Coon Creek*, Zebulon, September 5; water temperature, 71° F. This small tributary of John Creek has a sandy bottom, not reaching bed rock at any place. From it were taken 15 species of fishes, *Lepomis megalotis* and *Ericymba buccata* being quite common.

8. *Blaine Creek*, Catalpa, September 8; water temperature, 73° F. The collecting station was 2 miles west of the railroad bridge. Blaine Creek has about the same length and width as John Creek, but is quite different in character, being very sandy, no rocks appearing at any place in its lower course. The stream seems to be almost devoid of animal and vegetable life, and only a very few fishes were secured. Spring Creek, a small muddy tributary of Blaine Creek, was fished, but only a few minnows were found in it.

In the following list the different streams are designated by letters, as follows: Beaver Creek by Bea; Robinson Creek by R; Shelby Creek by S; Island Creek by I; Levisa Fork of the Big Sandy River by L; John Creek by J; Coon Creek by C; Blaine Creek by B. Some seining was done near the mouth of the Big Sandy River in September, 1888, by Dr. C. H. Gilbert and Dr. James A. Henshall. Species that were taken by them are included in the list, and are indicated by an asterisk (*).

FISHES OF THE BIG SANDY RIVER.

1. *Noturus miurus* Jordan. (B.) One small specimen was obtained. It had the usual markings across the back, but with the rest of the body covered with small black spots; upper third of dorsal black.
2. *Carpiodes velifer* (Rafinesque). *Quillback*. (R, L, J, C.) Common wherever taken; most abundant in the Big Sandy.
3. *Carpiodes difformis* (Cope). *Carp sucker*.
4. *Catostomus nigricans* Le Sueur. *Hog sucker*. (Bea, R, S, I, L, C, B.) Quite common in Island, Coon, and Blaine creeks; most abundant in Island Creek, the specimens from which place were somewhat lighter in color than the average. Lateral line, 47, 49, 46, 45, 47, 46, 46.
5. *Moxostoma duquesnei* (Le Sueur). *Redhorse*. (Bea, R, I, L, C, B*.) Common, except in Coon and Blaine creeks. Lateral line, 41.
6. *Campostoma anomalum* (Rafinesque). *Dough-belly*. (Bea, R, S, I, L, J, C*.) Rare except in Island and John Creeks, preferring clear streams with pebbly bottoms. Lateral line, 47, 48, 50.
7. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Taken at every station in this basin. Rare only in Robinson Creek.
8. *Cliola vigilax* (Baird and Girard). *Bull-headed minnow*. (B.) Taken at only one station; very rare. Lateral line, 43.
9. *Hybognathus nuchalis* (Agassiz)* *Silvery minnow*.
10. *Notropis deliciosus* (Girard). (Bea, I, L, J, C.) Common, except in Levisa Fork. Five of the largest specimens from Island Creek measure as follows:

Length.	Head.	Depth.	Eye.	Lateral line.	Scales before dorsal.
49	12	10	4	36	14
48	12-	9.5	4-	34	14
45	10	10	3	36	13
45	10	9.5	3	36	13
44	10	9	3	36	13

Compared with specimens from the more sluggish streams of Kentucky and other States these are more slender; the caudal peduncle especially is less deep; the lateral band is distinct from the dorsal to the caudal; vertebral line well marked. Specimens from John Creek have a dark spot before caudal and dorsal. Scales before dorsal, 13, 15, 14, 15.

11. *Notropis whipplei* (Girard). *Blue minnow*. Common at every station; the only minnow that was abundant in Blaine Creek.
12. *Notropis megalops* (Rafinesque). *Common shiner*. Taken at every station, but not common in the Big Sandy River or Blaine Creek. Lateral line, 40 to 48.
13. *Notropis ariommus* (Cope). (L.) Rare. Eye 2.5 in head; lateral line, 34.
14. *Notropis dilectus* (Girard). (Bea, R, S, I, L, J, B.*) Rare only in the Big Sandy River and Blaine Creek. Specimens from Island Creek are even darker than those from the Green River system, and are more slender from the dorsal to the caudal. Six specimens measure:

Length.	Head.	Depth.	Eye.	Lateral line.	Head in length.	Depth in length.	Eye in head.
51	12+	10.5	4-	39	4.25	4.85	3
53	13	11	4-	38	4.46	4.81	3.25
55	13	12	4	38	4.22	4.85	3.25
54	12.5	12	4	39	4.15	4.5	3.25
54	12.5	11.5	4	40	4.32	4.6	3.12
55	13	12	4	40	4.38	4.85	3.12

Specimens from the Big Sandy River much lighter in color. Those from John Creek were large, from 61 to 62 millimeters long, but with all the true characters of the species.

15. *Notropis coccogenis* (Cope). (R.) Rare. Length, 74; head, 17+; depth, 15; lateral line, 41; scales before dorsal, 19; teeth, 2, 4-4, 2.
16. *Notropis jejunus* (Forbes).*
17. *Notropis atherinoides* Rafinesque. *Rosy minnow*. (L, J, B. *) One specimen from Blaine Creek and several from the Big Sandy River and John Creek. All have the short snout and compressed back. Vertebral line not distinct; lateral line, 40; 17 scales before dorsal.
18. *Hybopsis amblops* (Rafinesque). *Silver chub*. (Bea, R, L, I, J.) Not abundant; common in Robinson and John creeks. Length, from 37 to 39 millimeters; lateral line, 38, 37, 37, 36, 36; 12 scales before dorsal.
19. *Hybopsis hyostomus* Gilbert. (B.) Rare.
20. *Hybopsis kentuckiensis* (Rafinesque). *Chub*; *Hornyhead*. (Bea, R, I, L, J, C.) Not plentiful; few specimens taken at any station.
21. *Semotilus atromaculatus* (Mitchill). *Creek chub*. (B.) Not common.
22. *Dorosoma cepedianum* (Le Sueur).* *Mud shad*.
23. *Ericymba buccata* Cope. Taken at every station, and quite common in Big Sandy River and Blaine Creek.
24. *Labidesthes sicculus* Cope. *Brook silverside*. (R, L.) Not common.
25. *Ambloplites rupestris* (Rafinesque). *Goggle-eye*; *Rock bass*. (B.) Common in the deeper and more quiet places.
26. *Lepomis megalotis* (Rafinesque). *Long-eared sunfish*. Taken at every station, and the only sunfish that was common.
27. *Lepomis pallidus* (Mitchill). *Blue sunfish*. (I.) Rare. Specimens young.
28. *Lepomis cyanellus* Rafinesque. *Green sunfish*. (B.) Only one specimen taken.
29. *Micropterus dolomieu* Lacépède. *Small-mouthed black bass*. Common at every station.
30. *Micropterus salmoides* (Lacépède). *Large-mouthed black bass*. (Bea, I, J, C, B.) Much less common than *M. dolomieu*.
31. *Etheostoma pellucidum* Baird. *Sand darter*. (L, B.) Common in the Big Sandy River, but very rare in Blaine Creek.
32. *Etheostoma nigrum* (Rafinesque). *Johnny darter*. (R, S.) Rare.
33. *Etheostoma blennioides* Rafinesque. *Green-sided darter*. (Bea, R, S, I, J.) Much more common than *E. nigrum*. Many of the specimens are dark green, with the markings very dark or black. Species common only in Island and John creeks. Dorsal, XIII-13, XII-13, XIII-13, XIII-13. Lateral line, 64, 69, 68, 69, 65, 64, 68, 61, 66, 64.
34. *Etheostoma macrocephalum* (Cope). (L.) Rare; only two small specimens taken.
35. *Etheostoma aspro* (Cope and Jordan). *Black-sided darter*. (L.) Not common; only four young specimens taken.
36. *Etheostoma phoxocephalum* Nelson. (L.) One small specimen taken.
37. *Etheostoma zonale* (Cope). (Bea, R, S, L, J, C.) Common, except in the Big Sandy River. Very common in John Creek. Length of five specimens: 45, 48, 47, 50, 45 millimeters. Lateral line, 43 to 50.
38. *Etheostoma cœruleum* Storer. *Rainbow darter*. (Bea, R, S, I, J, C.) Quite common at every station where found. Lateral line, 37, 38, 43, 48, 47, 40, 44, 44, 46; 26 to 28 scales, with pores.
39. *Etheostoma flabellare* (Rafinesque). (Bea, I, L, C, B.) Most common in Coon Creek, where five specimens were taken.
40. *Stizostedion vitreum* (Mitchill). *Jack salmon*; *Wall-eye*. (L.) Common.
41. *Stizostedion canadense* (J. B. Smith).* *Sauger*.

LICKING RIVER.

Licking River is a large southern tributary of the Ohio River. It rises in the mountains of eastern Kentucky, in Magoffin County, flows in a northwesterly direction, and joins the Ohio opposite Cincinnati. It was visited at Farmer, Rowan County, on the Newport News and Mississippi Valley Railroad. At this place the bottom is of smooth Devonian limestone, interrupted occasionally by ripples and sandbars. The surrounding country is rolling and well suited for farming, the soil producing good crops of grain, vegetables, and fruit. The river at this point is 35 or 40 yards wide, and varies in depth from 3 to 5 feet. The examination was made at a deep ripple 2 miles east of the railroad station. Very few species were obtained.

Triplet Creek, Farmer, September 9; water temperature, 71° F. Triplet Creek is a tributary of the Licking, and is about 20 miles long, and 20 yards wide near its mouth. The bed is of stone, sand, and gravel. The ripples are shallow, smooth, and swift. Collections were made one-half mile west of the railroad station and about the same distance from the mouth of the creek. The locality was a good one, twenty-seven species being taken. There is a small collection in the museum of the University of Indiana, made at Cynthiana, Harrison County, Kentucky, by Dr. James A. Henshall. These species are marked by an asterisk (*). In the following list "L" denotes the Licking River and "T" Triplet Creek:

FISHES OF THE LICKING RIVER.

1. *Ictalurus punctatus* (Rafinesque). *Fork-tailed cat*. Common in Triplet Creek; two specimens taken from the Licking River.
2. *Noturus flavus* Rafinesque. *Stone cat*. (T.) Rare.
3. *Catostomus nigricans* Le Sueur. *Stone-roller*. (T.) Quite common.
4. *Moxostoma duquesnei* (Le Sueur). *White sucker*. Not common.
5. *Campostoma anomalum* (Rafinesque). *Dough-belly*. (T.) Rare.
6. *Pimephales notatus* (Rafinesque). *Blunt-nosed minnow*. Common in Triplet Creek, but rare in Licking River.
7. *Notropis whipplei* (Girard). *Blue minnow*. (L, T.) Abundant only in Triplet Creek.
8. *Notropis megalops* (Rafinesque). *Common shiner*. (L, T.) Not common.
9. *Notropis atherinoides* Rafinesque. *Rosy minnow*. (L, T.) Not very common.
10. *Notropis dilectus* (Girard). (T.) Very rare.
11. *Notropis deliciosus* (Girard). (T.)
12. *Ericymba buccata* Cope. The most common species observed in Licking River; common in Triplet Creek.
13. *Hybopsis hyostomus* Gilbert. (L, T.) Very rare; specimens young.
14. *Hybopsis amblops* (Rafinesque). *Silver chub*. (T.) Not common.
15. *Hybopsis kentuckiensis* (Rafinesque). *Hornyhead*. (T, L.) Common.
16. *Lucius vermiculatus* (Le Sueur). *Pike; Pickerel*. (T.) One specimen taken.
17. *Labidesthes sicculus* Cope. *Brook silverside*. (T.) Not common.
18. *Lepomis megalotis* (Rafinesque). *Common sunfish*. (T.) Several large specimens taken.
19. *Lepomis pallidus* (Mitchill). *Blue sunfish*. (T.) Rare.
20. *Lepomis cyanellus* Rafinesque. *Green sunfish*. (T.) Not common. Lateral line, 48.
21. *Micropterus dolomieu* Lacépède. *Small-mouthed black bass*. (T.) Young specimens common.
22. *Micropterus salmoides* (Lacépède). *Big-mouthed black bass*. (T.) Not so common as *M. dolomieu*.

23. *Etheostoma nigrum* (Rafinesque). *Johnny darter*. (T, L.) Quite plentiful in Triplet Creek.
 24. *Etheostoma zonale* (Cope). (L, T.) The most common darter at these stations.
 25. *Etheostoma variatum* (Kirtland): (T.) Common.
 26. *Etheostoma cœruleum* Storer. *Rainbow darter*. (T*.) Quite plentiful. Lateral line from 44 to 47; from 20 to 24 scales, with pores.
 27. *Etheostoma flabellare* (Rafinesque). (L, T*.) Common. Scales, 51, 53, 48; pores, 26, 21, 20.
 28. *Etheostoma blennioides*.^{*} *Green-sided darter*.
 29. *Etheostoma maculatum*.^{*}

LITTLE SANDY RIVER.

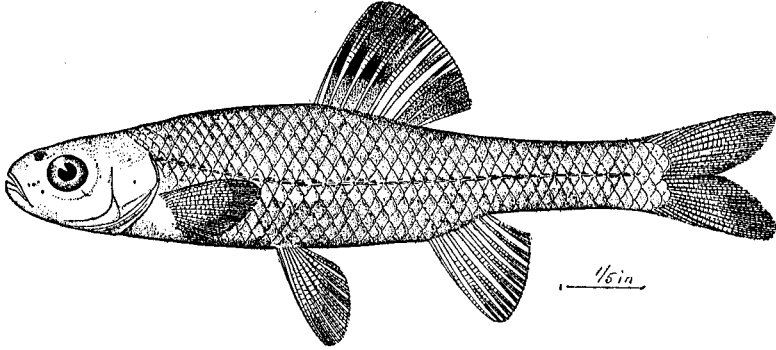
The following is a list of the species collected in the Little Sandy River by Dr. Charles H. Gilbert and Dr. James A. Henshall, in 1888:

- | | |
|---|--|
| 1. <i>Lepisosteus osseus</i> Linnæus. | 17. <i>Notropis atherinoides</i> Rafinesque. |
| 2. <i>Ictalurus punctatus</i> (Rafinesque). | 18. <i>Hybopsis storerianus</i> (Kirtland). |
| 3. <i>Noturus miurus</i> Jordan. | 19. <i>Labidesthes sicculus</i> Cope. |
| 4. <i>Carpionodes difformis</i> Cope. | 20. <i>Dorosoma cepedianum</i> (Le Sueur). |
| 5. <i>Moxostoma duquesnei</i> (Le Sueur). | 21. <i>Ambloplites rupestris</i> (Rafinesque). |
| 6. <i>Moxostoma anisurum</i> (Rafinesque). | 22. <i>Lepomis megalotis</i> (Rafinesque). |
| 7. <i>Moxostoma breviceps</i> (Cope). | 23. <i>Lepomis pallidus</i> (Mitchill). |
| 8. <i>Cliola vigilax</i> (Baird and Girard). | 24. <i>Pomoxis annularis</i> Rafinesque. |
| 9. <i>Hybognathus nuchalis</i> (Agassiz). | 25. <i>Micropterus dolomieu</i> Lacépède. |
| 10. <i>Ericymba buccata</i> Cope. | 26. <i>Micropterus salmoides</i> (Lacépède). |
| 11. <i>Clupea chrysochloris</i> Rafinesque. | 27. <i>Etheostoma zonale</i> (Cope). |
| 12. <i>Camptostoma anomalum</i> (Rafinesque). | 28. <i>Etheostoma nigrum</i> (Rafinesque). |
| 13. <i>Pimephales notatus</i> (Rafinesque). | 29. <i>Etheostoma scierum</i> (Swain). |
| 14. <i>Notropis whipplei</i> (Girard). | 30. <i>Etheostoma pellucidum</i> Baird. |
| 15. <i>Notropis deliciosus</i> (Girard). | 31. <i>Stizostedion vitreum</i> (Mitchill). |
| 16. <i>Notropis jejunus</i> (Forbes). | 32. <i>Stizostedion canadense</i> (C. H. Smith). |

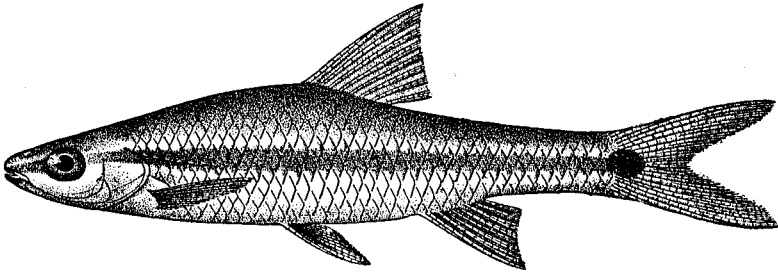
Table of distribution of fishes of Kentucky recorded in this report.

[The numbers refer to the pages where the species are recorded.]

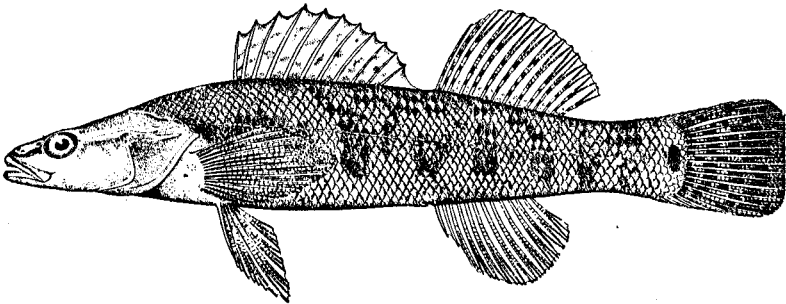
Species.	Rolling Fork.	Lower Green River.	Upper Green River.	Tradewater River.	Lower Cumberland River.	Upper Cumberland River.	Lower Tennessee River.	Upper Tennessee River.	Mayfield Creek.	Obion River.	Bayou de Chien.	Upper Kentucky River.	Big Sandy River.	Little Sandy River.	Licking River.
<i>Acipenser rubicundus</i>					262		268								
<i>Lepisosteus osseus</i>			256	261	262		268	269		272		278		286	
<i>platystomus</i>				261			268				274				
<i>Amia calva</i>											274				
<i>Noturus gyrinus</i>		253							270		274				
<i>miurus</i>	251	253	256						270			278	283	286	
<i>eleanorus</i>			256												285
<i>flavus</i>															
<i>Leptops olivaris</i>	251		256			266									
<i>Ameiurus nebulosus</i>			256			266									
<i>natalis</i>			256						270		274				
<i>Ictalurus punctatus</i>	251	253	256		262		268		270	272	274	278		286	285
<i>Ictiobus bubalus</i>			256		262			269			274				
<i>Carpiodes carpio</i>	251			261											
<i>volifer</i>							268								
<i>difformis</i>					262				270	272		278	283	286	
<i>Cycleptus elongatus</i>					262										
<i>Catostomus teres</i>						266			270			278			
<i>nigricans</i>	251	253	257	261	262	266		269	270			278	283		285
<i>Erimyzon succetta oblongus</i>			257	261		266			270						
<i>Minytrema melanops</i>			256			266			270						
<i>Moxostoma duquesnei</i>	251	253	256	261	262	266	268	269	270		274	278	283	286	285
<i>breviceps</i>														286	
<i>anisurum</i>														286	
<i>Lagochila lacera</i>						266									
<i>Campostoma anomalum</i>	251	253	257	261	262	266		269				278	283	286	285
<i>Chrosomus erythrogaster</i>						266									
<i>Hybognathus nuchalis</i>		253	257		262		268		270	272	274		283	286	
<i>Pimephales notatus</i>	251	253	257	261	262	266		269	270	272	274	278	283	286	285
<i>Cirola vigilax</i>	251				262								283	286	
<i>Notropis spectrunculus</i>						266						270			
<i>deliciosus</i>	251		257	261		266		269		272		278	283	286	285
<i>whipplei</i>	251	253	257		262	266	268	269			274	278	283	286	285
<i>galacturus</i>						266									
<i>megalops</i>	251	253	257	261	262	266		269		272		278	283	286	285
<i>coecogenis</i>															
<i>arioninus</i>	251		257									278	283	286	
<i>jejunus</i>					262					272			284	286	
<i>umbratilis ardens</i>			257												
<i>cyanoocephalus</i>	251	253		261		266			270	272		279			
<i>telescopus</i>			258												
<i>atherinoides</i>	251	253	258	261	262	266	268			272	274	279	284	286	285
<i>dilectus</i>			257			266						279	283		
<i>argo</i>			258									279	284	286	285
<i>Ericymba buccata</i>	251					266						270	284	286	285
<i>Phenacobius uranops</i>			258			266						270	284	286	285
<i>Hybopsis kentuckiensis</i>		253	258			266		269				270	284	286	285
<i>storerianus</i>	251	253			263		268				274			286	
<i>amblops</i>	251	253	258	261		266		269	270			279	284	286	285
<i>dissimilis</i>	251														
<i>watauga</i>			258					269							
<i>hyostomus</i>			258										284	286	285
<i>Semotilus atromaculatus</i>	251		258			266			270			280	284		
<i>Opsopodus emiliae</i>					263				271		274				
<i>bollmani</i>										272					
<i>Notemigonus chrysoleucus</i>									271		274				
<i>Hiodon alosoides</i>	251				263										
<i>selenops</i>	251		258												
<i>Clupea chrysochloris</i>										273	274		284	286	285
<i>Dorosoma cepedianum</i>	251	253			263		268							286	
<i>Fundulus catenatus</i>			258		263	266		269							
<i>Zygonectes notatus</i>	251		258	261	263				271	273	274				
<i>Gambusia patruelis</i>					263				273	273					
<i>Lucius vermiculatus</i>									271	273		274			285
<i>Anguilla chryssypa</i>				261		266						274			
<i>Labidesthes sicculus</i>		258	258	261	263			269	271	273	274	280	284	286	285
<i>Aphredoderus sayanus</i>		253							271	273	274				
<i>Contrachus macropterus</i>									271	273					
<i>Pomoxis annularis</i>			258	261					271	273	274			286	



1. OPSOPŒODUS EMILIVÆ Hay.



2. OPSOPŒODUS BOLLMANI Gilbert.



3. ETHEOSTOMA SPILOTUM (Gilbert).