# 5.—A REPORT UPON THE FISHES OF THE MISSOURI RIVER BASIN.

By Barton W. Evermann and Ulysses O. Cox.

## INTRODUCTION.

The investigations upon which this report is primarily based were provided for by two items in the sundry civil bill approved August 5, 1892. First, "for investigation and report respecting the advisability of establishing fish-hatching stations at suitable points in the States of South Dakota, Iowa, and Nebraska, $1,000, or as much thereof as may be necessary"; and second, "for investigation and report respecting the advisability of establishing a fish-hatching station at some suitable point in Wyoming, $400."

The conditions which determine the desirability of locating one or more fish-hatcheries in these States made it expedient to conduct each investigation as being a part of one general inquiry. It was wholly impracticable to separate them or to consider their results as pertaining alone to Wyoming on the one hand, or to Iowa, South Dakota, and Nebraska, on the other. They were, therefore, conducted with reference to the general fish-cultural needs of the entire group of north-central States west of the Mississippi River.

It became apparent, early in the consideration of the matter, that the greatest need of this region, so far as fish-culture is concerned, is a station for the hatching and rearing of the various pond and river fishes. With the exception of a few streams in northeastern Iowa, two or three small creeks in northern Nebraska, and the Black Hills streams in South Dakota, the waters of these three States are not adapted to trout. The streams of Wyoming which are suitable for trout are, with few unimportant exceptions, confined to that portion west of the Powder River and north of the Sweetwater. This is a region which can probably be best reached and stocked with trout from the station now being established at Bozeman, Montana.

It therefore appears that if but one station is established for these States it should be chiefly devoted to the hatching and rearing of the species of fishes which are indigenous to the waters of this region, and that the best location, geographically, would be somewhere in South Dakota, Nebraska, or Iowa. If it should be regarded as desirable to establish at any time a second station in these States it might very well be a trout station, and should be located in or near the Black Hills. If

but one station is established it should be a composite station, or one which, though chiefly devoted to pond and river fishes, could also engage in trout culture to some extent.

## SUMMARY OF REPORT.

These investigations were begun in the fall of 1892 (October 6 to November 2), but owing to cold weather the work was suspended the first week in November, and was not taken up again until June, 1893. The work done in 1892 was carried on by Professor Evermann, assisted by Mr. Lewis M. McCormick, formerly of Oberlin College, now of the Glen Island Museum, New York.

### ITINERARY, 1892.

Oct. 6. Began work at Deadwood, S. Dak.
7. Drove to Spearfish and examined Spearfish Creek and numerous springs in vicinity.
8. Drove from Spearfish to Beulah, Wyo.; examined Cook's Pond, Chicken and Crow creeks, Cox and Montana lakes, and Sand and Redwater creeks.
9. Returned to Deadwood.
10. Went to Lead City and examined Whitewood Creek and Gold Run.
11. Went to Belle Fourche, examined the waters in that vicinity, and seined Belle Fourche River.
12. Seined Redwater and Middle creeks and returned to Deadwood.
13. Went to Crystal Cave, S. Dak.
14. Examined Elk Creek, then went to Rapid City, S. Dak.
15. Examined Rapid Creek, Cleghorn's and Miller's springs, and went to Hot Springs.
16. At Hot Springs.
17. Drove to Cheyenne Falls.
18. Examined Fall River and various springs about Hot Springs and went to Edgemont.
19. Examined Cottonwood Creek and Cheyenne River.
20. Went to Newcastle, Wyo., and examined Salt and Beaver creeks.
21. Went to Ardmore, S. Dak., where we seined Hat Creek; took night train for Ravenna, Nebr.
22. Seined Mud Creek and South Loup River at Ravenna.
23. Took train for Lincoln.
24. Spent at Lincoln and vicinity.
25. Went to South Bend and examined Nebraska fish-hatchery there. Returned to Lincoln in the evening.
26. Went to Crete and examined Blue River. Took night train for Albia, Iowa.
27. Went to Lovilla, Iowa, where we examined Bluff Creek.
28. Went to Ames, Iowa.
29. Examined springs and streams near Ames.
30. At Ames. Went to Cedar Rapids, Iowa, at night.
31. Examined springs in the vicinity of Cedar Rapids.

Nov. 1. Went to Spirit Lake, Iowa.
2. Cold weather having set in, we decided to close the work here, and returned to Washington.

The work was resumed June 16, 1893, and carried on for several weeks, under the immediate direction of Professor Evermann, who was assisted by Prof. U. O. Cox, teacher of biology in the State Normal School at Mankato, Minn., Mr. Cloudsley Rutter, then of Long Pine, Nebr., now a student at Stanford University, and Prof. Robert G. Gillum, professor of chemistry and physics in the Indiana State Normal School. During the time that Professor Evermann was unable to remain with the party Mr. Cox was placed in charge.

The examination and determination of the physical and biological features of the streams of these States was made an important part of these investigations, and it was this phase of the work to which Mr. Cox and his assistants chiefly directed their attention. The work in Iowa was done by Professor Evermann alone, and was in most part devoted to the examination of springs and the smaller streams.

ITINERARY, 1893.

June 16. Messrs. Cox and Rutter began the work at Mitchell, S. Dak.
17. Examined the Dakota River, Rock Creek, and Firesteel Creek, near Mitchell.
18. Made collections in Enemy Creek, near Mitchell.
19 to 21. Spent in making further investigations on Dakota River and Rock Creek.
22. Professor Evermann joined the party. Went to Chamberlain, S. Dak.
23. Drove north of Chamberlain and examined Crow and Smith creeks.
24. Drove 15 miles southwest of Chamberlain and examined White River.
25. Sunday. Spent the day at Chamberlain.
26. Went from Chamberlain to Scotland, S. Dak., where we examined Prairie Creek; went to Springfield, S. Dak., in the evening.
27. Drove northwest of Springfield and examined Emanuel and Choteau creeks; then to Running Water, S. Dak., where we crossed the Missouri River and went to Niobrara, Nebr.
28. Went 3 miles west of Niobrara to Ponca Creek; examined it and Niobrara River, then drove east to Bazile Creek, which we examined; went to Verdigris, Nebr., in the evening.
29. Examined the Verdigris River and a small creek near Verdigris, and in the afternoon went to Creighton, Nebr., where we examined a large pond.
30. Drove to Bazile Mills, where we examined Spring Creek; then took train to Norfolk Junction, and fished Elkhorn River and Norfolk Creek.

July 1. Messrs. Cox and Rutter went to Ewing, Nebr., where they examined the Elkhorn River and other waters in that vicinity. In the evening they went to Long Pine, Nebr. Prof. Evermann examined springs near Council Bluffs, Iowa.
3 and 4. Messrs. Cox and Rutter examined streams about Long Pine, and were rejoined on the 4th by Messrs. Evermann and Gillum.
5 and 6. Examined various streams and springs about Long Pine.
7. Professor Evermann left the party here and went to Lake Erie; the others drove south of Long Pine and examined Lake George and Carp Lake, returning to Long Pine on evening of the 8th.
9. Went from Long Pine to Valentine, Nebr.
10. Fished the Niobrara River, Minnechaduza Creek, and another small creek near Valentine. Left in the evening for Chadron, Nebr.
11. Examined White River, Chadron Creek, and Lone Tree Creek near Chadron.
12. Went by rail to Casper, Wyo.
13. Examined the North Platte and a small creek at Casper.
14. Went from Casper to Glenrock, Wyo., and examined Deer Creek and North Platte River.
15. Went to Douglas, Wyo., and examined the North Platte at that place.
16. Sunday, spent at Douglas.
17. Went to Crawford, Nebr.
18. Went to Sheridan, Wyo.
19. Examined Big Goose Creek at Sheridan, and left in the afternoon for a three days' wagon trip to the mountains.

ITINERARY, 1893—Continued.

July 20. Investigated Tongue River.
21. Investigated Big Goose Creek.
22. Went to Little Goose Creek and returned to Sheridan.
23. Sunday, spent at Sheridan.
24. Left for Arvada, Wyo., Mr. Rutter stopping at Clermont to fish Clear Creek; fished Powder River at Arvada.
25. Went to Newcastle, Wyo.
26. Examined Salt and Beaver creeks near Newcastle, and went to Edgemont, S. Dak., in the evening.
27. Fished Cheyenne River and went to Hot Springs, S. Dak., where Prof. Evermann rejoined the party.
28. Examined Fall and Cheyenne rivers. Messrs. Evermann and Rutter left the party here and went to Cheyenne, Wyo., then to Idaho to take up work in Columbia River basin. Messrs. Cox and Gillum went to Buffalo Gap, S. Dak.
29. Fished Beaver Creek at Buffalo Gap and returned to Hot Springs at night.
30. Sunday, spent at Hot Springs.
31. Went from Hot Springs to Custer, S. Dak., and examined French Creek.

Aug. 1. Went to Hill City, S. Dak., and examined a small stream there.
2. Went from Hill City to Deadwood, S. Dak.
3. Went by stage to Spearfish, S. Dak., where examined Spearfish Creek.
4. Drove northwest of Spearfish and examined Cox, Hopkins, and Montana lakes and Redwater Creek.
5. Returned to Deadwood
6. Went to Crawford, Nebr.
7. Fished White River and then went to Marsland, Nebr.
8. Examined the Niobrara River at Marsland, and then went to Dunning, Nebr.
9. Examined Dismal River and the North Loup, and then went to Ravenna, Nebr.
10. Examined Mud Creek and the South Loup at Ravenna.
11. Went to Grand Island, where we fished the Platte River.
12. Went to York, Nebr., and fished Lincoln and Beaver creeks.
13. Sunday, spent at York.
14. Went to Seward, Nebr., and examined Lincoln Creek and Blue River.
15. Went from Seward to Lincoln, Nebr., where the work was brought to a close, and Mr. Cox and Mr. Gillum returned home.

Professor Evermann's examinations for the selection of a hatchery site in Iowa were made on the following dates: July 17, at Manchester; July 18, at Waterloo; July 19, at Marshalltown; July 20, at Cedar Rapids; July 21, at Ames; July 22, at Des Moines; October 23 and 24, at Spirit Lake; October 25, at Decorah; October 26, at McGregor; October 27, at Jesup.

As already stated, these investigations were not limited to the examination of proposed hatchery sites, but included an examination and study of the physical and biological features of the waters of the region, with especial reference to the species of fish and other animal life they already contain, and their suitability for stocking with other species of food-fishes not indigenous to them.

A report has already been made to the Commissioner, in which were given the details of the investigations bearing directly upon the selection of a hatchery site. In this particular work more than 100 springs were examined, their temperatures taken, their volume measured or approximately estimated, and the topographic features surrounding each noted and recorded.

After a careful consideration of the advantages and disadvantages of each place, the Commissioner selected a site on Spring Branch, near Manchester, Iowa, and the station is now under construction there.

In the present paper are given the results of the examination of the various streams visited in South Dakota, Nebraska, and Wyoming, together with our report upon the large collections of fishes obtained.

ACKNOWLEDGMENTS.

During the progress of our work in 1892, and again in 1893, numerous courtesies of one kind or another were shown us by various gentlemen who are interested in the work of the Commission, and we desire here to express our thanks to all these gentlemen for their many kindnesses. Especial mention should be made of Hon. George W. Holdredge, general manager of the Burlington and Missouri River Railroad; Hon. C. J. Ives, president of the Burlington, Cedar Rapids and Northern Railroad, and Hon. Roswell Miller, president of the Chicago, Milwaukee and St. Paul Railroad, all of whom took an active interest in our work and furnished facilities in the way of transportation which enabled us to greatly extend the field of our investigations.

Capt. Frank A. Whittemore, of Long Pine; Mr. Fred Ingalls and Mr. and Mrs. Blodgett, of Brown County, Nebr.; Dr. John Dixon and Messrs. John Harlow and John Johnson, of Spearfish; Mr. J. R. Brennan, of Rapid City; Major Wolcott, of Glenrock, Wyo.; Hon. Joseph M. Carey, Hon. Henry A. Coffeen, and Mr. Charles L. Decker, of Wyoming, all rendered us valuable assistance in various ways.

The following gentlemen in Iowa showed us many courtesies: Col. B. F. Shaw, ex-State fish commissioner, Cedar Rapids; Mr. T. J. Griggs, of Spirit Lake, then State fish commissioner; William Mynster, esq., Council Bluffs; Mr. J. A. Laird, Jesup; Mr. J. H. Larson, McGregor; Mr. Frank S. Landers, Decorah; Mr. A. M. Sherwood, Manchester; Mr. O. L. F. Browne, Des Moines; Prof. Herbert Osborn, Ames, and E. T. Cowin, esq., Waterloo.

## THE MISSOURI RIVER BASIN.

The Missouri is the longest river in North America. Its headwaters are among the Rocky Mountains of Montana, Wyoming, and Colorado. At numerous places its sources are but a few miles from those of the Saskatchewan, the Columbia, and the Colorado. In northwestern Montana are the sources of Milk River, which are said to be connected directly with those of the Saskatchewan, while only a few miles to the westward the drainage is into Flathead River and thence into the Columbia. In southwestern Montana the headwaters of the Big Hole, Beaverhead, Red Rock, and Madison, on one hand, closely approach those of the Bitter Root, Salmon, and Snake on the other. In northwestern Wyoming, just south of the Yellowstone National Park, the headwaters of the Columbia and Missouri actually unite in Two-Ocean Pass, forming a continuous waterway from the mouth of the Columbia to that of the Mississippi.

In Wyoming the Sweetwater, a tributary of the North Platte, and in Colorado the South Platte, rise within a few miles of streams which are tributary to the Colorado of the West.

The headwaters of these various tributary streams are 8,000 to 14,000 feet above sea level. Gallatin, Mont., where the Jefferson, Madison, and Gallatin rivers unite to form the Missouri proper, is 4,132 feet in altitude; the sources of the Madison River are over 8,300 feet above the sea, while Two-Ocean Pass is about 8,200 feet.

The mouth of the Missouri River is about 400 feet above sea level; the total fall of this river is therefore over 7,000 feet, or 3,732 feet between Gallatin and the Mississippi. The length of the Missouri proper is given as 3,000 miles; add to this the length of Madison River and we have 3,230 miles, which may properly be regarded as the total length of the Missouri. Among the important tributaries may be named Milk River; Jefferson Fork, 140 miles; Gallatin Fork, 170 miles; Yellowstone River, 1,100 miles; Platte River, 1,250 miles (including the North Platte); and the Kansas River, 900 miles (including the Smoky Hill Fork). The area drained by this great river is given as 518,000 square miles. This includes the entire State of Nebraska, all of South Dakota except a few square miles in the northeast corner, nearly all of Montana, North Dakota, and Wyoming, about half of Kansas, more than half of Missouri, and large parts of Iowa and Colorado.

In the mountains at the headwaters of the various tributary streams there is an abundance of rainfall in summer and snow in winter. As a rule, the mountains were naturally heavily timbered, and the moisture was therefore conserved and fed out slowly during the season of drought. This is still true in general, but the reckless destruction of the forests in many places is having its effect upon the streams.

After leaving the mountains the tributaries of the Missouri, with scarcely an exception, enter a broad plain almost entirely devoid of trees except along the water-courses. This plain extends over eastern Montana, the two Dakotas, eastern Wyoming, Nebraska, Kansas, and Iowa. The western portion is barren, in some places even desolate. This is particularly true of the Bad Lands, or Mauvaises Terres, of South Dakota, and parts of North Dakota, Montana, Wyoming, and Nebraska. These are Miocene beds of great thickness. The White River Tertiary beds of parts of Wyoming, Nebraska, and South Dakota are several hundred feet thick, full of alkali, and in most places easily eroded.

The eastern part of South Dakota, nearly all of Nebraska and Kansas, and those parts of Colorado and Iowa in the Missouri basin constitute a more or less gently undulating prairie country, becoming dry, almost arid to the westward, but receiving an abundance of moisture and being very rich and productive in the eastern parts. In the State of Missouri there is more timber and plenty of moisture. The Missouri basin as a whole, however, is a country whose soils erode with unusual ease, and after getting out of the mountains and upon the plains few of the streams are ever really clear. The Missouri River always carries

vast amounts of solid matter in suspension, and justly deserves the name "Big Muddy." The channels of the Missouri and all the larger tributaries are constantly changing and shifting the beds of the streams. All this, of course, has its effect upon the fishes.

*Classified list of streams examined in the Missouri River Basin in 1892 and 1893.*

Missouri River at Chamberlain and Running Water, S. D.
  Yellowstone River:
    Tongue River at Sheridan, Wyo.
      South Fork of Tongue River at Sheridan.
      Big Goose Creek at Sheridan.
      Wolf Creek at Sheridan.
      Little Goose Creek at Sheridan.
    Powder River at Arvada, Wyo.
      Clear Creek at Clermont, Wyo.
  Big Cheyenne:
    North Fork or Belle Fourche at Belle Fourche, S. D.
      Redwater Creek at Spearfish, S. D.
      Montana Lake at Spearfish, S. D.
      Cox Lake at Spearfish, S. D.
      Spearfish Creek at Spearfish, S. D.
      Crow Creek near Spearfish.
      Chicken Creek near Spearfish.
      Sand Creek near Beulah, Wyo.
    Whitewood Creek at Deadwood.
    Rapid Creek at Rapid City, S. D.
  South Fork at Hot Springs and Edgemont, S. D.
    Fall River at Hot Springs, S. D.
    Beaver Creek at New Castle, Wyo.
      Salt Creek at New Castle, Wyo.
    Hat Creek at Ardmore, S. D.
    Beaver Creek at Buffalo Gap, S. D.
    French Creek at Custer, S. D.
    Spring Creek at Hill City, S. D.
  Crow Creek at Chamberlain, S. D.
    Smith Creek at Chamberlain, S. D.
  White River at Chadron and Crawford, Neb., and Chamberlain, S. D.
    Chadron Creek at Chadron, Nebr.
    Lone Tree Creek at Chadron, Nebr.
  Choteau Creek at Springfield, S. D.
  Ponca Creek at Niobrara, Nebr.
  Niobrara River at Marsland, Valentine, Long Pine, and Niobrara.
    Schlegel Creek at Valentine, Nebr.
    Minnechaduza Creek at Valentine.

Missouri River—Continued.
  Niobrara River—Continued.
    Long Pine Creek at Long Pine.
      Bone Creek at Long Pine, Nebr.
      Ponds along creek at Long Pine.
    Verdigris River and a small creek at Verdigris, Nebr.
  Emanuel Creek at Springfield, S. D.
  Bazile Creek at Niobrara, Nebr.
    Ponds at Creighton, Nebr.
    Spring Creek at Bazile Mills, Nebr.
  James or Dakota River at Mitchell, S. D.
    Rock, Firesteel, and Enemy creeks at Mitchell, S. D.
    Prairie Creek at Scotland, S. D.
  Platte River at Grand Island and South Bend, Nebr.
    North Fork of Platte River at Casper, Glenrock and Douglas, Wyo.
      Garden Creek at Casper, Wyo.
      Deer Creek at Glenrock, Wyo.
      Little Deer Creek at Glenrock.
    Wood River at Grand Island, Nebr.
    Loup River at Grand Island, Nebr.
      Middle Loup and Dismal rivers at Dunning, Nebr.
      South Loup River and Mud Creek at Ravenna, Nebr.
      Calamus River:
      Isolated lakes near Long Pine.
      Carp Lake and Lake George near Long Pine, Nebr.
    Elkhorn River at Ewing and Norfolk, Nebr.
      Bayous, south fork of Elkhorn, and pond, at Ewing, Nebr.
      Ponds and Norfolk Creek at Norfolk, Nebr.
  Kansas River:
    Big Blue River at Seward and Creto, Nebr.
      Lincoln Creek at York and Seward.
      Beaver Creek at York, Nebr.

The Missouri River itself was examined at Chamberlain, S. Dak., where the stream is divided into two channels by an island, the west channel being 1,200 feet wide and the east 1,436 feet. At the time of the visit the water was higher than usual, "the June rise," as the people call it, and the current was swift, in some places averaging 3 feet per second. Owing to the high water it was impossible to do successful seining, although we attempted it at the north end of the island. As is usually the case with this river, the water was exceedingly muddy. At places the recently deposited silt was so deep that it was dangerous to attempt to wade in the water over it. Where the water had receded enough to allow a light crust to form on top of the mud it was possible to stand and shake the whole mass for a distance of 10 feet or more in all directions. The Missouri was also examined at Running Water, opposite Niobrara, but no specimens were obtained.

The larger and more important river fishes, such as sturgeon, cat, and buffalo are said to be abundant in this portion of the river and to furnish a considerable food supply.

*Tongue River* rises in the Big Horn Mountains west of Sheridan, Wyo., flows northeast, and empties into the Yellowstone River in southeastern Montana. We examined the Tongue River at the mouth of the canyon where it leaves the mountains. At this place it is a very swiftly flowing stream, current 3½ feet per second, discharging about 127,200 gallons of water a minute. The bed of the stream is everywhere strewn with bowlders, which made it next to impossible to seine in it. Considerable pine timber is found along the banks, which are composed in most part of granite, enough having been disintegrated and collected in places to allow the growth of a scanty vegetation. The source of the water supply is the melting snow on the mountains, and since there is barely any limestone with which it can come in contact the water is very pure and soft. The temperature of the water in the canyon was 54°, air 90°. While our fishing was done under many unfavorable circumstances, we secured one fine specimen of mountain trout (*Salmo mykiss lewisii*) 20 inches long, a black-nosed dace (*Rhinichthys cataractæ dulcis*), and from a fisherman a specimen of whitefish (*Coregonus williamsoni cismontanus*). The whitefish is said to be quite common there. Many persons were seen along the river fishing for trout. Taking everything into consideration, it would certainly be hard to find a more ideal trout stream. Small parties have reported as many as 800 fish taken with hook and line in a few days. There is so much fishing done now in that region that most residents are of the opinion that if something is not done to stock the stream its fame as a fishing resort will soon be lost.

*South Fork of Tongue River.*—Not far from where the Tongue River leaves the canyon it is joined by a small stream from the south called the south fork of Tongue River. We fished it a few miles from its mouth on Mr. Dinwiddie's ranch. At this place it averaged 8 inches deep and 5 to 20 feet wide, with a current of 2 feet per second. The

water was clear and pure and the bottom was covered with gravel and bowlders. We seined it very carefully and secured several specimens of *Pantosteus jordani*, several mountain trout, and a number of dace. The water was not cold, being 70°. The banks were lined with box-elders and a few low shrubs.

*Big Goose Creek*, a stream similar to Tongue River and one of its tributaries, flows from the mountains about 12 miles south of Tongue River. Big Goose Creek is a stream nearly as large as Tongue River, has a swift current, bottom covered with bowlders, and water clear and very pure. All the streams in this region have irrigation ditches connected with them, consequently the volume is much reduced outside the canyon. Goose Creek was fished in two places, at Beck's ranch about 3 miles from the mouth of the canyon, and at Sheridan. At the former place we took several mountain trout, one dace, and a sucker. At Sheridan we found the temperature of the water 62°, current 2 feet per second, stream 35 feet wide and ranging 2 to 5 feet deep. The bottom was gravelly, but in many places there were bowlders in addition. At this place we took one species of sucker and two species of minnows.

On Mr. Decker's ranch, about 10 miles northwest of Sheridan, we examined a small brook which was fed partially by springs. The largest spring we found discharged about 945 gallons per minute, and when this amount of water was flowing the temperature was 65°. The spring did not originate in any one place, but the water seemed to seep from the banks along the spring brook. We did not take any fish from either of these streams.

*Little Goose Creek* flows from the mountains some 7 or 8 miles south of Big Goose and is very much smaller than the latter. We did not fish in it, but found it a characteristic mountain stream similar to the other except in size. At the town of Bighorn we visited an artificial fish pond whose outlet is Little Goose Creek. The pond was fed by a spring whose temperature was 51°. The temperature of the water at the surface in the pond was 72°. At one edge of the pond there were considerable algæ and a very great amount of white water-crowfoot (*Batrachium trichophyllum*). The owner of the pond was trying to cultivate trout, but had not been successful. From appearances it is possible that black bass would do much better than trout. From the overflow stream we took two species of minnows and one species of sucker.

The streams about Sheridan are the finest of any that we visited in Wyoming, and were the most numerous for the region over which they were distributed. They are nearly all fed by melting snow, and since the snow does not entirely leave during the year, they never go dry. They are all filled with bowlders and the currents of all were swift. Big Goose and Tongue rivers are the longest, and have probably the most picturesque canyons.

*Powder River* was fished at Arvada, a watering station on the Burlington and Missouri road. The bed of the river at this place was 250

feet wide, but the water, simply running in a few shallow channels, did not fill it. At no place was the water more than 2½ feet deep. It was milky in color and strongly alkaline. The current was about 2 feet per second. We took five species of minnows, two species of suckers, and one catfish (*Noturus flavus*). The channel cat was reported by fishermen. The temperature of the water was 75°, air 90°. The country is very poor, there being but little vegetation except buffalo grass and sage brush. A few cottonwood trees grow on the river banks.

*Clear Creek*, a tributary of the Powder River, rises in the Bighorn Mountains and flows northeast until it joins the river about 15 miles south of the northern boundary line of the State. Mr. Rutter, of our party, examined this at the small station of Clermont. The depth of the water varied from 4 inches to 6 feet, and the width from 15 to 40 feet, with a very sluggish current. Temperature of water, 67.5°; air, 72°. A spring near by registered 54.5°. The bottom was covered with sand, pebbles, and large rocks, and the water was clear. There was very little woody vegetation along the banks. The following fishes were taken: Redhorse sucker (*Moxostoma aureolum*), 5¼ inches long; *Pantosteus jordani*, 12½ inches long; wall-eyed pike (*Stizostedion vitreum*); catfish (*Ictalurus punctatus*); also a number of minnows.

*Belle Fourche River* was examined at the little town of Belle Fourche, where it is a stream of some size, except during dry weather. The water is fairly pure, and a good many fishes, chiefly suckers, minnows, and catfishes, are found here. We also examined the Redwater Creek and a small creek called Middle Creek at this place.

*Redwater Creek* was examined 14 miles northwest of Spearfish, where it is a stream 30 feet wide, 2 feet deep, and discharged, when we were there, about 27,000 gallons of water per minute. The water was clear at this time, but ordinarily it contains red clay in suspension, and this gives the name to the stream. We fished it carefully, and took *Notropis blennius*, *Rhinichthys cataractæ dulcis*, *Pantosteus jordani*, *Catostomus commersonii*, *Platygobio gracilis*, and *Semotilus atromaculatus*. Near this stream is Cox Lake, which contains 4 acres or more, and whose depth we could not measure on account of not having a boat. The shores were grown up with *Chara*, which had become so incrusted with calcareous deposits that it would hold a person's weight, but when you ventured too far you would break through and sink to your waist. The outlet to the lake was in the same condition, and this hindered us very much in seining. We secured from the lake, however, two species of fish, *Rhinichthys cataractæ dulcis* and *Leuciscus neogæus*, the latter being very abundant. The outlet of this lake, measured just below the lake, October 8, was 14 feet wide, 16 inches deep, and flowed 2 feet per second. The temperature of the water was 58°.

About 3 miles west of Cox Lake is Montana Lake, which contains 5 acres or more, with shores filled with *Chara* similar to Cox Lake, but, in addition, other vegetation. We found it impossible to seine, but by

getting into an old boat we dipped out a few examples of *Leuciscus neogæus*. This fish swarmed by thousands around the mouth of a little spring that helped to feed the lake. We saw no other fish, but were told that suckers had been taken from it. The owner was contemplating stocking it with carp. The lake has an outlet, but at the time of our visit there was no overflow water.

*Spearfish Creek.*—This is by far the most picturesque of all the streams of the Black Hills seen by us. It has its source on the limestone divide between Crook Tower and Custer Peak, and after cutting a rough and interesting canyon through a belt of quartzite, shale, and igneous rocks, enters the limestone formation encircling the Hills, and unites its waters with those of Redwater Creek not far from Belle Fourche. We examined Spearfish Creek at the town of Spearfish, where it was 30 feet wide, 1 foot or more deep, and with a swift current. The temperature was 68° in one place and 70° in another, August 3. On October 7, at 11 a. m., it was 45° when the air was 64°. The bottom was gravelly and there was considerable vegetation along the banks. From it we took *Salvelinus fontinalis* (planted), *Pantosteus jordani*, and *Rhinichthys cataractæ dulcis*. The stream is a very fine one, indeed. The bulk of its water comes fresh from the hills, but even at Spearfish there are some fine springs. One in particular had a temperature of 52° and discharged 2,250 gallons per minute. The gentleman who owned it had a number of brook trout in a small pool formed by the spring. The bottom is in most places moderately coarse gravel of sandstone, chert, and quartz. There is but little vegetation except in the deeper holes, where there is some *Chara* and where the bottom is of stiff white clay. The banks are from 1 to 5 feet high in the little valley. The immediate banks are in most places pretty well covered with a growth of cottonwood, ash, elm, oak, etc. Further back and on the hills were a few pines.

About 12 miles above the town of Spearfish are Spearfish Falls, where the stream descends several feet in a series of very beautiful cascades. Below these falls 5 or 6 miles are two considerable and picturesque rapids; the more important one, known as Dickson Rapids, is about 2,200 feet long and falls 96 feet in that distance. Just above the town are several important springs. One of these, which may be designated as the upper spring, flows about 375 gallons per minute and has a temperature of 49° to 50°. The outlet of this spring soon receives the water from a number of smaller springs and the total flow amounts to about 1,100 gallons. Above the mill some distance from the town is Kroll's Spring, which has a temperature of 47° and flows about 500 gallons. A little further up is the Randall Spring, with a temperature of 47° and flowing about 800 gallons per minute. If fish-cultural work should ever be undertaken at any place in the Black Hills, the most satisfactory natural conditions could probably be found here.

*Crow Creek.*—This was visited at Gammon's ranch, not far from Beulah. It is a small, sluggish stream, excessively full of suckers and minnows.

*Whitewood Creek*, at Deadwood, is ruined by the tailings from the numerous stamp mills. No fish are now found in it, but in pools along the creek we found many young suckers.

*Chicken Creek* is a small stream rising north of Crow Peak and after flowing north about 4 miles empties into Redwater Creek near Gammon's ranch. It is a small stream that has cut out a narrow channel 6 to 10 feet deep in the loose soil through which it flows. The bottom is very muddy in most places. Average width near Gammon's ranch 2 feet, depth 10 inches, current 1½ feet per second, temperature, October 8, 57°.

*Sand Creek* rises about 8 miles southwest of Beulah, Wyo., and flows northeast, joining the Redwater a few rods below Beulah. The bed of this creek is of coarse gravel, the banks are 1 to 15 feet high and are composed chiefly of very red clay. Along the banks are a few willows and cottonwoods. Near Beulah the stream measured 17 feet wide, 14 inches deep, and flowed nearly 4 feet per second. The temperature at 3.30 p. m., October 8, was 55°. No vegetation was seen in the stream except in the quiet water above a dam.

The *South Fork* of the *Cheyenne River* rises in east-central Wyoming, flows east through southwestern South Dakota until it joins the North Fork, or Belle Fourche, then northeast and joins the Missouri. This river was examined at Cheyenne Falls, October 17, 1892, and again July 28, 1893; and at Edgemont, October 19, 1892, and again July 27, 1893. Measured at the ford, just below the mouth of Fall River, October 17, Cheyenne River was 100 feet wide, 2 feet deep, and flowed 3½ feet per second. There had been recent rains and there was a much larger volume of water than usual. At Cheyenne Falls the river forms two separate falls, the upper and the lower, the distance between them being about 250 feet. These falls are formed by ledges extending obliquely across the river, and the vertical descent in each is about 10 feet. At the time of our visit, in October, considerable water was flowing over, on account of recent rains. The ledges are quite irregular and the water pours over at several disconnected places. The temperature October 17 was 47° at noon, when the air was 58°. On July 28 the water temperature was 75°. The water was very muddy and strongly alkaline. All the fishes obtained were so bleached as to be almost colorless. The characteristic fishes of this place were found to be *Noturus flavus*, *Moxostoma*, *Hybognathus*, and *Platygobio*.

At Edgemont, on October 19, this river was less than 20 feet wide and 5 inches deep, with a current of 1 foot per second. At 9 a. m., when the air was 49°, the water was 39°. The channel of the stream here, as elsewhere, is much wider than the stream itself. The bed is of sand and yellowish or whitish clay, and is constantly shifting. The changes that had taken place since 1892 were very noticeable. The banks of Cheyenne River are usually of pale-colored clay and are ordinarily but a few feet high. The flood-plain is here from a few rods to a mile in width. The region through which the stream flows is a prairie country

with soil so charged with alkali as to be, in many places, almost without vegetation; indeed, a considerable portion of the Mauvaises Terres or Bad Lands lies in the drainage basin of the Cheyenne. This soil erodes with great ease, and, as a consequence, the water of the river is never clear. The only trees seen along the Cheyenne were a few cottonwoods. At Edgemont a small stream known as Cottonwood Creek flows into the Cheyenne. This is a muddy creek with only a few species of fishes, chief among which are *Platygobio gracilis*, *Hybognathus nuchale evansi*, and *Catostomus griseus*. The temperature of the water was 46° at noon, October 19, when the air was 59°.

*Fall River.*—This is a considerable stream, formed just above the town of Hot Springs by the union of Warm Creek and Cold Creek, the first of these deriving its water from numerous warm or hot springs. The larger warm springs at the town pour their waters into the creek there and the water is quite warm for some distance below. On October 18, when the air was 50° at noon, the water was 65° at a point 2 miles below the town. At the town the temperature of the water in the creek was 80°. This water is strongly impregnated with lime, and as a result the *Chara* which fills the stream grows very rank and forms thick deposits along the banks and in the bed of the stream. In places it has become quite hard, but upon attempting to walk over it one will frequently break through the crust and sink into the soft mud beneath. Besides the *Chara*, there are several species of algæ growing luxuriantly, and in this mass of vegetation the smaller crustaceans and other minute forms of animal life abound. The only species of fish which we found living in this warm water was the western dace (*Rhinichthys cataractæ dulcis*).

*Hat Creek.*—This stream was examined October 21 at Ardmore, S. Dak., about 1½ miles from the Nebraska line. It is a small alkali stream about 10 feet wide, 6 inches in average depth, and flowing about a foot in 2 seconds. At the time examined it was flowing more water and was muddier than usual, owing to recent rains. The bed is in most places of very soft mud; the banks are rather high and of blue or white adobe clay, which is sticky in the extreme when wet. There are occasional deeper holes in the stream, where the characteristic fishes of the region are found in considerable numbers. This stream is subject to sudden floods and dries up to mere isolated pools in the summer and early fall. The headwaters of the stream are said not to dry up so much as does the lower course. The country is prairie, easily eroded, and the water is always muddy or milky in appearance. At 5 p. m., when the temperature of the air was 52°, that of the water was 46°. The principal fishes found here were the flatheaded minnow and the silvery minnow (*Hybognathus nuchale evansi*), both of which were abundant. There were also a few western dace and suckers.

*Beaver Creek* rises in the western part of the Black Hills, flows south and empties into the South Fork of the Cheyenne River. We examined it near the L. A. K. ranch, 5 miles from Newcastle, Wyo., October 20,

and again on July 26, about 6 miles east of Newcastle. At the first place we found it to be a clear, cold, swift creek about 7 feet wide, 1½ feet deep, with a 4-foot current, and a temperature at 10 a. m. of 43°, when the air was 51°. The bottom was of large gravel in most places, mud-coated rocks with much *Chara*, and other aquatic vegetation in other places where the water was less swift. The banks were usually of mud, 1 to 5 feet high, and were covered with a good growth of willows, box-elders, buffalo berry, and cottonwood. The hills near by were covered with pines. No fish were seen here. At the place where it was visited July 26 it was about 10 feet wide and 2 feet deep, with a current flowing 2½ feet per second. The temperature of the water at this time was 58°, while that in some of the springs was 54°. One set of springs on Mr. Hanson's ranch near by discharges about 700 gallons per minute, while another furnishes about 300 gallons per minute.

We saw a number of fine brook trout and rainbow trout in the irrigating ditches on Mr. Hanson's ranch. These all seemed to be doing well, but Mr. Hanson did not think that they increased in numbers very rapidly. The water was thoroughly saturated with gypsum. From the brook we took one species of sucker and two species of minnows.

*Salt Creek* is a very small western tributary of Beaver Creek. We saw it east of Newcastle, Wyo., where it contained very little running water and no fish. The water was strongly saturated with common salt. On October 20, this creek was about 7 feet wide, 3 inches deep, and flowed about 9 inches per second. The temperature was 45° at 11 a. m., when the air was 52°.

*Beaver Creek.*—At Buffalo Gap, a small station on the Elkhorn Road east of Hot Springs, we examined a little stream called Beaver Creek. In places it was 10 feet wide and 3 feet deep, while at others it was narrowed down to a small, shallow ripple. The water contained much vegetation, principally algæ and *Chara*. The latter was incrusted with calcareous deposits from the water. We found suckers very abundant and took two species (*Pantosteus jordani* and *Catostomus commersonii*), besides three species of minnows and one species of catfish (*Noturus flavus*).

*French Creek* is a small stream which rises in the central part of the Black Hills and flows east to the south fork of the Cheyenne. We examined it at Custer, S. Dak. There is no creek worth mentioning, and at the time of our visit it consisted of a few stagnant pools. We took *Semotilus atromaculatus*, *Rhinichthys cataractæ dulcis*, *Pimephales promelas*, *Pantosteus jordani*, and *Catostomus commersonii*, all thickly covered with trematodes. Some of the fish were about dead from the effects of these parasites. Near Custer there is an interesting artificial lake, but it contained no fish.

*Spring Creek*, a western tributary of the Cheyenne, was examined at Hill City, S. Dak. It was not over 10 feet wide and contained very little running water. From it we took *Pantosteus jordani*, *Catostomus commersonii*, *Rhinichthys cataractæ dulcis*, and *Semotilus atromaculatus*.

*Crow Creek* rises northeast of Chamberlain, S. Dak., and, flowing west, empties into the Missouri some 16 miles south of the above-named town. The stream ranges from 15 to 20 feet wide, and from 6 inches to 3 feet deep. The current was moderate and the banks of the stream were covered with trees and shrubs. The quiet water contained some plant life, but much of it was free from this, and the creek bed was covered with gravel and bowlders. From the creek we took three species of suckers, a wall-eyed pike, a mooneye, a few darters, and several species of minnows. The next day after we were there a fisherman caught an 18-inch gar in the same creek, which we examined.

*Smith Creek* flows into Crow Creek near where we fished the latter. It is a small stream, with very little running water, but a few pools range from 2 to 4 feet deep and from 8 to 30 feet wide. These pools contain stagnant water, great mats of aquatic vegetation, and the bottom is covered with soft mud ranging in depth from 1 to 2 feet. Much marsh gas bubbled up through the water when the mud was disturbed. In some places a few trees and shrubs lined the banks.

It is worthy of notice that all these streams, as was the case with those at Mitchell and Scotland, are made up of more or less disconnected pools.

*White River* rises in the northwestern county of Nebraska, flows through southwestern South Dakota, and empties into the Missouri River near Chamberlain, S. Dak. In its entire course this river flows through a dry, barren, and worthless country, some of it—the Bad Lands—being among the most desolate regions found in the United States. The soil and the water are of such a nature as will support but few forms of plant life and the condition of the water limits the forms of animal life. The so-called alkali is found in the water, even up to the very head of the river, in small quantities. We examined White River at Crawford and Chadron, Nebr., and at Chamberlain, S. Dak. At Crawford the stream was 15 feet wide, 1½ feet deep, and discharged 9,450 gallons per minute. The water was clear, and in places there was considerable plant life. The banks had at this place a few bushes. We fished it here and took at least four species of fishes. At Chadron the stream was about the same size as at Crawford, and flowed through a similar country, but the water was more milky in color, which is a characteristic of the water of this region. There was no visible vegetation in the water here, but the banks supported a few small trees and shrubs. The fishes were not numerous, and all were white in color, bleached by the action of the alkaline water. Near Chamberlain, at the mouth of the river, the stream was 273 feet wide, averaged 10 inches deep, and discharged 153,500 gallons per minute. The banks supported but little vegetation, consisting of a few bushes; the bottom was gravelly in places, of quicksand in others, and in still others it was covered with a layer of fine mud. This fine mud was so near the same specific gravity as the water that where undisturbed it was held in suspension

in great quantities. Water that appeared to be 6 inches deep was found to be 12, the lower part being completely filled with the fine mud particles. In the mouth of this river we found such species as *Leptops olivaris* and *Polyodon spathula*, which had run in from the Missouri. We were told that spoonbill cat as long as 5 feet and buffalo weighing 30 pounds or more are often caught here.

*Chadron Creek* is a small stream, some 15 miles long, which empties into White River 3 miles west of Chadron, Nebr. We fished it not far from the mouth, where it was 4 to 6 feet wide and 2 to 3 feet deep, with a very sluggish current. There was no vegetation along the banks except grass.

*Lone Tree Creek*, 20 miles in length, flows from the northwest and empties into White River, near the mouth of Chadron Creek. Near its mouth, where we examined it, the stream was 40 to 50 feet wide and from 4 to 8 feet deep. The banks below the surface of the water were almost perpendicular, and the water so deep that we could do but little seining. The water was muddy and the current very sluggish. While the creek seemed to discharge but little water, the portion examined was a continuous pool. The banks were bare, with the exception of a very few small shrubs and some grass.

*Choteau Creek* is a small creek flowing into the Missouri from the north, 15 miles west of Springfield, S. Dak. At the place examined it was 50 feet wide and ranged from 1 to 8 feet deep, but averaging about 3 feet. The bottom was covered with soft, black mud, 15 inches deep in places, which gave forth large quantities of marsh gas when stirred. The bank on one side was well wooded, some of the trees being quite large. The trees and shrubs noted were ash, cottonwood, box-elder, oak, elm, willow, sumac, and plum. The temperature of the water at noon June 27 was 73°.

Much algæ, *Potamogeton*, and other aquatic plant life were found in the water. We fished the stream in several places and took as many as 10 different species of fishes. Among the valuable fishes were the wall-eyed pike, bullhead, channel cat, black sucker, redhorse sucker, and buffalo. Several other species of less importance were taken.

*Ponca Creek* rises in the southern part of Tripp County, S. Dak., flows a little southeast, and empties into the Missouri River in the northwestern part of Knox County, Nebr. It is more than 100 miles long, flows through a prairie country, and at its mouth is 41 feet wide, 4 to 8 feet deep, with a sluggish current and, at the time examined, muddy water. The sluggish current, depth of the water, and its muddiness were in part due to backwater from the Missouri River. Only two species of fish were taken, *Hiodon alosoides* and *Hybognathus nuchale evansi*. Temperature of water 72°, air 70°. The banks of the stream were heavily wooded.

*Niobrara River.*—The Niobrara River rises in eastern Wyoming, flows east through northern Nebraska, and empties into the Missouri River at the northeastern boundary of Nebraska. At Marsland, the

farthest western station made on it by us, the stream was 20 feet wide and 6 inches deep. The bottom was sandy, as is the case with the bottom at every station made. In some places this sand is very loose quicksand. The whole course of the river is through a dry, sandy country, known as the sand-hill region of Nebraska.

At Valentine, Nebr., the stream was 150 feet wide, 1 to 4 feet deep, and with a very swift current, 2½ feet per second, at least. We found it very difficult to seine, on account of the velocity of the current.

The temperature July 10 was 81½°. There was much quicksand in the bottom. The region at Valentine is a typical sand-hill country. Very little vegetation other than grass and small shrubs was found along the banks of the river. The water was clear and free from vegetation. Only a few cyprinoids were found here.

We fished the Niobrara again 15 miles north of Long Pine, Nebr., and found still more quicksand than at either Marsland or Valentine. The bed of the stream here was 800 feet wide. The current averaged about 3 feet per second, and the stream ranged in depth from 1 to 6 feet. The velocity and the quicksand bottom made it impossible to fish in some places. The banks of the river at this place are quite heavily timbered for a few rods on each side. The temperature of the water was 80°. Only minnows and a few suckers were found.

At Niobrara the Niobrara River is 1,000 feet wide, the water running in many small channels over the sandy bottom at the time examined, and averaging 10 inches in depth. The same characteristics that have been given above apply to the river here. A narrow timbered strip lines its banks, but the water is free from vegetation and is clear wherever running. A few rods from the river we fished a small pond and secured a few species of minnows. The pond was simply an old bend in the river that had been cut off by a change in the direction of the current. Some of the trees and shrubs of this region are cottonwood, elm, ash, cedar, two species of oak, wild cherry, willow, box-elder, grapevine, sumac, rose, poison ivy, *Euonymus*, prickly ash, elder, lead plant, and basswood.

*Schlegel Creek* is the tributary farthest up the Niobrara River which we examined. It is a small creek, 15 feet wide and 2 feet deep, which flows from the south and empties into the river about 4½ miles south of Valentine. Near the mouth the banks are broken and hilly and are covered with shrubs. The stream itself was dammed in many places by snags, which made seining very difficult. The bed of the creek was sandy. Fishermen reported that trout had been taken in this brook, and that it had been stocked up toward its head, where there are several springs. The temperature of the water was 71°.

*Minnechaduza Creek* flows from the west and empties into the north side of the Niobrara River at Valentine. It is a fine stream, averaging 20 feet wide, 1 foot deep, and having a velocity of 3 feet per second. The bottom is covered with rocks and gravel, and several springs flow

into it in the vicinity of Valentine. The banks are lined with various kinds of trees and shrubs, and the water was free from vegetable life of any importance. There are several fine small springs near Valentine. We took sunfish from this creek, the farthest west they have been recorded along the Niobrara River. Below the milldam, at Valentine, in Minnechaduza Creek there was a great abundance of fish, principally minnows, all trying, no doubt, to go upstream. The temperature of the water below the dam was 76°. A little spring running into the creek at this place had a temperature of 54°.

*Long Pine Creek*, which is something more than 20 miles in length, rises in the east-central part of Brown County, Nebr., and flows directly north, emptying into the Niobrara River. This stream is a characteristic spring creek. Near the town of Long Pine there are many fine springs, some of them discharging large quantities of water. The bed is sandy and the water clear and almost entirely free from lime and other impurities. Seven miles south of Long Pine, near the head of the creek, the stream was 15 feet wide and 1 to 3 feet deep, with a swift current. Temperature 65° At various places between the head of this creek and the town of Long Pine are numerous springs; indeed, the creek is fed almost entirely by springs. About 4 miles above the town is a spring creek about 2 feet wide and 5 inches deep, possessing a 2-foot current and a temperature of 53° to 55°. This was the temperature of all the springs along this creek except those at the extreme head. In them the water was more stagnant and warmer by several degrees. The temperature of the main stream was found to range from 61° to 75° near noon, July 5.

We secured some sunfish, a few sticklebacks, and some minnows. We fished the creek 10 miles north of Long Pine, where we found it 35 to 40 feet wide, 2 to 4 feet deep, and a current averaging 3 feet per second. We attempted to fish below a dam, but found it difficult on account of the swift current and the numerous snags. The banks along this portion of the creek were covered with small trees, principally ash. The temperature of the water was 79°. Half a mile above the dam Bone Creek enters Long Pine Creek from the west. It is small, 10 feet wide, 8 inches deep, and has a rather swift current. Its bottom is sandy and the water clear, with a temperature of 79°.

Between the mouth of Bone Creek and the dam in Long Pine Creek there are some ponds that have been made by a change of channel of Long Pine Creek. When we visited them there was no connection between them and the creek, and since Long Pine Creek depends upon springs and does not have high water, the ponds have not been connected with the stream for some time. The water in the ponds was almost completely filled with aquatic vegetation, ranged from 2 to 4 feet in depth, and had a temperature of 77°. From these ponds we took sunfish (*Apomotis cyanellus*), darters, and minnows.

Of the many streams of Nebraska which we have examined, Long Pine Creek is by far the most beautiful and best adapted to trout. In

volume of water, clearness, purity, and low temperature, it surpasses any other stream in the State, of which we know. Natural food of the trout is found in abundance; besides insect larvæ, the smaller crustaceans and mollusks abound, and several species of minnows are abundant as to individuals and doubtless furnish excellent food to better fishes.

The numerous beautiful groves of hardwood trees and shrubs covering the little park-like tracts of bottom land found along the stream, or scattered over the hillsides and in the narrow flanking canyons, make this region one of surprising beauty and picturesqueness. The trout that were planted in this creek a few years ago have done unusually well, and now Long Pine Creek affords excellent fishing to the anglers of Nebraska and neighboring States.

*Verdigris River* rises in the northwest corner of Antelope County, Nebr., flows northeast and then north, and empties into the Niobrara River about 5 miles from its mouth. We examined it at the town of Verdigris, where the stream below the mill-dam was 58 feet wide and 1 foot deep, with a current of 2½ feet per second. The temperature of the air was 77° and that of the water 67°. The bottom was covered with rather large rocks and the water was clear.

The small unnamed creek which emptied into Verdigris River at Verdigris had a very little muddy water standing in pools and consequently very few fish were found in it.

*Emanuel Creek* was fished 3 miles northwest of Springfield, S. Dak. It is quite a small stream, a tributary of the Missouri, with very muddy water which was not more than 3 feet deep at any place, and ranged from 4 to 30 feet wide. There were some bushes on the banks, principally ash, and a great amount of algæ in the bed of the stream.

*Bazile or Creighton Creek* is small, rises in northern Nebraska, flows north, and empties into the Missouri about 5 miles east of the town of Niobrara. The current is swift, flowing a stream 30 to 40 feet wide and 18 inches deep over a fine gravelly bottom. Shrubs and small trees, principally ash, are found along the banks. As many as 8 species of fishes were taken, but none in great abundance. A pond which has connection with Bazile Creek was fished at Creighton, Nebr. This pond is at the edge of the town and contains 10 or 15 acres. On one side there were a few shrubs, but, for the most part, the banks were grassy. The water was deep except at the edges and here it was almost completely filled with the algæ and other aquatic vegetation. In some places it was almost impossible to land the seine on account of this mass of plant life. Twelve species of fish, at least, were taken here, among them *Notropis topeka*, *Notropis cayuga*, *Apomotis cyanellus*, *Etheostoma iowæ*, and *Fundulus sciadicus*.

*Spring Creek*, a very small tributary of Bazile Creek, was fished at Bazile Mills. This brook was interesting on account of the fact that the water was cold, 54° at 8 a. m., when the air was 68°, and that trout had been planted there and were doing well. The only fish taken were

the trout and *Catostomus commersonii*. The water is clear and pure; the bottom is of sand and gravel. Though this stream is scarcely more than a mile long, it is so well suited to trout that it affords excellent trout fishing and large catches are made in it every season.

*Dakota* or *James River* rises near the central part of North Dakota and flows a little southeast until it empties into the Missouri River on the southeastern boundary of South Dakota. The country through which it flows is comparatively level prairie, hence the course of the river, while in general straight, has very many crooks and bends which make it many times longer than it would otherwise be. The current is sluggish and as a result the water becomes somewhat stagnant in summer and contains much aquatic vegetation and lower forms of aquatic life peculiar to such conditions. On account of the loose prairie soil through which the river flows, the water is muddy, even when only slightly disturbed.

The tributaries to the Dakota River are small and short, consequently the region drained, while long from north to south, is not wide.

We examined the Dakota River at Mitchell, S. Dak., about 80 miles from its mouth, where we found it 110 feet wide and averaging 6¼ feet in depth, with a current having a velocity of 1 foot per second, thus discharging about 300,000 gallons per minute. Owing to rains in the Dakota Valley a few days previous to our examination, the water was probably 1 foot higher than usual at this time of year, June 19. The temperature at this time was 74°. The nature of the stream shows at once its suitability for suckers, catfish, sunfish, and yellow perch, which is further proved by our taking numerous specimens of each, either in the river itself or from the mouths of creeks which empty into the river. The banks of the stream are covered with low shrubs and a few trees, principally ash.

*Rock Creek* flows from the northeast and enters the Dakota River near Mitchell. It averages 30 feet wide and 2½ feet deep, although it is very irregular, being made up apparently of a series of holes connected by a small stream of running water, probably formed partly by erosion and partly by glacial action. The same may be said of Enemy and Firesteel creeks. We examined Rock Creek near its mouth, where the banks are covered with small bushes, principally ash and willow, and took specimens of pike (*Lucius lucius*), yellow perch, sunfish, catfish, darters, and a few minnows. The water was clear, and contained so much algæ that seining was difficult in places. Much of the bottom was covered with bowlders. Crawfish, frogs, and toads were abundant.

*Firesteel Creek* flows from the northwest and empties into the Dakota River about 2 miles below the mouth of Rock Creek. It is, like that creek, tortuous and sluggish, and is about 30 feet wide, 4 feet deep, and has a current of ½ foot per second. The temperature was 79°. The bottom was covered with mud, the water contained much algæ and other aquatic vegetation, and about the same species of fish were taken here as in Rock Creek.

*Enemy Creek*, which empties into the Dakota River 6 miles southeast of Mitchell, is a small stream made up of connected pools and just enough running water through the narrow connecting channels to allow small fish to pass from one pool to another. The bottom in that part examined was gravelly, and the water did not contain as much plant life as was found in the others. We did not find as great a variety of fishes here as in the other streams, the principal species being suckers, yellow perch, sunfish, and catfish.

*Prairie Creek*, a western tributary of the Dakota River, was examined about 4 miles east of Scotland, S. Dak. The creek was nearly dry, with the exception of a few small pools, but these were deep and contained so much plant life that seining was difficult. No trees or shrubs were found on the banks. The country about Scotland is of the same general character as that around Mitchell. The aquatic animals that we found, other than fish, were crawfish, clams, and frogs.

*Platte River.*—The North Fork of the Platte River rises in western Wyoming, and flows a little southeast through Wyoming and Nebraska until it joins the South Fork in the southwestern part of the latter State. Platte River proper, formed by the joining of the two forks, flows east through Nebraska and empties into Missouri River. The point nearest its head, at which the North Fork was examined, was Casper, Wyo. The stream at this place varied from 150 to 200 feet in width, has a very swift current, and was in some places from 6 to 7 feet deep. The temperature was 66½°, and the water was clear. Along the banks were a few scattered cottonwood, willow, and box-elder trees.

We next examined the North Platte at Glenrock, Wyo., where we found the temperature, current, size, and general appearance about the same as at Casper.

At Douglas, Wyo., we found the North Platte the same swift, sandy stream, and not any larger than before, owing to the dry region through which it flows.

Our next station was on the Platte River proper, at Grand Island. At the time of our visit, August 11, the water was very low and ran in several small and shallow channels, the depth at no place being more than 2½ feet, consequently only very small fish could live in it. The temperature of the water was 79°. Several minnows were taken, as well as young wall-eyed pike, yellow catfish, a buffalo, a moon-eye, and a sturgeon.

On October 23, 1892, we examined the Platte at South Bend, Nebr., but made no collections except specimens of *Etheostoma iowæ* from the State fish-hatchery waters near South Bend, where this small darter is very abundant.

*Garden Creek*, a little mountain stream discharging 250 gallons of water per minute at the mouth of the canyon, is the tributary farthest up the North Platte that we examined. In fact, it is a tributary only during high water, for during the dry season all the water is used in irrigation and not a drop of it reaches the river. At the mouth of the

canyon is a pretty little fall, 70 feet in height. Only two species of fish were found, *Semotilus* and *Rhinichthys*. Trout would probably live in this stream, since the temperature in the canyon was 53½°.

*Deer Creek* rises in the Laramie Mountains and flows northeast into the North Platte at Glenrock, Wyo. It is a small stream, not over 15 feet in width at its mouth at the time examined, but this was during the dry season and much of the water was used above for irrigating purposes. The stream did not average more than 6 inches deep at the mouth; the water was clear, and the temperature 61½°.

*Little Deer Creek*, a tributary of Deer Creek, flows out of a canyon in the Laramie Mountains on the ranch of Major Wolcott, about 7 miles south of Glenrock. It is a very pretty little mountain stream, discharging about 1,600 gallons of water per minute at the mouth of the canyon and registering a temperature of 50°.

*Wood River* flows first in a southeasterly direction, until it gets within 4 or 5 miles of the Platte, when it takes a northwesterly course, following alongside the latter river until it joins it about 10 miles east of Grand Island. We fished it at Grand Island, where it was not more than 15 feet wide, the water muddy, and standing principally in holes. The banks were lined with small trees. The fishes taken were *Hybognathus nuchale evansi*, *Notropis lutrensis*, *Notropis blennius*, *Catostomus commersonii*, and *Carpiodes carpio*.

*Middle Loup River* rises in Cherry County, in northwestern Nebraska, and joins the South Loup about the center of the State. We examined it at Dunning, where it was 200 to 250 feet wide, averaged 6 inches deep, and had a current of 2 feet per second, thus discharging 112,500 gallons per minute. The bottom was sandy and the water clear, with a temperature of 65°. From it we took *Platygobio gracilis*, *Hybopsis æstivalis*, *Rhinichthys cataractæ dulcis*, *Notropis lutrensis*, *Noturus flavus*, *Hybognathus nuchale evansi*, *Fundulus sciadicus*, *Notropis blennius*, and *Carpiodes carpio*. The country about Dunning is prairie with but a few small bushes along the banks of the river.

*Dismal River*, a tributary which joins the Middle Loup at Dunning, was also examined. It is 100 feet wide, averages 10 inches deep, and has a current of 2 feet per second, thus discharging 75,000 gallons per minute. Like the Loup River, the water was clear and the bottom sandy. In two or three shallow ponds near by, containing much *Lemna* and other aquatic vegetation, we found the green sunfish (*Apomotis cyanellus*). This was the farthest west in central Nebraska that we took sunfish. From the ponds and river we took, also, *Pimephales promelas*, *Notropis lutrensis*, *Catostomus commersonii*, and *Fundulus sciadicus*. The temperature of the water was 66°.

*South Loup* and the mouth of *Mud Creek* were examined, October 22 and August 10, at Ravenna, where they join. The South Loup River here is 150 feet wide, but the water at the times of our visits was very shallow and flowed in several channels over the sandy bottom. Mud Creek is a very sluggish stream, being 40 to 60 feet wide and from 2 to

8 feet deep. The bottom is covered with a thick deposit of black mud, and at the edge of the water there was considerable vegetation. The temperature October 22 was 46° when the air was 62°. Owing to a milldam in the stream at the town, the fish from the river have free access to only about a mile of Mud Creek. The water was considerably colder than that in Loup River, and this, with the great amount of food matter and the quietness and depth of the water, accounted for the abundance of fishes found in it. No doubt many of them had been driven in here on account of low water in Loup River.

We examined Mud Creek from the railroad bridge down to its mouth, a distance of nearly a mile, and then seined the river at several places near the mouth of Mud Creek. The abundance of fishes here, both as to species and individuals, was unusually great. We obtained not fewer than 15 species, among which were the following:

| | | |
|---|---|---|
| Moxostoma aureolum. | Carpiodes velifer. | Platygobio gracilis. |
| Notropis jejunus. | *Notropis lutrensis.* | Stizostedion vitreum. |
| Hiodon alosoides. | Fundulus sciadicus. | Hybognathus nuchale evansi. |
| Apomotis cyanellus. | Hybopsis æstivalis. | Micropterus salmoides (planted). |
| Ictalurus punctatus. | Hybopsis storerianus. | Pimephales promelas. |

The black bass had been planted and seemed to be doing well. We saw two which a fisherman had taken, that were each 12 inches long. There is certainly much need of a fishway in Mud Creek, so that fish may pass to the water above the dam. The banks of both streams are well covered with trees. In Mud Creek 2 species of turtles were seen, *Chelydra serpentina* and *Aspidonectes spinifer*.

*Lakes Carp and George.*—Seventeen miles south and a little west of Long Pine, Nebr., lie two isolated lakes of considerable size, and a few small ones. There is no record of any outlet for these lakes, but the slope is toward the south, and since there is but one neighboring river, the Calamus, in this direction, it is likely that these lakes were once drained by that stream.

*Carp Lake* contains about 160 acres and ranges in depth from 3 to 7 feet. There is open water in the center, but the edges of the lake are grown up with various species of aquatic plants. We seined the lake on the south side and secured a large number of *Ameiurus melas* and *Apomotis cyanellus*. At one haul we took 65 specimens of *Ameiurus*, 4 of them ranging from 11 to 13 inches in length. No other species of fish were seen, and Mr. Blodgett, who lives near the lake, said that no native fish had ever been taken there. The catfish and sunfish he planted in the lake himself. In 1887 he planted 2,000 young carp, but never saw any afterwards. In 1888 he planted 512 sunfish and 6 bullheads, and it was from these that the fish we caught had grown. We also tried catching sunfish with a hook and were very successful. Those we caught were not very large, but Mr. Blodgett said he had caught some that measured 8 inches in length.

*Lake George* lies about 3 miles southeast of Carp Lake, covers 200 acres, and is from 3 to 7 feet deep. It has more open water than Carp

Lake and not so much vegetation around the shores. We made several hauls in it and secured nothing but *Apomotis cyanellus*, all young, many of them but one-half inch long. Eight carp were planted in this lake at the same time the 2,000 were put in Carp Lake, but they have never been seen since. A few sunfish and a few bullheads were planted in this lake at the time those were put in Carp Lake. Both lakes abound in fish food, and the conditions are very favorable for the black bass. The water in both lakes is quite pure and the temperature at the time of our visit was 70°.

A little lake of about 20 acres, north of Carp Lake, was visited, but no fish were found. The water was not more than 1 foot deep and was very warm. In one haul of the seine we took a large number of tadpoles and about 150 larval salamanders.

In addition to the lakes mentioned, there are other small ponds and marshes throughout the region, but all are shallow and contain no fish.

*Elkhorn River* rises in the central part of Rock County, in northern Nebraska, flows southeast and finally south, and empties into Platte River about 30 miles above its mouth. We examined it at Ewing and at Norfolk, Nebr. At Ewing the stream was about 100 feet wide and 6 inches to 5 feet deep, averaging 18 inches, and the current was moderate. The bottom was sandy in most places, but occasionally there was a bunch of aquatic vegetation, in which we found sunfish (*Apomotis cyanellus*) and black bass (*Micropterus salmoides*). We also took two species of suckers, a catfish, two darters, and several species of minnows. Near the river are some old bayous that are probably connected with the river during high water, but at the time of our visit were isolated. These contain thousands of young black bass, most of them about one-fourth inch long.

Elkhorn River, 2 miles southeast of Norfolk Junction, is 150 feet wide, averages 2 feet in depth, and has a swift current. The bottom is sandy and trees line the south bank. Among the fish taken here were the pickerel (*Lucius lucius*), large-mouthed black bass, redhorse sucker, a darter, and a number of minnows.

Near the river are some bayous that furnish excellent fishing for the people of Norfolk, the principal fish being black bass and sunfish. There are two of these bayous located in a nicely wooded grove. The water was quiet and in the shallow places completely matted with aquatic vegetation. From the banks the sunfish could be seen quietly swimming around looking for food, while farther along, perhaps, numerous fish were jumping out of the water to catch the unwary insects that had ventured too near the surface. Many frogs were seen along the banks and the aquatic vegetation was well loaded with numerous forms of animal life. One noticeable fact was the scarcity of minnows, yet this is not remarkable when we consider the abundance of bass.

*South Fork of Elkhorn River.*—The tributary of Elkhorn River nearest its head, which we examined, was the south fork of the Elkhorn at Ewing, Nebr. The stream was 30 feet wide, 1 foot deep, current

swift, and water with a temperature of 79½°. The bottom was sandy, the water clear, and there were no trees on the banks, only a few willows. We secured two species of minnows, one darter, and one sucker. From a small pond near by we took a few catfish (*Ameiurus melas*).

*Norfolk Creek* flows into Elkhorn River about 3 miles southeast of Norfolk Junction, and near its mouth averages 35 feet wide and 1½ feet deep, but a few holes were as much as 6 feet. The current was rather sluggish and the water somewhat muddy. The banks were well wooded in places with cottonwood, box-elder, willow, and ash. From this stream we secured at least five species of minnows, two species of darters, one species of black bass, two species of catfish, and a redhorse sucker.

*Big Blue River* rises in southeastern Nebraska, flows south, and empties into the Kansas River. We fished the Big Blue at Seward, Nebr., where it was 30 feet wide, 2 to 4 feet deep, and very muddy. From it we secured *Lepomis humilis*, *Ameiurus melas*, *Notropis lutrensis*, and *Pimephales promelas*. This stream was also examined at Crete in 1892, and by Mr. Rutter at Crete in 1891.

*Lincoln Creek*, a tributary of the Big Blue River, was 10 feet wide, 10 inches deep, had a current of 1 foot per second at York, was very muddy, and registered a temperature of 68°. From it we took the following species: *Noturus flavus*, *Pimephales promelas*, *Ameiurus melas*, *Notropis lutrensis*, and *Notropis blennius*.

At Seward, Nebr., Lincoln Creek was 40 to 50 feet wide, 4 to 6 feet deep, and very muddy. We found but one species of fish here, *Notropis lutrensis*. The place fished was just above a dam, consequently the water was much deeper than at other places.

*Beaver Creek*, a tributary of the Big Blue River, was fished at York, Nebr. We found it a little larger than Lincoln Creek at the same place, but the same kind of a stream, and with a temperature of 71°. We took from it *Ameiurus melas*, *Noturus flavus*, *Notropis lutrensis*, *Pimephales promelas*, *Notropis blennius*, and *Semotilus atromaculatus*.

## HISTORICAL AND BIBLIOGRAPHICAL.

In the following pages we give the bibliography of the ichthyology of the Missouri River basin. We have meant to include all faunal lists and such other papers as throw light upon the geographic distribution of the species of fishes in the drainage basin of that river. The titles are arranged in chronologic order, thus enabling one to see at a glance the progress of ichthyological investigations in that region. Following the title of each paper will be found a brief statement of the character of the paper, and then a summary of its contents, including (1) the page upon which the species is mentioned, (2) the name under which recorded, (3) our identification of the nominal species, (4) the locality from which the specimens were obtained, and (5) the name of the col-

lector. Whenever the character of the paper permits it, the summary is given in briefer form.

The first printed references to fishes of the Missouri River basin that have come under our notice are those by Lewis and Clark in the journal of their famous expedition to the mouth of the Columbia River in 1803–1806. The original edition of the history of this expedition was published in 1814.

In 1893 appeared the elegant and splendidly annotated new edition by Dr. Elliott Coues. In this edition all the fishes mentioned in the original journals and note books of the expedition are identified when the reference is sufficiently full.

The fishes mentioned are, as would be expected, those which they were able to catch for food, and we find the following noted with sufficient detail to render identification possible: *Ictalurus punctatus*, *Leptops olivaris* or *Ameiurus lacustris*, *Stizostedion canadense boreum*, *Moxostoma aureolum*, *Pantosteus jordani*, and *Salmo mykiss lewisi*.

The following are the more important notes on the fishes seen. The references are to the new edition of Lewis and Clark, in four volumes, by Dr. Elliott Coues (New York, 1893):

Vol. I, p. 54: "White catfish [*Ictalurus punctatus*], the eyes of which were small, and its tail resembling that of a dolphin"; Missouri River near mouth of Papillion Creek, near present site of Omaha.

Vol. I, p. 76: "August 16. * * * A party had gone out yesterday to the Maha Creek [and] a second went to-day. They made a kind of drag with small willows and bark, and swept the creek. The first company brought 318 fish, the second upward of 800, consisting of pike [probably *Lucius lucius*], bass [*Micropterus salmoides?*], fish resembling salmon trout, red-horse [*Moxostoma aureolum*], buffalo fish [*Ictiobus sp.?*], rockfish, one flat-back, perch, catfish, a small species of perch called on the Ohio silver-fish, a shrimp of the same size, shape, and flavor of those about New Orleans and the lower part of the Mississippi. We also found very fat mussels." Few, if any, of these are certainly identifiable. This locality is in the present Dakota County, Nebraska, a little south of Dakota City. They called the place "Fishing Camp."

Vol. I, p. 88: "Some large catfish, nine that would together weigh 300 pounds." Ninemiles below mouth of Bow Creek, Cedar County, Nebraska. These may have been *Leptops olivaris* or *Ameiurus lacustris*.

Vol. I, p. 320: "We have caught very few fish on this side of the Mandans, and these were the white catfish of two to five pounds"; Missouri River near mouth of Beauchamp Creek, Mont., longitude about 108° W.

Vol. II, p. 363: "The white cat [-fish] continues as high as Marias River, but they are scarce in this part of the Missouri, nor have we caught any of them since leaving the Mandans which weighed more than six pounds."

Vol. II, p. 364: "I amused myself catching those white [cat-] fish yesterday. I caught upward of a dozen in a few minutes; they bite most freely at the melt of a deer which Goodrich brought with him for the purpose of fishing." (Lewis.) This locality was near the mouth of Marias River, longitude about 110° 30′ W.

Vol. II, p. 367: "Both kinds of white fish" [*I. punctatus* and *Stizostedion canadense boreum*]. Falls of Missouri.

Vol. III, p. 1159: "Some catfish and soft-shelled turtles were procured"; near mouth of Tongue River.

Vol. II, p. 362: "June 11. One of the men caught several dozen fish of two species. The first is about nine inches long, of a white color, round in shape; the mouth is beset both above and below with a rim of fine, sharp teeth, the eye moderately large, the pupil dark, the iris narrow, and of a yellowish brown. In form and size it resembles the white chub of the Potomac, though its head is proportionally smaller. These readily bite at meat or grasshoppers; the flesh, though soft and of a fine white color, is not highly flavored. The second species is precisely of the form and about the size of the fish known by the name of hickory-shad or old-wife, though it differs from it in having the outer edge of both the upper and lower jaw set with a rim of teeth, and the tongue and palate also defended by long, sharp teeth bending inward; the eye is very large, the iris wide, and of a silvery color. These do not inhabit muddy water, and the flavor is much superior to that of the former species. Of the first kind we have seen a few before we reached Marias River; but had found none of the last before we caught them in the Missouri above its junction with that river." This locality was near the mouth of Marias River. The first species is *Stizostedion canadense boreum*, and the other either *Hiodon alosoides* or *Hiodon tergisus*.

Vol. II, p. 367: "June 13. In the afternoon they caught in the falls some of both kinds of the white fish, and half a dozen trout from 16 to 23 inches long, precisely resembling in form and in the position of the fins the mountain or speckled trout of the United States, except that the specks of the former are of a deep black while those of the latter are of a red or gold color. They have long, sharp teeth on the palate and tongue, and generally a small speck of red on each side behind the front ventral fins; the flesh is of a pale yellowish red, or when in good order of a rose-colored red." This locality is the lower or Crooked Falls of the Missouri, below the present town of Great Falls, Montana. The two kinds of "white fish" were probably *Ictalurus punctatus* and *Hiodon alosoides*, and the trout, of course, was *Salmo mykiss lewisi*.

Vol. II, p. 373: The next day and at the same place they "obtained a number of fine trout and several small catfish, weighing about four pounds and differing from the white catfish lower down the Missouri." These were probably not different from the other white catfish.

Vol. II, p. 431: "July 20. Since the river has become shallow we have caught a number of trout and a fish white on the belly and sides, but of a bluish cast on the back, with a long, pointed mouth opening somewhat like that of a shad." This was in the Missouri nearly due east of Helena. The fish were *Salmo mykiss lewisi* and probably *Hiodon alosoides*.

Vol. II, p. 458: "August 3. The only fish observed in this part of the river were the trout and a species of white fish with a remarkably long, small mouth, which one of our men recognized as the fish called in the Eastern States the 'bottlenose.'" This was in Jefferson Fork of the Missouri, near the mouth of Whitetail Deer Creek, south of Helena. The trout was *Salmo mykiss lewisi;* the "bottlenose" is not identifiable; it may have been *Coregonus williamsoni cismontanus* or *Pantosteus jordani*.

Vol. II, p. 495: "August 13. Some very fine trout [*Salmo mykiss lewisi*] were caught, as also for several days past." This was in Beaverhead River near the mouth of Grasshopper Creek, south of Dillon, Mont.

Vol. III, p. 1138: "July 16. One of the men caught a fish which they had not seen before. It was eight inches long, and resembled a trout in form, but its mouth was like that of a sturgeon, and it had a red streak passing on each side from the gills to the tail." This locality was in the Yellowstone River near the mouth of Little Timber Creek, some 30 miles below Livingston, Mont. The fish was undoubtedly a sucker, and almost certainly the species named *Pantosteus jordani* 87 years afterward. There is, of course, a possibility of its having been *Catostomus catostomus*.

The papers whose titles follow are each more or less faunal in character and each contains references to fishes from definite Missouri Basin localities.

**1854.** LOUIS AGASSIZ. Notice of a collection of fishes from the southern bend of the Tennessee River, in the State of Alabama. <Amer. Journ. Science and Arts, 2d series, vol. XVII, No. 50, March, 1854, 297-308, and No. 51, May, 1854, 353-365.

In a footnote on page 304 of this paper Professor Agassiz described as new two darters collected in the Osage River, Missouri, by Mr. George Stolley. These are *Pœcilichthys spectabilis* (=*Etheostoma cœruleum spectabile*) and *Pœcilichthys punctulatus* (=*Etheostoma punctulatum*).

**1856.** CHARLES GIRARD. Researches upon the cyprinoid fishes inhabiting the fresh waters of the United States west of the Mississippi Valley, from specimens in the museum of the Smithsonian Institution. <Proc. Ac. Nat. Sci. Phila. 1856, 165-218.

This is the first of the several papers based wholly or partly upon the collections made by the naturalists connected with the Pacific Railroad Survey parties which traversed portions of the Missouri Basin. The localities from which the specimens of these collections came are seldom given with any definiteness, as will appear from an examination of the following table. In this table, and in all others of like character in the present paper, the names of new species are printed in italics.

| Page. | Nominal species. | Identification. | Locality. | Collector. |
|---|---|---|---|---|
| 170 | Carpiodes *damalis* | Carpiodes velifer | Milk River | Suckley. |
| 172 | Ptychostomus *haydeni* | Minytrema melanops | Missouri River at Fort Pierre. | Evans and Hayden. |
| | | | Yellowstone River. | Do. |
| 174 | Catostomus (Acomus) *lactarius*. | Catostomus griseus | Milk River | Suckley. |
| 174 | Catostomus (Acomus) *griseus*. | do | Sweetwater River | Bowman. |
| 175 | Catostomus *sucklii* | Catostomus commersonii | Milk River | Suckley. |
| 180 | Pimephales *fasciatus* | Pimephales promelas | Yellowstone River. | Hayden. |
| 182 | Hybognathus *argyritis* | Hybognathus argyrite | Milk River | Suckley. |
| 182 | Hybognathus *evansi* | Hybognathus nuchale evansi. | Fort Pierre, Nebr | Evans. |
| 185 | Argyreus *dulcis* | Rhinichthys cataractæ dulcis. | Sweetwater River | Bowman. |
| 188 | Pogonichthys *communis* | Platygobio gracilis | Fort Pierre, Nebr. | Evans. |
| | | | Fort Union | Denig. |
| | | | Above Fort Union. | Suckley. |
| | | | Milk River | Do. |
| | | | Yellowstone River. | Hayden. |
| | | | Sweetwater River | Bowman. |
| 188 | Gobio *gelidus* | Hybopsis gelidus | Milk River | Suckley. |
| 189 | Leucosomus *dissimilis* | Couesius dissimilis | Milk and Little Muddy rivers. | Do. |
| 190 | Nocomis *nebracensis* | Hybopsis kentuckiensis | Sweetwater River | Bowma. |
| 190 | Plagyrus *bowmani* | Notropis cornutus | do | Do. |
| 204 | Semotilus *macrocephalus* | Semotilus atromaculatus. | Fort Pierre, Nebr. | Evans. |
| 204 | Semotilus *speciosus* | do | Sweetwater River | Bowman. |

**1858.** CHARLES GIRARD. The fishes [of the Pacific Railroad Surveys]; Pacific Railroad Report, vol. X, 1–400, numerous plates, 1858; vol. VI, part IV, No. 1, 9–34, 11 plates.

The reports of the Pacific Railroad Survey credit but 23 nominal species to the Missouri Basin.

| Page. | Nominal species. | Identification. | Locality. | Collector. |
|---|---|---|---|---|
| 17 | Calliurus longulus | Apomotis cyanellus | Platte River | Captain Pope. |
| 32 | Stizostedion boreus | Stizostedion canadense boreum. | Fort Sarpy, Nebr | Dr. Hayden. |
| | | | Milk River, Mont | Dr. Suckley. |
| | | | Fort Union, Mont | Dr. Hayden. |
| 98 | Amblodon grunniens | Aplodinotus grunniens | Milk River, Mont | Dr. Suckley. |
| 212 | Pimelodus *olivaceus* | Ictalurus punctatus | Fort Pierre, Nebr | Dr. Evans. |
| | | | Milk River, Mont | Dr. Suckley. |
| | | | Yellowstone River, Nebr. | Mr. Walker, Dr. Hayden. |
| 219 | Carpiodes damalis | Carpiodes velifer | Milk River | Dr. Suckley. |
| | | | Fort Pierre, Nebr | Dr. Evans. |
| 221 | Ptychostomus hayden | Minytrema melanops | Yellowstone River | Dr. Hayden. |
| 21 | | | Missouri River at Fort Pierre, Nebr. | Dr. Evans. |
| 222 | Acomus griseus | Catostomus griseus | Sweetwater River | J. S. Bowman. |
| 22 | | | | |
| 223 | Acomus lactarius | do | Milk River | Dr. Suckley. |
| 226 | Catostomus sucklii | Catostomus commersonii | do | Do. |
| 234 | Pimephales fasciatus | Pimephales promelas | Yellowstone River | Dr. Hayden. |
| | | | Milk River | Dr. Suckley. |
| 236 | Hybognathus argyritis | Hybognathus argyrite | do | Do. |
| 22 | | | | |
| 237 | Hybognathus evansi | Hybognathus nuchale evansi. | Fort Pierre, Nebr | Dr. Evans. |
| | | | Sweetwater River | J. S. Bowman. |
| 243 | Argyreus dulcis | Rhinichthys cataractæ dulcis. | do | Do. |
| 248 | Pogonichthys communis | Platygobio gracilis | Milk River | Dr. Suckley. |
| | | | Sweetwater River | J. S. Bowman. |
| | | | Missouri River at Fort Union. | E. J. Denig. |
| | | | Milk River above Fort Union. | Dr. Suckley. |
| | | | Fort Pierre, Nebr | Dr. Evans. |
| | | | Yellowstone River | Dr. Hayden. |
| 249 | Gobio gelidus | Hybopsis gelidus | Milk River | Dr. Suckley |
| 251 | Leucosomus dissimilis | Couesius dissimilis | do | Do. |
| | | | Little Muddy River | Do. |
| 253 | Leucosomus macrocephalus. | Semotilus atromaculatus | Fort Pierre, Nebr | Dr. Evans. |
| 254 | Nocomus nebrascensis | Hybopsis kentuckiensis | Sweetwater River | J. S. Bowman. |
| 23 | | | | |
| 264 | Plagyrus bowmani | Notropis cornutus | do | Do. |
| 284 | Semotilus speciosus | Semotilus atromaculatus | Tributary of Platte River, Nebr. | Do. |
| 25 | | | | |
| 320 | Salar lewisi | Salmo mykiss lewisi | Falls of Missouri River. | Dr. Suckley. |
| 357 | Scaphirhynchus platirhynchus. | Scaphirhynchus platorhynchus. | Missouri River | Dr. Shumard. |
| 59 | | | | |
| 358 | Polyodon folium | Polyodon spathula | Fort Pierre, Nebr | Dr. Evans. |

**1859.** CHARLES GIRARD. Ichthyological Notices. <Proc. Ac. Nat. Sci. Phila. 1859, 100–104.

In these "notices" Dr. Girard described as new two species of darters from the Missouri Basin, viz: In Notice XXXVII, p. 103, *Boleichthys exilis*, obtained by Dr. George Suckley in the Little Muddy River, and in Notice XL, p. 104, *Boleichthys warreni* (=*Boleichthys exilis*), obtained by Dr. F. V. Hayden in the Cannon Ball River September, 1856. The Cannon Ball flows into the Missouri just below Bismarck, N. Dak., in long. 100° 30′, lat. 46° 30′. The stream called Little Muddy River is probably near Bismarck.

**1860.** CHARLES C. ABBOTT. Descriptions of two new species of *Pimelodus* from Kansas. <Proc. Ac. Nat. Sci. Phila. 1860, 568–569.

In this paper are given descriptions of the two nominal species, *Pimelodus hammondii* (=*Ictalurus punctatus*) and *Pimelodus notatus* (=*Ictalurus punctatus*). The types of each were collected at Fort Riley, Kans., by Dr. W. A. Hammond, presumably from the Kansas River.

**1860.** Dr. GEORGE SUCKLEY. Report upon the fishes collected on the [Pacific Railroad] Survey; chapter 1, Report upon the *Salmonidæ;* chapter 2, Report upon the fishes exclusive of the *Salmonidæ*. Pacific Railroad Report, vol. XII, part III, No. 5, pp. 307–368, with 21 plates, 1860; and in Natural History of Washington Territory, same pagination, plates, and date.

All of the dozen Missouri Basin fishes mentioned in this paper were collected by Dr. Suckley.

| Page. | Nominal species. | Identification. | Locality. |
|---|---|---|---|
| 348 | (Salmo) Salar lewisi | Salmo mykiss lewisi | Falls of Missouri River. |
| 351 | Stizostedion boreus | Stizostedion canadense boreum | Milk River. |
| 355 | Amblodon grunniens | Aplodinotus grunniens | Do. |
| 359 | Pimelodus olivaceus | Ictalurus punctatus | Do. |
| 360 | Carpiodes damalis | Carpiodes velifer | Do. |
| 360 | Acomus lactarius | Catostomus griseus | Do. |
| 360 | Catostomus sucklii | Catostomus commersonii | Upper Missouri and its tributaries. |
| 360 | Pimephales fasciatus | Pimephales promelas | Milk River. |
| 361 | Hybognathus argyritis | Hybognathus argyrite | Do. |
| 361 | Pogonichthys communis | Platygobio gracilis | Do. |
| 361 | Gobio gelidus | Hybopsis gelidus | Do. |
| 364 | Hyodon tergisus | Hiodon tergisus | West of Fort Union. |

**1862.** THEODORE GILL. Observations on the genus *Cottus*, and descriptions of two new species (abridged from the forthcoming report of Capt. J. H. Simpson.) <Proc. Bost. Soc. Nat. Hist., VIII, 1862, 40–42.

In this paper, page 40, is given the original description of *Potamocottus punctulatus* (=*Cottus bairdi punctulatus*), the type a single specimen obtained by Dr. George Suckley in 1859, "between Bridger's Pass and Fort Bridger." This is probably in the Missouri Basin.

**1862a.** THEODORE GILL. Descriptions of new species of *Pimelodinæ* (abridged from the forthcoming report of Capt. J. H. Simpson). <Proc. Bost Soc Nat. Hist., VIII, 1862, 42–46.

In this paper Dr. Gill described as new 3 species of catfishes, viz. *Ictalurus simpsonii* (=*I. punctatus*), from the "Big Sandy River of Kansas" (probably the Kansas River); *Amiurus obesus* (=*Ameiurus melas*), "supposed to be from Nebraska" (collected by Mr. McCarthy); and *Noturus occidentalis* (=*N. flavus*) from Platte River. The first and third were collected by Dr. Suckley.

**1863.** F. W. PUTNAM. List of the fishes sent by the Museum to different institutions in exchange for other specimens, with annotations. <Bull. Mus. Comp. Zool., vol. 1, No. 1, 2-16, 1863.

In this paper are described 2 species supposed to be new. The types of each were collected by Mr. Stolley in the Osage River, Missouri. They are *Alburnus lineolatus* Agassiz MS., 1854, and *Alburnus zonatus* Agassiz MS., 1854 (=*Notropis zonatus*). The first of these is unidentifiable; it may be *Notropis scylla.*

**1864.** THEODORE GILL. A new species of *Percopsis* (*Percopsis hammondii*) from Kansas. <Proc. Ac. Nat. Sci. Phila. 1864, 151.

In this note Dr. Gill describes *Percopsis hammondii* (=*Percopsis guttattus*), the specimen said to have been obtained in Kansas by Dr. W. A. Hammond.

**1864.** E. D. COPE. On a blind Silurid from Pennsylvania. <Proc. Ac. Nat. Sci. Phila. 1864, 231-233.

In the paper bearing this inadequate title Professor Cope describes not only the blind catfish from Pennsylvania and a new darter from New Jersey, but a new darter (as *Pœcilichthys mesœus*=*Boleosoma nigrum*) from Platte River, near Fort Kearney, Nebr. The type was collected by Dr. Hammond.

**1864a.** EDWARD D. COPE. Partial catalogue of the cold-blooded Vertebrata of Michigan. Part I. <Proc. Ac. Nat. Sci. Phila. 1864, 276-285.

In this paper Professor Cope records 5 species of fishes from the Missouri Basin, 4 of which he describes as new. All were collected by Dr. W. A. Hammond.

| Page. | Species. | Present identification. | Locality. |
|---|---|---|---|
| 277 | Pogonichthys (Platygobio) *gulonellus.* | Platygobio gracilis..... | Near Bridger Pass. |
| 278 | Rhinichthys *maxillosus*..... | Rhinichthys cataractæ dulcis.. | Kansas. |
| 282 | Alburnus *oligaspis*..... | Notropis dilectus..... | Do |
| 283 | Hybognathus evansi..... | Hybognathus nuchale evansi... | Upper Platte River. |
| 284 | Campostoma *hippops*..... | Campostoma anomalum..... | Platte River at Fort Kearney, Kans. |

**1865.** EDWARD D. COPE. Partial catalogue of the cold-blooded Vertebrata of Michigan. Part II. <Proc. Ac. Nat. Sci. Phila. 1865, 78-88.

In this paper Professor Cope incorporates a "Note on fishes brought from the Platte [Kansas] River, near Fort Riley, by Dr. W. A. Hammond." Twenty-four species are mentioned, three of which (*Gasterosteus micropus*, *Fundulus sciadicus*, and *Lepidosteus otarius*) are described as new. The localities assigned to some of these species seem to be erroneous. *Gila affinis* certainly did not come from any Missouri Basin locality, and the trout mentioned as *Trutta lewisi* probably came from some point in the headwaters of the South Platte rather than

from Fort Riley. Fort Riley was on the Kansas River, in what is now Davis County, Kans., near the present town of Junction City. It is very doubtful if trout ever occurred so far east in Kansas.

| Page. | Nominal species. | Identification. |
|---|---|---|
| 85 | Bryttus longulus | Apomotis cyanellus. |
| 85 | Stizostedium americanum | Stizostedion canadense. |
| 85 | Pœcilichthys mesæus | Boleosoma nigrum. |
| 81 | Gasterosteus *micropus* | Eucalia inconstans. |
| 85 | Trutta lewisi | Salmo mykiss stomias. |
| 85 | Hyodon tergisus | Hiodon tergisus. |
| 85 | Percopsis hammondii | Percopsis guttatus. |
| 78 | Fundulus *sciadicus* | Fundulus sciadicus. |
| 85 | Carpiodes damalis | Carpiodes velifer. |
| 85 | Catostomus chloropterum | Catostomus commersonii. |
| 85 | Campostoma hippops | Campostoma anomalum. |
| 85 | Hybognathus evansi | Hybognathus nuchalo evansi. |
| 85 | Pimephales promelas | Pimephales promelas. |
| 85 | Alburnus oligaspis | Notropis dilectus. |
| 85 | Gila affinis | Gila robusta (locality erroneous). |
| 85 | Semotilus corporalis | Semotilus atromaculatus. |
| 85 | Semotilus pallidus | Do. |
| 85 | Platygobio gulonellus | Platygobio gracilis. |
| 85 | Ceratichthys cyclotis | Hybopsis kentuckiensis. |
| 85 | Rhinichthys maxillosus | Rhinichthys cataractæ dulcis. |
| 85 | Ictalurus cærulescens | Ictalurus punctatus. |
| 86 | Ictalurus notatus | Do. |
| 86 | Amia calva | Amia calva. |
| 86 | Lepidosteus *otarius* | Lepisosteus osseus. |

**1870.** EDWARD D. COPE. A partial synopsis of the fishes of the fresh waters of North Carolina. <Proc. Amer. Philos. Soc. 1869–70 (June 7, 1870), 448–495.

In this paper, page 482, *Carpiodes grayi* (=*Carpiodes velifer*) is described as new. The definite locality is not known, but Prof. Cope says "it is probably from one of the Western States."

**1870.** AUG. DUMÉRIL. Histoire naturelle des poissons, ou ichthyologie générale, vol. II, 1870.

In this work the common sturgeon of the Great Lakes and the Mississippi Valley is described as new no fewer than sixteen times. The types of three of these nominal species are reputed to have come from the Missouri Basin. They are the following: *Acipenser* (*Huso*) *copei*, Upper Missouri; *Acipenser* (*Huso*) *rauchii*, Osage River, Missouri, and *Acipenser* (*Huso*) *anasimos*, Missouri River, near St. Louis.

**1871.** EDWARD D. COPE. Recent reptiles and fishes. Report on the reptiles and fishes obtained by the naturalists of the expedition. <Preliminary Report U. S. Geological Survey of Wyoming and portions of contiguous territory, being a second annual report of progress, 432–442, 1870 (1871).

This paper is a report upon the fishes collected by the naturalists of the Hayden Survey during the season of 1870. Most of the specimens were probably collected by C. P. Carrington, zoologist, and Henry D. Schmidt, naturalist, of the expedition. Some were obtained by Dr. W. A. Hammond, and others by Dr. William Stimpson.

| Page. | Nominal species. | Present name. | Locality. |
|---|---|---|---|
| 433 | Salmo (Salar) *stomias*..... | Salmo mykiss stomias..... | Platte [Kansas] River near Fort Riley. |
| 434 | Catostomus sucklii ..... | Catostomus commersonii... | Platte River. |
| 434 | Catostomus griseum..... | Catostomus griseus ..... | Horse Creek, Red Cloud Creek, Platte River. |
| 437 | Ptychostomus *bucco* ..... | Moxostoma bucco..... | St. Joseph, Mo. |
| 437 | Campostoma anomalum..... | Campostoma anomalum.... | Probably headwaters of Platte River. |
| 437 | Coliscus *parietalis*..... | Pimephales promelas..... | Missouri River near St. Joseph. |
| 437 | Hybopsis *missuriensis*..... | Notropis blennius..... | Near St. Joseph, Mo. |
| 438 | Hybopsis *scylla*..... | Notropis scylla..... | Red Cloud Creek. |
| 438 | Photogenis *piptolepis*..... | Notropis piptolepis..... | North Platte River and Red Cloud Creek. |
| 439 | Hypsilepis cornutus..... | Notropis cornutus ..... | Red Cloud Creek. |
| 439 | Cyprinella *billingsiana* ..... | Notropis lutrensis..... | St. Joseph, Mo. |
| 439 | Moniana *jugalis* ..... | .....do..... | Do. |
| 440 | Alburnellus *percobromus*... | Notropis rubrifrons..... | Do. |
| 440 | Sarcidium *scopiferum*..... | Phenacobius scopifer..... | Missouri River near St. Joseph, Mo. |
| 442 | Rhinichthys maxillosus .... | Rhinichthys cataractæ dulcis. | Red Cloud Creek and Platte River. |
| 442 | Noturus flavus..... | Noturus flavus..... | Platte River. |

**1872.** EDWARD D. COPE. Report on the recent reptiles and fishes of the survey, collected by Campbell Carrington and C. M. Dawes. <Preliminary Report U. S. Geological Survey of Montana and portions of adjacent territory, being a fifth annual report of progress, 467–476, 1872.

Only three or four species from the Missouri Basin are mentioned in this paper.

| Page. | Nominal species. | Present name. | Locality. |
|---|---|---|---|
| 469 | Thymallus tricolor ... | Thymallus signifer ontariensis. | Yellow Creek and the Gallatin Fork of the Missouri in Montana; headwaters of Yellowstone. |
| 471 | Salmo *plcuriticus* ..... | Salmo mykiss stomias and Salmo mykiss lewisi. | Platte River and Yellowstone River; Yellow Creek and Gallatin Fork of Missouri, Montana; Yellowstone Lake. |
| 476 | Uranidea punctulata. | Cottus bairdi punctulatus. | Gallatin Fork of the Missouri River. |

**1874.** EDWARD D. COPE. On the *Plagopterinæ* and the ichthyology of Utah. <Proc. Amer. Philos. Soc. Phila. 1874, 129–139, 1–11 of reprint.

In this paper one species is recorded from the Missouri Basin, viz: *Fundulus floripinnis*, which is described as new (as *Haplochilus floripinnis*, on page 10 of reprint). The specimens were obtained by Mr. J. M. Keasbey from the South Platte River near Denver.

**1874.** GEORGE SUCKLEY. On the North American species of salmon and trout. <Report U. S. Fish Comm. 1872–73 (1874), 91–160.

This paper was written by Dr. Suckley in 1861, but was not printed and published until 1874. Only one species is mentioned from the Missouri Basin, viz: *Salmo mykiss lewisi* (as *Salmo lewisi*), on page 139, from headwaters of the Missouri (Dr. Suckley; Dr. Cooper); southern tributaries of the Yellowstone; Black Hills, Nebr. (Dr. Hayden); on page 140, "Falls of the Missouri in Nebraska" (Dr. Cooper); "Great Falls of the Missouri" (the types; Dr. Suckley).

**1874.** JAMES W. MILNER. Notes on the grayling of North America. <Report U. S. Fish Comm. 1872–73 (1874), 729–742.

In this paper, p. 741, Professor Milner describes the grayling of the headwaters of the Missouri as a new species, to which he gives the name *Thymallus montanus*. The type came from Camp Baker, Montana.

**1876.** E. D. COPE and H. C. YARROW. Report upon the collections of fishes made in portions of Nevada, Utah, California, Colorado, New Mexico, and Arizona, during the years 1871, 1872, 1873, and 1874. <U. S. Geographical Surveys west of the one hundredth meridian, in charge of First Lieut. G. M. Wheeler, Corps of Engineers, U. S. Army, vol. V, Zoology, Fishes, 635–703, pls. XXVI–XXXII, 1875 (1876).

The only species mentioned in this report from the Missouri Basin is *Fundulus floripinnis* (as *Haplochilus floripinnis*, p. 695, pl. XXVIII, figs. 4, 4*a*, 4*b*), from Denver, Colo.

**1876.** THEODORE GILL. Report on [the] ichthyology [of Captain Simpson's explorations across the Great Basin of the Territory of Utah in 1859]. Appendix L, 385–431, pls. I–IX, 1876.

In this report the following species are mentioned as having been obtained from Missouri Basin localities:

| Page. | Nominal species. | Present name. | Locality. |
|---|---|---|---|
| 408 | Platygobio communis..... | Platygobio gracilis..... | Platte Valley.* |
| 417 | Ictalurus simpsoni..... | Ictalurus punctatus ..... | Big Sandy River of Kansas. |
| 420 | Amiurus obesus ..... | Ameiurus melas..... | Probably Nebraska. |
| 423 | Noturus occidentalis..... | Noturus flavus..... | Platte River. |

*The specimens of this species which Dr. Gill records from "Green River, Utah," almost certainly came from some point in the Missouri Basin. It is not known to occur in the Green River Basin. This is not the Big Sandy Fork of Green River, but probably the Platte, or possibly the Arkansas.

**1878.** DAVID STARR JORDAN. Report on the collection of fishes made by Dr. Elliott Coues, U. S. A., in Dakota and Montana during the seasons of 1873 and 1874. <Bull. U. S. Geol. and Geog. Surv. Terr., IV, 1878.

The fishes reported upon in this paper were collected by Dr. Elliott Coues, naturalist of the United States Northern Boundary Survey. The localities are not, in most cases, stated with such definiteness as is desirable. The following 9 species are reported from the Missouri Basin:

| Page. | Nominal species. | Present name. | Locality. |
|---|---|---|---|
| 777 | Scaphyrynchus platyrhynchus. | Scaphirhynchus platorynchus.. | Fort Buford, N. Dak. |
| 777, 778 | Ichthælurus punctatus..... | Ictalurus punctatus ..... | Big Muddy River. |
| 777, 792 | Hyodon chrysopsis..... | Hiodon alosoides..... | Quaking Ash River. |
| 777 | Catostomus teres..... | Catostomus commersonii..... | Five Forks of Milk River; headwaters of Milk River. |
| 777, 780 | Pantosteus virescens..... | Pantosteus jordani ..... | Sweet Grass Hills. |
| 777, 797 | Salmo clarki..... | Salmo mykiss lewisi ..... | St. Marys River. |
| 777 | Polyodon folium (?)..... | Polyodon spathula..... | Do. |
| 778, 798 | Esox lucius..... | Lucius lucius..... | Do. |
| 791 | Cliola chlora..... | Notropis scylla ..... | Upper Missouri. |

**1879.** E. D. COPE. A contribution to the zoology of Montana. <American Naturalist, XIII, July, 1879, 432–441.

In the summer and autumn of 1876 Professor Cope made an expedition into Montana and South Dakota, the special object of which was the investigation of the beds of the Judith River lignite formation and the extraction of their fossils. Some attention was given to the present fauna of the region, and this paper contains his notes on the fishes and other animals observed. The fishes mentioned were seen chiefly in the vicinity of Fort Benton, on the Missouri River, in longitude 110° 40′ west, latitude 47° 50′ north, and near the mouth of Battle Creek, which empties into the Missouri a short distance north of the mouth of the Moreau River, South Dakota, longitude 100° 30′ west, latitude 45° 25′ north. The streams from which fishes are recorded in this paper are: Missouri River at Fort Benton and near mouth of Battle Creek; lower portion of Battle Creek, South Dakota; Judith River, Montana, and headwaters of the Upper Missouri.

| Page. | Nominal species. | Present name. | Locality. |
|---|---|---|---|
| 439? 440? | Lucioperca borea..... | Stizostedion canadense borcum. | Missouri River at Fort Benton and elsewhere, abundant. |
| 440 | Lota maculosa..... | Lota lota maculosa..... | Battle Creek. |
| 440 | Ichthelurus punctatus... | Ictalurus punctatus ..... | Pools left by river near Battle Creek. |
| 440 | Semotilus corporalis..... | Semotilus atromaculatus ..... | Battle Creek. |
| 440 | Pogonichthys communis . | Platygobio gracilis ..... | Fort Benton, Judith River. |
| 440 | Rhinichthys maxillosus.. | Rhinichthys cataractæ dulcis. | Battle Creek. |
| 440 | Phoxinus *milnerianus*.... | Leuciscus milnerianus..... | Battle Creek, probably. |
| 440 | Chrosomus sp. (?) ..... | Chrosomus dakotensis?..... | Battle Creek. |
| 440 | Hybognathus evansi ..... | Hybognathus nuchale evansi. | Do. |
| 440 | Hyborhynchus nigellus.. | Pimephales promelas..... | Do. |
| 441 | Hyodon tergisus ..... | Hiodon tergisus..... | Judith River and river pools near Battle Creek. |
| 441 | Coregonus williamsonii .. | Coregonus williamsoni cismontanus. | Heads of tributaries of the Upper Missouri. |
| 441 | Lepidosteus productus... | Lepisosteus platostomus..... | River pools near Battle Creek. |
| 441 | Lepidosteus otarius..... | Lepisosteus osseus..... | Do. |
| 441 | Scaphirhynchops platyrhynchus. | Scaphirhynchus platorynchus. | Missouri River at Fort Benton. |

**1881.** SAMUEL GARMAN. New and little-known reptiles and fishes in the Museum collections. Bull. Mus. Comp. Zool., VIII, No. 3, 85–93, February, 1881.

This paper contains a single reference to the Missouri Basin. On page 88 *Fundulus lineatus* is described as new (as *Zygonectes lineatus*), and "northeastern Wyoming" is given as the type locality.

**1881a.** SAMUEL GARMAN. North American fresh-water fishes (1). Science Observer, vol. III, No. 8, 1881, 57–63.

In this paper is given a synopsis of the species of *Rhinichthys*. The western dace (*Rhinichthys cataractæ dulcis*) is recorded from Missouri Basin localities as follows: Northeast Wyoming and Montana (as *R. ocella* sp. nov.); Cheyenne, Wyo. (as *R. dulcis*); and from Kansas (as *R. maxillosus*).

**1883.** DAVID S. JORDAN and CHARLES H. GILBERT. Synopsis of the fishes of North America. Bull. U. S. Nat. Mus., 16, 1882 (1883).

In the Synopsis are several references to Missouri Basin localities, none of them, however, being original references.

**1884.** SETH E. MEEK. Description of a new species of *Hybopsis* (*Hybopsis montanus*).

This species was described from three specimens (No. 36882, U. S. N. M.) collected by Dr. F. V. Hayden. The exact locality is not known, but it is presumably somewhere in the Upper Missouri region.

**1884.** DAVID S. JORDAN. Descriptions of four new species of *Pœcilichthys* in the United States National Museum. <Proc. U. S. Nat. Mus., VII, 1884, 477–480.

On page 479 of this paper *Pœcilichthys beani* (=*Boleosoma nigrum*) is described as new. The type (No. 35754, U. S. N. M.) came from Tabo Creek, Lafayette County, Mo.

**1884.** CHARLES H. GILBERT. Notes on the fishes of Kansas. <Bulletin Washburn Laboratory of Natural History, vol. I, No. 1, 10–16, September, 1884.

In 1883 the Washburn College laboratory of natural history (Topeka, Kans.) began a biological survey of the State of Kansas, under Prof. Francis W. Cragin, director, at that time professor of natural history in Washburn College. The fishes, which were collected chiefly by Professor Cragin and his students and by Dr. Watson, of Ellis, Kans., were studied by Dr. Gilbert. This paper and three others published in 1885, 1886, and 1889, respectively, contain the results of his examination of the different collections.

| Page. | Nominal species. | Identification. | Locality. |
|---|---|---|---|
| 10 | Amiurus melas | Ameiurus melas | Kansas River, Topeka. |
| 10 | Ictiobus carpio | Carpiodes carpio | Manhattan, Riley County, Ward Creek. |
| 10 | Catostomus teres | Catostomus commersonii | Shunganunga Creek and Kansas River, Topeka. |
| 11 | Campostoma anomalum | Campostoma anomalum | Alma, Wabaunsee County; Kansas River, Topeka; Ellis, Ellis County. |
| 11 | Hybognathus nuchalis | Hybognathus nuchale | Ward Creek, Menoken; Kansas River, Topeka. |
| 11 | Pimephales confertus | Pimephales promelas | Ellis, Ellis County. |
| 12 | Pimephales notatus | Pimephales notatus | Ward Creek. |
| 12 | Cliola straminea | Notropis blennius | Do. |
| 13 | Cliola (Hybopsis) *topeka* | Notropis topeka | Shunganunga Creek, Topeka. |
| 13 | Cliola (?) gibbosa | Notropis lutrensis | Ward Creek. |
| 14 | Minnilus cornutus | Notropis cornutus | Ellis, Ellis County. |
| 14 | Minnilus (Lythrurus) *nigripinnis*. | Notropis umbratilis umbratilis. | Shunganunga Creek, Topeka. |
| 14 | Phenacobius mirabilis | Phenacobius mirabilis | Ward Creek. |
| 15 | Semotilus corporalis | Semotilus atromaculatus | Shunganunga Creek, Topeka. |
| 15 | Fundulus zebrinus | Fundulus zebrinus | Ellis, Ellis County. |
| 16 | Lepomis humilis | Lepomis humilis | Ward and Shunganunga creeks, Topeka. |
| 16 | Pœcilichthys cœruleus | Etheostoma lepidum | Ellis, Ellis County. |

**1885.** CHARLES H. GILBERT. Description of three new fishes from Kansas. <Proc. U. S. Nat. Mus., VII, 1884 (January 19, 1885), 512-514.

Two of these three species are from Missouri Basin localities, viz: *Cliola* (*Hybopsis*) *topeka* (=*Notropis topeka*) from Shunganunga Creek, Topeka (type, No. 36609, U. S. N. M., coll. Prof. F. W. Cragin), and *Minnilus* (*Lythrurus*) *nigripinnis* (=*Notropis umbratilis umbratilis*), also from Shunganunga Creek, Topeka (type, No. 36613, coll. Prof. Cragin). The first publication of these names was really in the preceding paper.

**1885.** DAVID STARR JORDAN and SETH E. MEEK. List of fishes collected in Iowa and Missouri in August, 1884, with descriptions of three new species. <Proc. U. S. Nat. Mus. 1885, 1-17.

The explorations upon which this paper was based were carried on during August, 1884, under the auspices of the United States National Museum and the United States Fish Commission. The field work was under the direction of Dr. Jordan, assisted by Mr. Meek.

Collections were made in the Missouri Basin at the following places:

(*a*) At Bedford, Taylor County, Iowa, from the east fork of Hundred and Two River, and at Marysville, Nodaway County, Mo., from Hundred and Two River.
(*b*) At St. Joseph, Mo., from Missouri River on the Kansas shore opposite the city.
(*c*) About 6 miles east of Lexington, Lafayette County, Mo., from Tabo Creek, a small tributary of the Missouri.
(*d*) At Brownsville, Saline County, Mo., from Blackwater Creek, and near Sedalia, Pettis County, Mo., from Flat Creek. Both of these creeks are small tributaries of La Mine River, which flows into the Missouri northeast of Sedalia.
(*e*) At Clinton, Henry County, Mo., from Grand River, and at Calhoun, in the same county, from Tabo Creek, a small tributary of Grand River. Grand River flows into the Osage River at Warsaw, a few miles southeast of Clinton, and the latter stream unites with the Missouri just below Jefferson City.

Nineteen species were obtained from Hundred and Two River:

Noturus flavus.
Ameiurus melas.
Ictalurus punctatus.
Carpiodes velifer (as Ictiobus velifer).
Catostomus commersonii (as C. teres).
Hybognathus nuchale.
Pimephales promelas.
Pimephales notatus.
Notropis blennius (as N. deliciosus).
Notropis topeka (only at Bedford, from an abandoned stone quarry).
Notropis lutrensis.
Notropis umbratilis.
Notropis cornutus (as N. megalops).
Phenacobius mirabilis.
Hybopsis kentuckiensis (as H. biguttatus).
Semotilus atromaculatus.
Lepomis humilis.
Apomotis cyanellus (as Lepomis cyanellus).
Boleosoma nigrum (as Boleosoma olmstedi maculatum).

From the Missouri River, opposite St. Joseph, the following 22 species were collected:

Lepisosteus osseus.
Leptops olivaris.
Ameiurus melas.
Ameiurus natalis.
Ictalurus punctatus.
Ictalurus furcatus.
Ictiobus cyprinella.
Ictiobus urus.
Ictiobus bubalus.
Ictiobus carpio.
Hybognathus nuchale.
Notropis blennius (as N. deliciosus).
Platygobio gracilis.
Hybopsis meeki (as H. gelidus).
Dorosoma cepedianum.
Hiodon alosoides.
Micropterus salmoides.
Apomotis cyanellus (as Lepomis cyanellus).
Lepomis pallidus.
Pomoxis annularis.
Stizostedion canadense.
Aplodinotus grunniens.

From Tabo Creek, near Lexington, 9 species were obtained, viz:

Ameiurus melas.
Ictalurus punctatus.
Notropis blennius (as N. deliciosus).
Notropis lutrensis.
Phenacobius mirabilis.
Semotilus atromaculatus.
Hiodon alosoides.
Dorosoma cepedianum.
Apomotis cyanellus (as Lepomis cyanellus).

From the tributaries (Blackwater and Flat creeks) of La Mine River 24 species were obtained, viz:

Noturus flavus.
Ameiurus melas.
Carpiodes velifer (as Ictiobus velifer).
Catostomus commersonii (as C. teres).
Moxostoma aureolum (as M. macrolepidotum duquesnii).
Campostoma anomalum.
Pimephales notatus.
Notropis blennius (as N. deliciosus).
Notropis lutrensis.
Notropis umbratilis.
Notropis cornutus (as N. megalops).
Notropis rubrifrons.
Abramis crysoleucas (as Notemigonus americanus chrysoleucus; from Blackwater Creek only).
Phenacobius mirabilis.
Hybopsis kentuckiensis (as H. biguttatus).
Semotilus atromaculatus.
Labidesthes sicculus.
Micropterus salmoides.
Apomotis cyanellus (as Lepomis cyanellus).
Lepomis humilis.
Pomoxis annularis.
Boleosoma nigrum (as Boleosoma olmstedi maculatum).
Etheostoma cæruleum spectabile (as E. variatum spectabile).
Aplodinotus grunniens.

From the tributaries (Grand River and Tabo Creek) of Osage River the following 27 species were secured:

Lepisosteus osseus.
Noturus flavus.
Ameiurus melas.
Leptops olivaris.
Ictalurus punctatus.
Carpiodes velifer (as Ictiobus velifer).
Catostomus commersonii (as C. teres).
Campostoma anomalum.
Pimephales notatus.
Cliola vigilax.
Notropis blennius (as N. deliciosus).
Notropis gilberti.
Notropis dilectus.
Notropis umbratilis.
Notropis cornutus (as N. megalops).
Notropis lutrensis.
Phenacobius mirabilis.
Hybopsis storerianus.
Semotilus atromaculatus.
Micropterus salmoides.
Dorosoma cepedianum.
Apomotis cyanellus (as Lepomis cyanellus).
Lepomis humilis.
Hadropterus phoxocephalus.
Boleosoma nigrum (as B. olmstedi maculatum).
Etheostoma cæruleum spectabile (as E. variatum spectabile).
Aplodinotus grunniens.

**1885a.** CHARLES H. GILBERT. Second series of notes on the fishes of Kansas. <Bull. Washburn Lab. Nat. Hist., vol. 1, No. 3, 97-99.

This is the second of the four papers of Dr. Gilbert based upon the collections made by Prof. F. W. Cragin in connection with the biological survey of Kansas conducted by the Washburn College laboratory of natural history.

Specimens were obtained from the following streams:

(*a*) Ward Creek, Shunganunga Creek, and Kansas River, in Shawnee County, near Topeka; collectors, Messrs. Ralph McCampbell and Dana McVicar. Menoken, Shawnee County; collector, Mr. L. T. Matthews.
(*b*) Manhattan, Riley County; collector, Prof. E. A. Popenoe.
(*c*) Mill Creek, at Alma, Wabaunsee County; collectors, Professor Cragin and Mr. Jerry Fields.
(*d*) Ellis, Ellis County; collector, Dr. L. Watson.

| Page. | Nominal species. | Identification. | Locality. |
|---|---|---|---|
| 97 | Ictalurus punctatus | Ictalurus punctatus | Ward Creek. |
| 97 | Amiurus melas | Ameiurus melas | Shunganunga and Ward creeks. |
| 97 | Ictiobus carpio | Carpiodes carpio | Manhattan and Ward Creek. |
| 98 | Catostomus teres | Catostomus commersonii | Shunganunga Creek and Kansas River. |
| 98 | Moxostoma macrolepidotum | Moxostoma aureolum | Shunganunga Creek. |
| 98 | Campostoma anomalum | Campostoma anomalum | Shunganunga Creek, Kansas River, Ellis, and Mill Creek. |
| 98 | Hybognathus nuchalis | Hybognathus nuchale | Ward Creek, Menoken, and Kansas River. |
| 98 | Pimephales promelas | Pimephales promelas | Shunganunga Creek, Kansas River, Ward and Mill creeks and Ellis. |
| 98 | Pimephales notatus | Pimephales notatus | Shunganunga and Ward creeks. |
| 98 | Notropis topeka | Notropis topeka | Shunganunga Creek and Ellis. |
| 98 | Notropis lutrensis | Notropis lutrensis | Ward and Shunganunga creeks. |
| 98 | Notropis megulops | Notropis cornutus | Ellis; Shunganunga, Ward, and Mill creeks. |
| 98 | Notropis nigripinnis | Notropis umbratilis umbratilis. | Shunganunga Creek. |
| 98 | Phenacobius mirabilis | Phenacobius mirabilis | Shunganunga and Ward creeks. |
| 98 | Hybopsis biguttatus | Hybopsis kentuckiensis | Mill Creek. |
| 99 | Semotilus atromaculatus | Semotilus atromaculatus | Mill and Shunganunga creeks. |
| 99 | Fundulus zebrinus | Fundulus zebrinus | Ellis. |
| 99 | Lepomis humilis | Lepomis humilis | Ellis; Ward and Shunganunga creeks. |
| 99 | Lepomis cyanellus | Apomotis cyanellus | Ward and Shunganunga creeks. |
| 99 | Etheostoma variatum | Etheostoma cæruleum spectabile. | Ellis. |

**1885.** F. W. CRAGIN. Note on the chestnut lamprey. <Bull. Washburn Lab. Nat. Hist., vol. 1, No. 3, 99–100.

In this note Professor Cragin records the occurrence of the chestnut lamprey (*Ichthyomyzon castaneus*) in Mill Creek, Shawnee County, Kans.

**1885a.** F. W. CRAGIN. Preliminary list of Kansas fishes. <Bull. Wash. Coll. Lab. Nat. Hist., vol. 1, No. 3, 105–111.

This is a list of 91 nominal species thought to inhabit the waters of Kansas. Of this number 69 are credited to that portion of the State lying in the Missouri basin. These are given in the following tabular list:

| Page. | Nominal species. | Identification. | Locality. |
|---|---|---|---|
| 106 | Ammocœtes nigor | Lampetra wilderi | Kansas River at Lawrence (Snow). |
| 106 | Petromyzon argenteus | Ichthyomyzon concolor | Osage River (Prof. Wheeler). |
| 106 | Petromyzon castaneus | Ichthyomyzon castaneus | Mill Creek, Wabaunsee County (Cragin). |
| 106 | Polyodon spathula | Polyodon spathula | Kansas River at Lawrence (Snow). |
| 106 | Acipenser rubicundus | Acipenser rubicundus | Do. |
| 106 | Scaphirhynchops platyrrhynchus. | Scaphirhynchus platorynchus. | Kansas River at Topeka (Cragin) and Lawrence (Snow). |
| 106 | Lepidosteus osseus | Lepisosteus osseus | Kansas River (Cragin) and Osage River (Wheeler). |
| 106 | Lepidosteus platystomus | Lepisosteus platostomus | Kansas River at Topeka (Cragin), and Osage River (Wheeler). |
| 106 | Litholepis tristœchus | Lepisosteus osseus(?) | Kansas River at Junction City (Cragin). |
| 107 | Leptops olivaris | Leptops olivaris | Kansas River (Cragin), Lawrence (Snow), and Osage River (Wheeler). |
| 107 | Amiurus nebulosus | Ameiurus nebulosus | Topeka (Cragin), Lawrence (Snow), and Ottawa (Wheeler). |

| Page. | Nominal species. | Identification. | Locality. |
|---|---|---|---|
| 107 | Amiurus natalis | Ameiurus natalis | Kansas River (Snow). |
| 107 | Ictalurus albidus | Ictalurus punctatus (?) | Osage River (Wheeler). |
| 107 | Ictalurus lacustris | Ictalurus furcatus (?) | Kansas River (Snow) and Osage River (Wheeler). |
| 107 | Ictalurus punctatus | Ictalurus punctatus | Kansas River, Silver Lake, Ward Creek, and Mill Creek (Cragin); Manhattan (Prof. Popenoe); Blue River (Graham). |
| 107 | Ictalurus furcatus | Ictalurus furcatus | Kansas River (Snow). |
| 107 | Ictiobus cyprinella | Ictiobus cyprinella | Soldier Creek in Shawnee County (Cragin); Osage River (Wheeler). |
| 107 | Ictiobus urus | Ictiobus urus | Silver Lake and Soldier Creek in Shawnee County (Cragin). |
| 107 | Ictiobus bubalus | Ictiobus bubalus | Kansas River (Snow). |
| 107 | Ictiobus carpio | Carpiodes carpio | Silver Lake and Ward Creek in Shawnee County (Cragin); Fort Riley (Cope). |
| 107 | Ictiobus bison | Carpiodes velifer | Ottawa (Wheeler). |
| 107 | Ictiobus velifer | ....do | Eureka Lake (Graham). |
| 107 | Cycleptus elongatus | Cycleptus elongatus | Kansas River between Manhattan and Topeka (Cragin). |
| 107 | Catostomus teres | Catostomus commersonii | Shunganunga Creek and Kansas River (Cragin); Wild Cat Creek (Graham); Osage River (Wheeler); Fort Riley (Abbott). |
| 108 | Catostomus nigricans | Catostomus nigricans | Osage River (Wheeler). |
| 108 | Erimyzon sucetta | Erimyzon sucetta | Kansas River (Snow). |
| 108 | Minytrema melanops | Minytrema melanops | Osage River (Wheeler); Mill Creek (Cragin). |
| 108 | Moxostoma macrolepidotum. | Moxostoma aureolum | Soldier Creek, Shunganunga Creek and Silver Lake (Cragin); Osage River (Wheeler); Blue River (Graham). |
| 108 | Moxostoma aureolum | ....do | Kansas River (Snow). |
| 108 | Campostoma anomalum | Campostoma anomalum | Kansas River, Shunganunga Creek, Mill Creek, and Ellis (Cragin); Wild Cat Creek (Graham). |
| 108 | Hybognathus nuchalis | Hybognathus nuchale | Kansas River and Ward Creek (Cragin); Fort Riley (Cope). |
| 108 | Pimephales promelas | Pimephales promelas | Kansas River at Topeka and small streams in Shawnee, Wabaunsee, and Ellis counties (Cragin). |
| 108 | Pimephales notatus | Pimephales notatus | Shunganunga and Ward creeks (Cragin). |
| 108 | Notropis hudsonius | Notropis hudsonius | Wild Cat Creek (Graham). |
| 108 | Notropis topeka | Notropis topeka | Shunganunga Creek and Ellis (Cragin). |
| 108 | Notropis lutrensis | Notropis lutrensis | Shunganunga and Ward creeks (Cragin). |
| 108 | Notropis billingsiana | ....do | Missouri River at St. Joseph (Cope). |
| 108 | Notropis megalops | Notropis cornutus | Shawnee, Wabaunsee, and Ellis counties (Cragin). |
| 109 | Notropis atripinnis | Notropis umbratilis umbratilis. | Shunganunga Creek (Cragin). |
| 109 | Notropis percobromus | Notropis rubrifrons | St. Joseph, Mo. (Cope). |
| 109 | Phenacobius mirabilis | Phenacobius mirabilis | Shunganunga and Ward creeks (Cragin). |
| 109 | Rhinichthys maxillosus | Rhinichthys cataractæ dulcis. | Fort Riley (Cope). |
| 109 | Hybopsis biguttatus | Hybopsis kentuckiensis | Mill Creek (Cragin); Fort Riley (Cope). |
| 109 | Platygobio gracilis | Platygobio gracilis | Fort Riley (Cope). |

| Page. | Nominal species. | Identification. | Locality. |
|---|---|---|---|
| 109 | Semotilus atromaculatus ... | Semotilus atromaculatus ... | Shunganunga and Mill creeks (Cragin); Fort Riley (Cope). |
| 109 | Hyodon tergisus..... | Hiodon tergisus ..... | Kansas River at Topeka (Cragin). |
| 109 | Hyodon alveoides ..... | Hiodon alosoides ..... | Silver Lake (Cragin). |
| 109 | Dorosoma cepedianum ..... | Dorosoma cepedianum..... | Shunganunga and Ward creeks (Cragin). |
| 109 | Salmo purpuratus stomias.. | Salmo mykiss stomias ..... | Kansas River (Cope). |
| 109 | Percopsis hammondi..... | Percopsis guttatus..... | Kansas (Gill). |
| 110 | Fundulus zebrinus..... | Fundulus zebrinus..... | Ellis (Cragin). |
| 110 | Anguilla rostrata..... | Anguilla chrysypa ..... | Kansas River at Lawrence (Snow) and at Topeka (Cragin). |
| 110 | Pomoxys annularis ..... | Pomoxis annularis..... | Soldier Creek (Cragin). |
| 110 | Pomoxys sparoides ..... | Pomoxis sparoides..... | Osage River (Wheeler). |
| 110 | Ambloplites rupestris ..... | Ambloplites rupestris ..... | Kansas River (Snow). |
| 110 | Lepomis cyanellus..... | Apomotis cyanellus ..... | Shunganunga and Ward creeks (Cragin). |
| 110 | Lepomis humilis..... | Lepomis humilis..... | Shunganunga and Ward creeks and Ellis (Cragin). |
| 110 | Lepomis gibbosus ..... | Euponotis gibbosus ..... | Osage River at Ottawa (Wheeler). |
| 110 | Micropterus salmoides ..... | Micropterus salmoides ..... | Soldier Creek (Cragin). |
| 110 | Ammocrypta pellucida ..... | Ammocrypta pellucida ..... | Kansas River (Snow). |
| 110 | Boleosoma nigrum..... | Boleosoma nigrum..... | Near Fort Riley (Cope). |
| 110 | Diplesion bleunioides..... | Diplesion bleunioides..... | Wild Cat Creek (Graham). |
| 111 | Etheostoma variatum..... | Etheostoma cæruleum spectabile. | Ellis (Cragin). |
| 111 | Stizostedion vitreum ..... | Stizostedion vitreum ..... | Soldier Creek (Cragin). |
| 111 | Stizostedion canadense ..... | Stizostedion canadense boreum. | Mill Creek (Graham). |
| 111 | Roccus chrysops..... | Roccus chrysops..... | Do. |
| 111 | Roccus interruptus..... | Morone interrupta..... | Kansas River (Snow). |
| 111 | Aplodinotus grunniens..... | Aplodinotus grunniens ..... | Kansas River (Cragin). |
| 111 | Lota maculosa ..... | Lota lota maculosa..... | Missouri River at Wyandotte (Snow; Bean). |

**1885**. I. D. GRAHAM. Preliminary list of Kansas fishes. <Trans. Kans. Ac. Sci., vol. IX, 1883-84 (1885), 69-78.

This paper seems to be merely a compilation and contains no definite original locality references. Several of the references need verification

| Page. | Nominal species. | Identification. | Locality.* |
|---|---|---|---|
| 70 | Ammocœtes niger..... | Lampetra wilderi..... | Wild Cat Creek near Manhattan. |
| 70 | Petromyzon argenteus..... | Ichthyomyzon concolor..... | Cottonwood River. |
| 70 | Polyodon spathula..... | Polyodon spathula..... | Kansas River, Manhattan. |
| 70 | Scaphirhynchops platyrrhynchus. | Scaphirhynchus platorynchus. | Kansas, common over the State. |
| 70 | Acipenser rubicundus..... | Acipenser rubicundus..... | Kansas River. |
| 70 | Lepidosteus osseus..... | Lepisosteus osseus..... | Common in all streams in Kansas. |
| 71 | Lepidosteus platystomus... | Lepisosteus platostomus... | Kansas River. |
| 71 | Amia calva..... | Amia calva..... | Branches of Missouri River, Osage River, etc. |
| 71 | Noturus miurus..... | Schilbeodes miurus..... | Branches of Missouri River. |
| 71 | Noturus exilis..... | Schilbeodes exilis..... | Osage River, etc. |
| 71 | Leptops olivaris..... | Leptops olivaris..... | Kansas River. |
| 71 | Amiurus melas..... | Ameiurus melas..... | Common over the State. |
| 71 | Amiurus natalis..... | Ameiurus natalis..... | Kansas River. |
| 71 | Amiurus nebulosus..... | Ameiurus nebulosus..... | Plentiful. |
| 71 | Ictalurus punctatus..... | Ictalurus punctatus..... | Quite common. |
| 71 | Ictalurus furcatus..... | Ictalurus furcatus..... | Large streams. |
| 71 | Ictiobus carpio..... | Carpiodes carpio..... | Kansas River. |
| 72 | Ictiobus velifer..... | Carpiodes velifer..... | Do. |
| 72 | Ictiobus velifer bison..... | .....do ..... | Do. |
| 72 | Ictiobus urus..... | Ictiobus urus..... | Kansas River and branches of the Missouri. |

*Some of the locality references given in this column seem somewhat vague, but we have used the phraseology of Mr. Graham.

| Page. | Nominal species. | Identification. | Locality. |
|---|---|---|---|
| 72 | Ictiobus bubalus | Ictiobus bubalus | Plentiful over State. |
| 72 | Ictiobus cyprinella | Ictiobus cyprinella | Eastern Kansas. |
| 72 | Cycleptus elongatus | Cycleptus elongatus | Kansas River. |
| 72 | Catostomus teres | Catostomus commersonii | Common over State. |
| 72 | Catostomus nigricans | Catostomus nigricans | Kansas River. |
| 72 | Moxostoma macrolepidotum. | Moxostoma aureolum | Plentiful. |
| 72 | Campostoma anomalum | Campostoma anomalum | Common in small streams. |
| 72 | Chrosomus erythrogaster | Chrosomus erythrogaster | Marais des Cygnes. |
| 72 | Hybognathus placita | Hybognathus nuchalo evansi. | Kansas River and other branches of the Missouri. |
| 73 | Pimephales promelas | Pimephales promelas | Kansas River. |
| 73 | Notropis hudsonius | Notropis hudsonius | Kansas River branches. |
| 73 | Notropis billingsiana | Notropis lutrensis | Kansas River and Missouri River at St. Joseph. |
| 73 | Notropis lutrensis | do | Very abundant. |
| 73 | Notropis lineolatus | Notropis scylla | Marais des Cygnes. |
| 73 | Notropis deliciosa | Notropis blennius | Kansas River branches. |
| 73 | Notropis topeka | Notropis topeka | Missouri River, St. Joseph. |
| 73 | Notropis rubifrons | Notropis rubifrons | Kansas and Missouri rivers. |
| 74 | Phenacobius mirabilis | Phenacobius mirabilis | Common throughout the State. |
| 74 | Hybopsis biguttatus | Hybopsis kentuckiensis | Very common. |
| 74 | Hybopsis gelidus | ?Hybopsis meeki | Branches of Missouri River. |
| 74 | Hybopsis storerianus | Hybopsis storerianus | Osage River and branches. |
| 74 | Platygobio gracilis | Platygobio gracilis | Kansas River. |
| 74 | Gila allinis | Gila robusta | Kansas River (erroneous). |
| 74 | Notemigonus chrysoleucus | Abramis crysoleucas | Eastern Kansas. |
| 74 | Hyodon alosoides | Hiodon alosoides | Kansas, Marais des Cygnes, and Missouri rivers. |
| 74 | Hyodon tergisus | Hiodon tergisus | Common. |
| 75 | Dorosoma cepedianum | Dorosoma cepedianum | Very common. |
| 75 | Fundulus zebrinus | Fundulus zebrinus | Kansas River and branches. |
| 75 | Fundulus diaphanus | Fundulus diaphanus | Kansas River. |
| 75 | Anguilla rostrata | Anguilla chrysypa | Believed to be common throughout the State. |
| 75 | Pomoxys annularis | Pomoxis annularis | Kansas River at Lawrence. |
| 75 | Chænobryttus gulosus | Chænobryttus gulosus | Kansas River. |
| 75 | Lepomis cyanellus | Apomotis cyanellus | Common. |
| 75 | Lepomis humilis | Lepomis humilis | Locally abundant. |
| 76 | Micropterus salmoides | Micropterus salmoides | Kansas River at Lawrence. |
| 76 | Micropterus dolomieu | Micropterus dolomieu | Marais des Cygnes. |
| 76 | Percina caprodes | Percina caprodes | Eastern Kansas. |
| 76 | Boleosoma olmstedi maculatum. | Boleosoma nigrum | Kansas River. |
| 76 | Diplesion blennioides | Diplesion blennioides | Wild Cat Creek, Manhattan. |
| 76 | Hadropterus phoxocephalus | Hadropterus phoxocephalus | Marais des Cygnes. |
| 76 | Etheostoma variatum | Etheostoma cæruleum | Kansas River. |
| 76 | Etheostoma fusiforme | Boleichthys fusiformis | Marais des Cygnes. |
| 77 | Stizostedion vitreum | Stizostedion vitreum | Kansas River. |
| 77 | Stizostedion canadense | Stizostedion canadense | Kansas River and Mill Creek. |
| 77 | Roccus chrysops | Roccus chrysops | Kansas River. |
| 77 | Aplodonatus (Aplodinotus) grunniens | Aplodinotus grunniens | Do. |
| 77 | Clupea chrysochloris | Pomolobus chrysochloris | Abundant in large streams. |

**1886.** CHARLES H. GILBERT. Third series of notes on Kansas fishes. <Bull. Washburn Laboratory of Natural History, vol. 1, No. 7, 207-211.

This is the third series of notes upon the collections made by the Washburn College Laboratory biological survey of Kansas. The Missouri Basin specimens reported upon in this paper came from the following places:

(*a*) Mission Creek, Shawnee County; collectors, Messrs. H. J. Adams and Ralph McCampbell.
(*b*) Snokomo Creek, Wabaunsee County; collector, Mr. Aaron Myers.
(*c*) Missouri River, Leavenworth; collectors, Professors Cragin and Kelly, and Messrs. Poston, Lange, and Johnston.
(*d*) Shunganunga Creek, Shawnee County; collectors, Professor Cragin and Mr. Myers.
(*e*) Blacksmith Creek, Shawnee County; collectors, Messrs. Adams and McCampbell.
(*f*) Spring near Maple Hill, Wabaunsee County.

| Page. | Nominal species. | Identification. | Locality. |
|---|---|---|---|
| 207 | Noturus flavus | Noturus flavus | Mission Creek, Snokomo Creek, Leavenworth. |
| 207 | Amiurus natalis | Ameiurus natalis | Shunganunga, Blacksmith, and Mission creeks. |
| 207 | Ictalurus furcatus | Ictalurus furcatus | Leavenworth. |
| 208 | Notropis rubrifrons | Notropis rubrifrons | Blacksmith and Snokomo creeks. |
| 209 | Hybopsis gelidus | Hybopsis meeki | Leavenworth. |
| 209 | Hadropterus aspro | Hadropterus aspro | Snokomo Creek. |
| 209 | Percina caprodes | Percina caprodes | Do. |
| 209 | Etheostoma cæruleum lepidum. | Etheostoma lepidum | Shunganunga Creek and Maple Hill. |
| 210 | Boleosoma olmstedi maculatum. | Boleosoma nigrum | Shunganunga, Blacksmith, and Snokomo creeks. |
| 210 | Lota lota maculosa | Lota lota maculosa | Leavenworth. |
| 210 | Amiurus melas | Ameiurus melas | Blacksmith Creek. |
| 210 | Ictalurus punctatus | Ictalurus punctatus | Blacksmith and Mission creeks. |
| 210 | Catostomus teres | Catostomus commersonii | Blacksmith Creek. |
| 210 | Campostoma anomalum | Campostoma anomalum | Do. |
| 210 | Pimephales promelas | Pimephales promelas | Do. |
| 210 | Notropis topeka | Notropis topeka | Do. |
| 210 | Notropis lutrensis | Notropis lutrensis | Do. |
| 210 | Notropis megalops | Notropis cornutus | Do. |
| 210 | Hybopsis biguttatus | Hybopsis kentuckiensis | Mission and Blacksmith creeks. |
| 211 | Semotilus atromaculatus | Semotilus atromaculatus | Do. |
| 211 | Lepomis cyanellus | Apomotis cyanellus | Blacksmith Creek. |
| 211 | Lepomis humilis | Lepomis humilis | Do. |

**1887.** R. ELLSWORTH CALL. Memoranda on a collection of fishes from the Ozark region of Missouri. <Proc. Davenport Ac. Nat. Sci., vol. v, 1887, 73-80.

The collections upon which this paper was based were made by Professor Call in June and July, 1886. The majority of the specimens came from the west fork of Black River and its smaller tributaries in Reynolds County, and from Jacks Fork and its tributaries in Shannon County. These streams are in southeastern Missouri and drain southward by way of the Black River, being no part of the Missouri system. A small collection was made in Texas County, in Piney River, a tributary of the Gasconade, which flows northeastward into the Missouri. In October and November of the same year Professor Call made some collections

in Bear and Hickson creeks, near Columbia, Boone County, which lies on the north side of the Missouri. In this paper 11 species are credited to Piney River, viz:

Ictalurus punctatus.
Catostomus nigricans (as Hypentelium nigricans).
Campostoma anomalum.
Hybognathus nubilum (as Dionda nubila).
Hybognathus nuchale.
Notropis blennius (as N. deliciosus).
Notropis whipplii (as N. notatus).
Notropis zonatus.
Notropis cornutus (as N. megalops).
Micropterus dolomieu.
Cottus bairdi (as Uranidea richardsoni).

In the same paper 5 species are reported from Hickson Creek, near Columbia, Boone County, viz:

Catostomus commersonii (as C. teres).
Schilbeodes exilis (as Noturus exilis).
Campostoma anomalum.
Apomotis cyanellus (as Lepomis cyanellus).
Moxostoma aureolum (as M. macrolepidotum.)

From Bear Creek, near Columbia, Boone County, the 10 following species are recorded:

Apomotis cyanellus (as Lepomis cyanellus).
Lepomis humilis.
Boleosoma nigrum (as B. olmstedi ozarcanum).
Campostoma anomalum.
Pimephales notatus.
Pimephales promelas.
Notropis blennius (as N. deliciosus missuriensis).
Semotilus atromaculatus.
Phenacobius scopifer (as P. mirabilis scopifer).
Pomoxis annularis.

**1887.** O. P. HAY. A contribution to the knowledge of the fishes of Kansas. <Proc. U. S. Nat. Mus. 1887, 242–253.

The fishes on which this paper was based were collected in July, 1885, by Prof. Hay, assisted by Prof. M. J. Thompson, of Bethany College.

Collections were made from the following streams:

(*a*) Republican River, Concordia, Cloud County, Kans.
(*b*) Small tributary of Solomon River, Beloit, Mitchell County, Kans.
(*c*) North fork of Solomon River, Kirwin, Phillips County, Kans.
(*d*) North fork of Solomon River, Lenora, Norton County, Kans.
(*e*) Saline River, north of Wakeeney, Trego County, Kans.
(*f*) Smoky Hill River, Wallace, Wallace County, Kans.

The following species were obtained:

| Page. | Nominal species. | Identification. | Locality. |
|---|---|---|---|
| 242 | Hyodon alosoides | Hiodon alosoides | Republican River. |
| 242 | Notropis lutrensis | Notropis lutrensis | Do. |
| 242 | Ictiobus velifer | Carpiodes velifer | Do. |
| 242 | Ictalurus punctatus | Ictalurus punctatus | Do. |
| 242 | Ameiurus melas | Ameiurus melas | Do. |
| 243 | Boleosoma olmstedi | Boleosoma nigrum | Solomon River at Beloit. |
| 243 | Lepomis humilis | Lepomis humilis | Do. |
| 243 | Lepomis cyanellus | Apomotis cyanellus | Do. |
| 243 | Semotilus atromaculatus | Semotilus atromaculatus | Do. |
| 243 | Phenacobius mirabilis | Phenacobius mirabilis | Do. |
| 243 | Notropis megalops | Notropis cornutus | Do. |
| 243 | Notropis lutrensis | Notropis lutrensis | Do. |
| 244 | Notropis macrostoma | ....do | Do. |
| 245 | Notropis *æneolus* | Notropis topeka | Do. |
| 246 | Notropis deliciosus | Notropis blennius | Do. |
| 246 | Notropis topeka | Notropis topeka | Do. |
| 246 | Pimephales notatus | Pimephales notatus | Do. |
| 247 | Pimephales promelas confertus. | Pimephales promelas | Do. |

| Page. | Nominal species. | Identification. | Locality. |
|---|---|---|---|
| 247 | Campostoma anomalum..... | Campostoma anomalum .... | Solomon River at Beloit. |
| 247 | Moxostoma macrolepidotum. | Moxostoma aureolum..... | Do. |
| 247 | Catostomus teres ..... | Catostomus commersonii.... | Do. |
| 247 | Ictiobus velifer ..... | Carpiodes velifer ..... | Do. |
| 247 | Ictalurus punctatus ..... | Ictalurus punctatus..... | Do. |
| 247 | Amiurus melas ..... | Ameiurus melas..... | Do. |
| 247 | Lepidosteus osseus ..... | Lepisosteus osseus ..... | Do. |
| 247 | Lepomis humilis..... | Lepomis humilis..... | North fork of Solomon River at Kirwin. |
| 247 | Semotilus atromaculatus ... | Semotilus atromaculatus ... | Do. |
| 247 | *Notropis megalops*..... | *Notropis cornutus*..... | Do. |
| 247 | Notropis deliciosus ..... | Notropis blennius ..... | Do. |
| 248 | Notropis lutrensis..... | Notropis lutrensis..... | Do. |
| 248 | Notropis æneolus..... | Notropis topeka ..... | Do. |
| 248 | Pimephales promelas confertus. | Pimephales promelas ..... | Do. |
| 248 | Pimephales notatus ..... | Pimephales notatus..... | Do. |
| 248 | Amiurus melas ..... | Ameiurus melas..... | Do. |
| 248 | Etheostoma lepidum..... | Etheostoma lepidum..... | North fork of Solomon River at Lenora. |
| 249 | Boleosoma olmstedi..... | Boleosoma nigrum..... | Do. |
| 249 | Lepomis cyanellus..... | Apomotis cyanellus..... | Do. |
| 249 | Fundulus zebrinus ..... | Fundulus zebrinus ..... | Do. |
| 249 | Squalius elongatus..... | Leuciscus elongatus..... | Do. |
| 249 | Semotilus atromaculatus... | Semotilus atromaculatus.... | Do. |
| 249 | Phenacobius mirabilis..... | Phenacobius mirabilis..... | Do. |
| 249 | *Notropis megalops* ..... | *Notropis cornutus* ..... | Do. |
| 249 | Notropis umbratilis ..... | Notropis umbratilis ..... | Do. |
| 249 | Notropis deliciosus ..... | *Notropis blennius* ..... | Do. |
| 249 | Notropis lutrensis ..... | Notropis lutrensis ..... | Do. |
| 249 | Pimephales promelas confertus. | Pimephales promelas ..... | Do. |
| 249 | Pimephales notatus ..... | Pimephales notatus..... | Do. |
| 249 | Chrosomus erythrogaster... | Chrosomus erythrogaster... | Do. |
| 250 | Campostoma anomalum..... | Campostoma anomalum..... | Do. |
| 250 | *Catostomus teres* ..... | *Catostomus commersonii* ... | Do. |
| 250 | Noturus flavus ..... | Noturus flavus..... | Do. |
| 250 | Etheostoma lepidum..... | Etheostoma lepidum..... | Saline River near Wakeeney. |
| 250 | Boleosoma olmstedi..... | Boleosoma nigrum..... | Do. |
| 250 | Lepomis humilis..... | Lepomis humilis..... | Do. |
| 250 | Lepomis cyanellus..... | Apomotis cyanellus..... | Do. |
| 250 | Fundulus zebrinus..... | Fundulus zebrinus..... | Do. |
| 250 | Hyodon alosoides ..... | Hiodon alosoides ..... | Do. |
| 250 | *Semotilus atromaculatus*.... | *Semotilus atromaculatus*.... | Do. |
| 250 | Hybopsis biguttatus..... | Hybopsis kentuckiensis.... | Do. |
| 250 | Hybopsis storerianus..... | Hybopsis storerianus..... | Do. |
| 250 | Phenacobius mirabilis..... | Phenacobius mirabilis..... | Do. |
| 250 | Notropis megalops..... | Notropis cornutus ..... | Do. |
| 250 | Notropis deliciosus..... | Notropis blennius ..... | Do. |
| 250 | Notropis lutrensis ..... | Notropis lutrensis..... | Do. |
| 251 | Notropis æneolus..... | Notropis topeka ..... | Do. |
| 251 | Pimephales promelas confertus. | Pimephales promelas..... | Do. |
| 251 | Pimephales notatus..... | Pimephales notatus..... | Do. |
| 251 | Hybognathus nuchalis ..... | Hybognathus nuchale ..... | Do. |
| 251 | Campostoma anomalum .... | Campostoma anomalum..... | Do. |
| 251 | Catostomus teres ..... | Catostomus commersonii ... | Do. |
| 251 | Ictiobus velifer..... | Carpiodes velifer..... | Do. |
| 251 | Ictalurus punctatus..... | Ictalurus punctatus..... | Do. |
| 251 | *Amiurus melas* ..... | *Ameiurus melas*..... | Do. |
| 252 | Etheostoma lepidum..... | Etheostoma lepidum..... | Smoky Hill River at Wallace. |
| 252 | Lepomis humilis..... | Lepomis humilis..... | Do. |
| 252 | Lepomis cyanellus..... | Apomotis cyanellus..... | Do. |
| 252 | Fundulus zebrinus..... | Fundulus zebrinus..... | Do. |
| 252 | Semotilus atromaculatus ... | Semotilus atromaculatus.... | Do. |
| 252 | Hybopsis biguttatus..... | *Hybopsis kentuckiensis*.... | Do. |
| 252 | Phenacobius mirabilis ..... | Phenacobius mirabilis..... | Do. |
| 252 | *Notropis megalops*..... | *Notropis cornutus* ..... | Do. |
| 252 | Notropis deliciosus ..... | Notropis blennius ..... | Do. |
| 252 | Notropis lutrensis ..... | Notropis lutrensis ..... | Do. |
| 252 | Notropis æneolus ..... | Notropis topeka ..... | Do. |
| 252 | Notropis *germanus* ..... | Notropis heterodon ..... | Do. |
| 253 | Pimephales promelas confertus. | Pimephales *promelas* ..... | Do. |
| 253 | Hybognathus nuchalis ..... | *Hybognathus* nuchale..... | Do. |
| 253 | Campostoma anomalum..... | Campostoma anomalum..... | Do. |
| 253 | *Catostomus teres* ..... | Catostomus commersonii... | Do. |
| 253 | Amiurus melas ..... | Ameiurus melas ..... | Do. |
| 253 | Noturus flavus ..... | Noturus flavus ..... | Do. |

**1889.** CHARLES H. GILBERT. Fourth series of notes on the fishes of Kansas. <Bull. Washburn Laboratory of Natural History, vol. II, No. 9, 38–43, January, 1889.

These collections also were made by Professor Cragin and his students (James L. Poston and Dana McVicar) during the summer of 1887 for the Washburn College Laboratory of Natural History. The Missouri Basin localities are the following:

(*a*) Republican River, near Wano, Cheyenne County.
(*b*) Sappa Creek, a tributary of Republican River, Oberlin, Decatur County.
(*c*) North fork of Solomon River, Logan, Phillips County.
(*d*) North fork of Solomon River, Harlan, Smith County.
(*e*) Middle Beaver Creek, a tributary of North fork of Solomon River, Smith County.
(*f*) A spring branch of Spring Creek, near Smith Center, Smith County.
(*g*) Osage River, La Cygne, Linn County.

Localities *a* to *f* are in the northwestern part of the State, while *g* is near the middle of the eastern boundary.

| Page. | Nominal species. | Identification. | Locality. |
|---|---|---|---|
| 38 | Amiurus melas | Ameiurus melas | Sappa Creek. |
| 38 | Notropis deliciosus lineolatus. | Notropis blennius | Republican River; Logan and Harlan; Ward Creek, Shawnee County. |
| 39 | Notropis topeka | Notropis topeka | Sappa Creek. |
| 39 | Notropis lutrensis | Notropis lutrensis | Do. |
| 39 | *Notropis jejunus* | *Notropis jejunus* | Do. |
| 39 | Phenacobius mirabilis | Phenacobius mirabilis | Do. |
| 39 | Semotilus atromaculatus | Semotilus atromaculatus | Republican River. |
| 39 | Fundulus zebrinus | Fundulus zebrinus | Do. |
| 39 | Lepomis humilis | Lepomis humilis | Sappa Creek. |
| 39 | Etheostoma olmstedi maculatum. | Boleosoma nigrum | Do. |
| 40 | Amiurus melas | Ameiurus melas | Logan and Harlan; Middle Beaver Creek. |
| 40 | *Ictalurus punctatus* | *Ictalurus punctatus* | Harlan. |
| 40 | Noturus flavus | Noturus flavus | Logan and Harlan. |
| 40 | Catostomus teres | Catostomus commersonii | Middle Beaver Creek and Logan. |
| 40 | Campostoma anomalum | Campostoma anomalum | Middle Beaver Creek and spring branch of Spring Creek. |
| 40 | *Hybognathus nuchalis* | *Hybognathus nuchale* | Logan. |
| 40 | Pimephales promelas | Pimephales promelas | Middle Beaver Creek and Logan. |
| 40 | Notropis deliciosus lineolatus. | Notropis blennius | Middle Beaver and Spring creeks and Logan. |
| 40 | Notropis lutrensis | Notropis lutrensis | Do. |
| 40 | Notropis megalops | Notropis cornutus | Logan. |
| 40 | Phenacobius mirabilis | Phenacobius mirabilis | Do. |
| 40 | *Semotilus atromaculatus* | *Semotilus atromaculatus* | Middle Beaver and Spring Creeks. |
| 40 | Fundulus zebrinus | Fundulus zebrinus | Logan and in a spring branch of Sand Creek 5 miles southwest of Logan. |
| 40 | Lepomis humilis | Lepomis humilis | Smith County. ? |
| 40 | Ictalurus punctatus | Ictalurus punctatus | Osage River at La Cygne, Linn County, Kans. |
| 40 | Noturus flavus | Noturus flavus | Do. |
| 40 | Notropis deliciosus | Notropis blennius | Do. |
| 40 | Notropis lutrensis | Notropis lutrensis | Do. |
| 40 | Notropis rubrifrons | Notropis rubrifrons | Do. |
| 40 | Phenacobius mirabilis | Phenacobius mirabilis | Do. |
| 40 | Hybopsis biguttatus | Hybopsis kentuckiensis | Do. |
| 40 | Dorosoma cepedianum | Dorosoma cepedianum | Do. |
| 40 | Lepomis humilis | Lepomis humilis | Do. |
| 40 | *Lepomis cyanellus* | *Apomotis cyanellus* | Do. |
| 40 | Etheostoma phoxocephalus | Hadropterus phoxocephalus | Do. |

**1891.** DAVID STARR JORDAN. Report of explorations in Colorado and Utah during the summer of 1889, with an account of the fishes found in each of the river basins examined. <Bull. U. S. Fish Comm., IX, 1889 (May 29, 1891), 1-40, plates 1-5.

During July and August, 1889, these collections were made under the direction of the United States Fish Commission. In making them Dr. Jordan was assisted by Messrs. Barton W. Evermann, Bert Fesler, and Bradley M. Davis. Specimens from the Missouri Basin were obtained at the following places:

(*a*) South Platte River near Denver.
(*b*) South Platte River at Hartsel Hot Springs.
(*c*) Bear Creek near Morrison, Jefferson County, Colo. This creek is a small tributary of South Platte. The specimens from this place were obtained by Messrs. Fesler and Davis.
(*d*) Middle Boulder Creek near Boulder, Boulder County, Colo. This is also a tributary of the South Platte. The collecting here was done by Messrs. Jordan and Evermann.

The following species were obtained:

| Page. | Nominal species. | Identification. | Locality. |
|---|---|---|---|
| 7 | *Catostomus teres sucklii*.... | *Catostomus commersonii* | Denver. |
| 7 | Catostomus griseus..... | Catostomus griseus..... | Denver, Hartsel Hot Springs, Morrison, and Boulder. |
| 8 | Hybognathus nuchalis (? var. placita). | Hybognathus nuchale evansi. | Denver. |
| 8 | Notropis scylla ..... | Notropis scylla ..... | Do. |
| 8 | Notropis gilberti..... | Notropis gilberti ..... | Do. |
| 8 | Notropis megalops..... | Notropis cornutus ..... | Do. |
| 8 | *Notropis lutrensis*..... | *Notropis lutrensis*..... | Do. |
| 8 | Semotilus atromaculatus ... | Semotilus atromaculatus | Do. |
| 8 | Rhinichthys dulcis ..... | Rhinichthys cataractæ dulcis. | Denver, Hartsel Hot Springs, and Morrison. |
| 8 | Zygonectes floripinnis..... | Fundulus floripinnis... | Denver. |
| 8 | Etheostoma nigrum ..... | Boleosoma nigrum..... | Do. |
| 8 | Salmo mykiss stomias ..... | Salmo mykiss stomias .. | Morrison. |

**1891a.** DAVID STARR JORDAN. A reconnoissance of the streams and lakes of the Yellowstone National Park, Wyoming, in the interest of the United States Fish Commission. <Bull. U. S. Fish Comm., IX, 1889 (July 11, 1891), 41-63, plates 7-22, and map.

The investigations upon which this paper was based were made under the direction of the United States Fish Commissioner in October, 1889, by Dr. Jordan, assisted by Dr. C. H. Gilbert. The following streams in the Missouri Basin were examined:

(*a*) Yellowstone and Gardiner rivers near Mammoth Hot Springs, and Yellowstone River at Livingston, Mont.
(*b*) Madison River, Yellowstone Park.
(*c*) Horsethief Springs, Gallatin County, Mont.
(*d*) Gallatin River west of Yellowstone Park.
(*e*) Riddle Lake and Solution Creek, Yellowstone Park.
(*f*) Canyon Creek, Yellowstone Park.

The following species were found in the Missouri Basin:

| Page. | Nominal species. | Identification. | Locality. |
|---|---|---|---|
| 46 | Catostomus griseus..... | Catostomus griseus..... | Yellowstone and Gardiner rivers. |
| 48 | Rhinichthys dulcis..... | Rhinichthys cataractæ dulcis. | Gardiner River. |
| 49 | Coregonus williamsoni *cismontanus.* | Coregonus williamsoni cismontanus. | Madison, Yellowstone, and Gardiner rivers, and Horsethief Springs. |
| 49 | Thymallus signifer ontariensis. | Thymallus signifer ontariensis. | Madison River, Horsethief Springs, and Gallatin River. |
| 50 | Salmo mykiss..... | Salmo mykiss lewisi..... | Livingston, Gardiner River below the falls, Solution Creek, Riddle Lake, Canyon Creek, and Madison River. |
| 53 | Cottus bairdi punctulatus.. | Cottus bairdi punctulatus | Gibbon and Madison rivers, and Canyon Creek. |

**1891.** SETH EUGENE MEEK. Report of explorations made in Missouri and Arkansas during 1889, with an account of the fishes observed in each of the river basins examined. <Bull. U. S. Fish Comm., IX, 1889 (1891), 113–141.

The collections reported upon in this paper were made between July 17 and August 21, 1889, for the United States Fish Commission, by Professor Meek, assisted by Messrs. Frank M. Drew and Louis J. Rettger. Collections were made in Missouri in the Missouri Basin at the following places: Gasconade River at Arlington, Phelps County, and at a point 5 miles above Arlington; Little Piney River, an eastern tributary of the Gasconade at Arlington, and also at Newburg, Phelps County; Osage Fork of Gasconade River, 6 miles southeast of Marshfield, Webster County; Lock Fork of Gasconade River, Mansfield-Wright County; Big Piney River, a southern tributary of the Gasconade, near Cabool, Texas County; Jones Creek, a small western tributary of the Gasconade, near Dixon, Pulaski County; Marais River, near Dixon; Niangua River, near Marshfield; and Sac River, near Springfield, Greene County. The last three streams mentioned are tributaries of Osage River, the most important southern tributary of the Missouri in Missouri.

The following 16 species were obtained from the Gasconade River at or near Arlington:

Leptops olivaris.
Ictalurus punctatus.
Catostomus nigricans.
Moxostoma aureolum (as M. duquesnei).
Notropis shumardi (as N. boops).
Notropis zonatus.
Hybopsis kentuckiensis.
Hybopsis dissimilis.
Semotilus atromaculatus.
Fundulus catenatus.
Apomotis cyanellus (as Lepomis cyanellus).
Lepomis pallidus.
Micropterus dolomieu.
Diplesion blennioides (as Etheostoma blennioides).
Cottogaster uranidea (as Etheostoma uranidea).
Etheostoma cœruleum spectabile.

From Little Piney River at Arlington and Newburg 25 species were obtained, as follows:

Schilbeodes exilis (as Noturus exilis).
Catostomus nigricans.
Moxostoma aureolum (as M. duquesnei).
Hybognathus nubilum.
Pimephales notatus.
Notropis shumardi (as N. boops).
Notropis lutrensis.
Notropis whipplii.
Notropis zonatus.
Hybopsis kentuckiensis.
Hybopsis dissimilis.
Semotilus atromaculatus.
Dorosoma cepedianum.
Fundulus catenatus.
Apomotis cyanellus (as Lepomis cyanellus).
Lepomis pallidus.
Micropterus dolomieu.
Micropterus salmoides.
Diplesion blennioides (as Etheostoma blennioides).
Cottogaster uranidea (as Etheostoma uranidea).
Hadropterus aspro (as Etheostoma aspro).
Hypohomus cymatotænia (as Etheostoma cymatotænia).
Etheostoma flabellare.
Etheostoma cœruleum spectabile.
Cottus bairdi.

From Osage Fork of the Gasconade the following 27 species were taken:

Ameiurus nebulosus.
Catostomus nigricans.
Moxostoma aureolum (as M. duquesnei).
Campostoma anomalum.
Chrosomus erythrogaster.
Hybognathus nubilum.
Pimephales notatus
Notropis cayuga.
Notropis whipplii.
Notropis umbratilis cyanocephalus.
Notropis zonatus.
Notropis rubrifrons.
Hybopsis kentuckiensis.
Semotilus atromaculatus.
Fundulus macdonaldi (as Zygonectes macdonaldi).
Labidesthes sicculus.
Lepomis macrochirus.
Lepomis pallidus.
Lepomis megalotis.
Micropterus dolomieu.
Micropterus salmoides.
Percina caprodes (as Etheostoma caprodes).
Diplesion blennioides (as Etheostoma blennioides).
Hypohomus cymatotaenia (as Etheostoma cymatotaenia).
Etheostoma flabellare.
Etheostoma punctulatum.
Etheostoma cœruleum spectabile.
Cottus bairdi.

The following 20 species were found in Lock Fork of the Gasconade:

Catostomus nigricans.
Moxostoma aureolum (as M. duquesnei).
Campostoma anomalum.
Hybognathus nubilum.
Pimephales notatus.
Notropis cayuga.
Notropis umbratilis cyanocephalus.
Notropis zonatus.
Notropis cornutus (as N. megalops).
Notropis rubrifrons.
Hybopsis kentuckiensis.
Semotilus atromaculatus.
Lepomis macrochirus.
Micropterus salmoides.
Etheostoma punctulatum.
Etheostoma cœruleum spectabile.
Boleosoma nigrum (as Etheostoma nigrum).
Diplesion blennioides (as Etheostoma blennioides).
Percina caprodes (as Etheostoma caprodes).
Cottus bairdi.

The collection from Big Piney River contained 16 species, as follows:

Ameiurus melas.
Catostomus commersonii (as C. teres).
Moxostoma aureolum (as M. duquesnei).
Campostoma anomalum.
Chrosomus erythrogaster.
Pimephales notatus.
Notropis cayuga.
Notropis zonatus.
Notropis cornutus (as N. megalops).
Hybopsis kentuckiensis.
Semotilus atromaculatus.
Labidesthes sicculus.
Apomotis cyanellus (as Lepomis cyanellus).
Lepomis pallidus.
Micropterus salmoides.
Etheostoma cœruleum spectabile.

From Jones Creek, near Dixon, the following 17 species were taken:

Schilbeodes exilis (as Noturus exilis).
Catostomus nigricans.
Campostoma anomalum.
Chrosomus erythrogaster.
Hybognathus nubilum.
Notropis shumardi (as N. boops).
Notropis zonatus.
Hybopsis kentuckiensis.
Semotilus atromaculatus.
Fundulus catenatus.
Fundulus macdonaldi (as Zygonectes macdonaldi, types).
Etheostoma flabellare.
Etheostoma punctulatum.
Etheostoma cœruleum spectabile.
Microperca punctulata (as Etheostoma microperca).
Apomotis cyanellus (as Lepomis cyanellus).
Cottus bairdi.

The following 10 species were found in each of the three tributaries of the Osage River—the Marais, the Niangua, and the Sac:

Catostomus nigricans.
Campostoma anomalum.
Chrosomus erythrogaster.
Hybognathus nubilum.
Pimephales notatus.
Notropis zonatus.
Hybopsis kentuckiensis.
Semotilus atromaculatus.
Etheostoma cœruleum spectabile.
Cottus bairdi.

The following 7 species were found in both the Marais and Niangua, but not in the Sac:

Catostomus commersonii (as C. teres).
Moxostoma aureolum (as M. macrolepidotum duquesnei).
Campostoma anomalum.
Labidesthes sicculus.
Apomotis cyanellus (as Lepomis cyanellus).
Boleosoma nigrum (as Etheostoma nigrum).
Etheostoma flabellare.

The following 2 species were found in the Marais and Sac, but not in the Niangua:

Diplesion blennioides (as Etheostoma blennioides).
Notropis umbratilis.

In the Niangua were found 4 species not found in either of the two other streams, viz:

Schilbeodes exilis (as Noturus exilis).
Notropis cayuga.
Etheostoma punctulatum.
Etheostoma nianguæ.

The Marais contained 7 species not found in either of the other streams, viz:

Ameiurus melas.
Ictiobus cyprinella.
Ictiobus bubalus.
Abramis crysoleucas (as Notemigonus chrysoleucus).
Notropis lutrensis.
Lepomis humilis.
Micropterus dolomieu.
Hypohomus cymatotænia (as Etheostoma cymatotænia).

In the Sac River only 2 species were found which were not obtained from the Marais or the Niangua, viz:

Notropis blennius (as N. deliciosus).
Notropis rubrifrons.

**1892.** SETH EUGENE MEEK. Report upon the fishes of Iowa, based upon observations and collections made during 1889, 1890, and 1891. <Bull. U. S. Fish Comm., x, 1890 (1892), 217-248.

The Missouri Basin localities mentioned in this paper are as follows:

(*a*) Missouri River at Sioux City, Woodbury County, Iowa.
(*b*) Big Sioux River at Sioux City and at Sioux Falls, Minnehaha County, S. Dak.
(*c*) Silver Lake, Dickinson County, Iowa, at the head of the north fork of Little Sioux River.
(*d*) East Fork of Soldier River at Charter Oak, Crawford County, Iowa.
(*e*) Boyer River at Arion, Crawford County, Iowa.

All of these localities (except Sioux Falls) are in the northwestern part of Iowa, in which region all the streams flow southwestward, in courses nearly parallel to the Missouri. In this report upon the fishes of Iowa, Prof. Meek records the following species from that portion of the State lying in the Missouri River basin:

| Page. | Species. | Locality. |
|---|---|---|
| 245 | *Polyodon spathula* | Missouri River, Harrison County, Iowa. |
| 245 | Scaphirhynchus platorynchus | Missouri River. |
| 245, 246 | Ictalurus punctatus | Missouri River; Big Sioux River at Sioux City. |
| 245, 246 | Noturus flavus | Missouri River; Big Sioux River at Sioux Falls and Sioux City. |
| 246 | Schilbeodes gyrinus | Big Sioux River. |
| 247, 248 | Amciurus melas | Silver Lake; Soldier River at Charter Oak; Boyer River at Arion. |
| 245, 246 | Carpiodes velifer | Missouri River; Big Sioux River at Sioux City. |
| 246, 248 | Catostomus commersonii | Big Sioux River at Sioux City; Boyer River at Arion. |
| 246 | Moxostoma aureolum (as duquesnei). | Big Sioux River at Sioux Falls and Sioux City. |
| 245, 246, 247 | Hybognathus nuchale | Missouri River; Big Sioux River at Sioux City; Soldier River at Charter Oak. |
| 246, 247 | Pimephales notatus | Big Sioux River at Sioux City and Sioux Falls; Silver Lake. |
| 247, 248 | Pimephales promelas | Silver Lake; Soldier River at Charter Oak; Boyer River at Arion. |
| 245, 246 | Notropis dilectus | Missouri River; Big Sioux River at Sioux Falls. |
| 246 | Notropis cayuga | Big Sioux River at Sioux City. |
| 246, 248 | Notropis blennius | Big Sioux River; Boyer River. |
| 246, 248 | Notropis topeka | Big Sioux River at Sioux City; Boyer River. |
| 246 | Notropis heterodon | Silver Lake. |
| 246 | Notropis hudsonius | Big Sioux River at Sioux City. |
| 246 | *Notropis whipplii* | Do. |
| 246 | Notropis atherinoides | Do. |
| 246, 247, 248 | Notropis cornutus (as megalops). | Big Sioux River; Silver Lake; Boyer River. |
| 247, 248 | Notropis gilberti | Soldier River; Boyer River. |
| 248 | Notropis lutrensis | Boyer River. |
| 245 | Hybopsis meeki (as gelidus) | Missouri River. |
| 246 | Hybopsis kentuckiensis | Big Sioux River at Sioux Falls. |
| 245 | Platygobio gracilis | Missouri River. |
| 246, 247 | *Abramis crysoleucas* | Big Sioux River at Sioux Falls; Silver Lake. |
| 247, 248 | Semotilus atromaculatus | Soldier River; Boyer River. |
| 248 | Phenacobius mirabilis | Boyer River. |
| 245, 246 | Dorosoma cepedianum | Missouri River; Big Sioux River at Sioux City. |
| 245, 246 | Hiodon alosoides | Do. |
| 246, 247 | Fundulus zebrinus | Big Sioux River at Sioux City; Silver Lake. |
| 246, 248 | Percopsis guttatus | Big Sioux River at Sioux City; Boyer River. |
| 248 | Lucius lucius | Boyer River. |
| 246 | Ambloplites rupestris | Big Sioux River at Sioux City and Sioux Falls. |
| 246, 247, 248 | *Apomotis cyanellus* | Big Sioux River at Sioux City and Sioux Falls; Soldier River; Boyer River. |
| 246, 248 | Lepomis humilis | Big Sioux River at Sioux City and Sioux Falls; Boyer River. |
| 247 | Lepomis megalotis | Silver Lake. |
| 246, 248 | Boleosoma nigrum | Big Sioux River at Sioux City and Sioux Falls; Boyer River. |
| 246 | *Etheostoma zonale* | Big Sioux River at Sioux City. |
| 246 | Hadropterus aspro | Big Sioux River. |
| 247 | Etheostoma iowæ | Silver Lake. |
| 246, 247 | Perca flavescens | Big Sioux River at Sioux City and Sioux Falls; Silver Lake. |
| 246 | Stizostedion vitreum | Big Sioux River. |
| 246 | Stizostedion canadense | Do. |
| 246, 247 | Roccus chrysops | Big Sioux River; Silver Lake. |
| 246 | Aplodinotus grunniens | Big Sioux River at Sioux City. |

**1892.** BARTON W. EVERMANN. A reconnaissance of the streams and lakes of western Montana and northwestern Wyoming, in Report of the Commissioner of Fish and Fisheries respecting the establishment of fish-cultural stations in the Rocky Mountain region and Gulf States. Senate Mis. Doc. 65, Fifty-second Congress, first session, 1–90, plates 1–36, May 25, 1892.

These investigations were carried on during July and August, 1891, by Professor Evermann, assisted by Prof. O. P. Jenkins, of Stanford University, and Mr. B. Clapham, of Monroeville, Ind.

The Missouri Basin localities from which specimens were obtained are the following:

(*a*) Red Rock River, near Red Rock, Beaverhead County, Mont.
(*b*) Beaverhead River, near Dillon, Beaverhead County, Mont.
(*c*) Junction of Firehole and Gibbon rivers, Yellowstone Park.
(*d*) Horsethief Springs, Gallatin County, Mont.
(*e*) Atlantic Creek, in and below Two-Ocean Pass, Wyoming.
(*f*) Mouth of Upper Yellowstone River, Yellowstone Park.
(*g*) Meadow Creek at its mouth on east side of Yellowstone Lake.
(*h*) East Fork of Gardiner River, below the falls, Yellowstone Park.
(*i*) McClellan Creek, near Helena, Mont.
(*j*) Canyon Creek, Yellowstone Park.

From these localities only 7 species were obtained, viz:

| Page. | Species. | Identification. | Locality. |
|---|---|---|---|
| 41 | Catostomus discobolus.... | Pantosteus jordani..... | Red Rock and Beaverhead rivers. |
| 42 | Rhinichthys dulcis..... | Rhinichthys cataractæ dulcis. | Beaverhead River, Red Rock River, and junction of Firehole and Gibbon rivers. |
| 47 | Coregonus williamsoni.... | Coregonus williamsoni cismontanus. | Do. |
| 47 | Thymallus signifer ..... | Thymallus signifer montanus. | Red Rock and Beaverhead rivers; junction of Firehole and Gibbon Rivers; Horsethief Springs. |
| 48 | Salmo mykiss..... | Salmo mykiss lewisi..... | Atlantic Creek in Two-Ocean Pass and one mile above its mouth; mouth of Upper Yellowstone River; Meadow Creek; east fork of Gardiner River; McClellan Creek. |
| 51 | Cottus bairdi punctulatus. | Cottus bairdi punctulatus. | Beaverhead and Red Rock rivers; Canyon Creek and junction of Firehole and Gibbon rivers. |
| 52 | Lota lota maculosa..... | Lota lota maculosa..... | Red Rock River. |

**1892a.** BARTON W. EVERMANN. Report on the establishment of fish-cultural stations in the Rocky Mountain region and Gulf States. <Bull. U. S. Fish Comm., XI, 1891 (1892), 1–90, plates 1–36.

This is the Fish Commission edition of the above report, and contains no additional species.

**1893** BARTON W. EVERMANN. Description of a new sucker, *Pantosteus jordani*, from the Upper Missouri Basin. <Bull. U. S. Fish Comm., XII, 1892 (January 27, 1893), 51–56, with figure.

This paper contains the original description of *Pantosteus jordani*. The type locality and all others from which specimens were obtained are given under this species in the general list and need not be repeated.

**1893a.** BARTON W. EVERMANN. The ichthyologic features of the Black Hills. <Proc. Indiana Ac. Sci. 1892 (1893), 73-78.

This was a preliminary paper upon the work done in the Black Hills and gives the Black Hills localities for the 15 species collected there in October, 1892, by Evermann and McCormick. All these localities are clearly given in the present report, and need not be repeated here.

**1894.** CARL H. EIGENMANN. Results of explorations in western Canada and the northwestern United States. <Bull. U. S. Fish Comm., XIV, 1894 (July 7), 101-132, plates 5-8.

During these explorations (summer of 1892) Dr. Eigenmann made two stations in the Missouri River basin—at Craig, Mont. (long. 112° W., lat. 47° N.), where collections were made from Missouri River, and at Poplar, Mont. (long. 105° W., lat. 48° N.), where Poplar River was examined.

The following species are recorded by Dr. Eigenmann:

| Page. | Species. | Locality. |
|---|---|---|
| 107 | Noturus flavus | Missouri River at Craig, Mont. |
| 107 | Carpiodes velifer | Poplar River at Poplar, Mont. |
| 108 | Catostomus griseus | Missouri River at Craig. |
| 108 | Catostomus commersonii | Poplar River at Poplar. |
| 108 | Moxostoma aureolum | Poplar River. |
| 108 | Hybognathus nuchale evansi (as placita) | Do. |
| 110 | Notropis atherinoides | Do. |
| 111 | Rhinichthys cataractæ dulcis | Poplar River; Missouri River. |
| 111 | Couesius dissimilis | Poplar River. |
| 111 | Platygobio gracilis | Missouri River; Poplar River |
| 114 | Hiodon alosoides | Poplar River at Poplar. |
| 115 | Coregonus williamsoni | Missouri River at Craig. |
| 115 | Thymallus signifer ontariensis | Do. |
| 116 | Eucalia inconstans | Poplar River at Poplar. |
| 118 | Stizostedion canadense boreum (as griseum) | Do. |
| 118 | Cottus bairdi punctulatus | Missouri River at Craig. |
| 118 | Lota lota maculosa | Do. |

**1894.** SETH EUGENE MEEK. Notes on the fishes of western Iowa and eastern Nebraska. <Bull. U. S. Fish Comm., XIV, 1894, 133-138.

The localities from which were obtained the specimens mentioned in this paper are the following:

(*a*) Spirit Lake, Dickinson County, Iowa.
(*b*) East and West Okoboji lakes, Dickinson County, Iowa.
(*c*) Little Sioux River, the outlet of Spirit and the Okoboji lakes, was examined at Cherokee, Cherokee County, Iowa.
(*d*) Floyd River was examined at Lemars, Plymouth County, and Sioux City, Woodbury County, Iowa.

Collections were made from these Iowa localities by Professor Meek in 1890. A few specimens from Spirit and East Okoboji lakes obtained by Professor Evermann, October 31, 1892, are also included.

(*e*) Platte River at Fremont, Dodge County, Nebr.
(*f*) Elkhorn River near Fremont, Nebr.
(*g*) Salt Creek near Lincoln, Nebr.
(*h*) Blue River at Crete, Saline County, Nebr.

The specimens from these four places were obtained in the summer of 1891 by Professor Meek and Prof. P. B. Burnett, then of Cotner College, now of Nebraska State University.

(*i*) Nebraska State fish commission ponds in Sarpy County, near the mouth of Platte River.

The few specimens recorded by Professor Meek from this locality were obtained by Messrs. Evermann and McCormick, October 25, 1892.

In this paper Dr. Meek records the following species from Missouri Basin localities:

| Page. | Species. | Locality. |
|---|---|---|
| 135 | Lepisosteus osseus | Spirit Lake, Iowa. |
| 135 | Schilbeodes gyrinus | Platte River at Fremont; Floyd River at Lemars and Sioux City. |
| 135 | Noturus flavus | Salt Creek near Lincoln. |
| 135 | Ameiurus melas | Platte and Elkhorn Rivers at Fremont; Salt Creek near Lincoln; Floyd River at Lemars; Spirit Lake. |
| 135 | Ictalurus punctatus | Blue River at Crete; Platte and Elkhorn rivers at Fremont; Salt Creek near Lincoln. |
| 135 | Ictiobus cyprinella | Elkhorn River at Fremont. |
| 135 | Ictiobus bubalus | Floyd River at Sioux City; East Okoboji Lake. |
| 135 | Carpiodes velifer | Blue, Platte, Elkhorn, and Floyd rivers. |
| 135 | Catostomus commersonii | Floyd River at Lemars and Sioux City. |
| 136 | Moxostoma aureolum | Floyd and Blue rivers. |
| 136 | Placopharynx duquesnei | Floyd River. |
| 136 | Campostoma anomalum | Floyd River at Sioux City. |
| 136 | Hybognathus nuchale | Platte, Elkhorn, and Floyd rivers; Salt Creek. |
| 136 | Pimephales promelas | Blue, Platte, Elkhorn, and Floyd rivers; Salt Creek. |
| 136 | Pimephales notatus | Blue, Elkhorn, and Floyd rivers. |
| 136 | Notropis cayuga | Floyd River. |
| 136 | Notropis blennius | Platte, Elkhorn, Blue, and Floyd rivers; Salt Creek. |
| 136 | Notropis gilberti | Floyd River. |
| 136 | Notropis topeka | Blue and Floyd rivers; Salt Creek. |
| 136 | Notropis hudsonius | Floyd River; Spirit Lake, and East and West Okoboji lakes. |
| 136 | Notropis lutrensis | Blue, Platte, Elkhorn, and Floyd rivers; Salt Creek. |
| 136 | Notropis cornutus | Floyd and Elkhorn rivers. |
| 136 | Notropis jejunus | Platte and Elkhorn rivers. |
| 136 | Notropis dilectus | Floyd and Elkhorn rivers. |
| 136 | Phenacobius mirabilis | Blue River. |
| 137 | Hybopsis kentuckiensis | Elkhorn River. |
| 137 | Hybopsis storerianus | Floyd and Elkhorn rivers. |
| 137 | Hybopsis hyostomus | Blue, Platte, and Elkhorn rivers. |
| 137 | Platygobio gracilis | Platte River. |
| 137 | Semotilus atromaculatus | Floyd River. |
| 137 | Abramis chrysoleucas | Platte and Floyd rivers; Spirit Lake. |
| 137 | Hiodon alosoides | Floyd and Platte rivers. |
| 137 | Dorosoma cepedianum | Floyd and Elkhorn rivers. |
| 137 | Percopsis guttatus | Floyd River; East Okoboji Lake. |
| 137 | Fundulus zebrinus | East Okoboji Lake. |
| 137 | Fundulus sciadicus | Floyd, Platte, and Elkhorn rivers. |
| 137 | Lucius lucius | Floyd River; East Okoboji, West Okoboji, and Spirit lakes. |
| 137 | Pomoxis sparoides | East Okoboji Lake. |
| 137 | Ambloplites rupestris | Floyd River. |
| 137 | Apomotis cyanellus | Platte River at South Bend and Fremont; Elkhorn and Floyd rivers. |
| 137 | Lepomis humilis | Platte River at South Bend and Fremont; Elkhorn, Blue, and Floyd rivers; Salt Creek. |
| 137 | Lepomis pallidus | Spirit Lake. |
| 137 | Eupomotis gibbosus | Do. |
| 138 | Micropterus salmoides | Floyd, Platte, and Elkhorn rivers; Spirit Lake. |
| 138 | Micropterus dolomieu | Spirit Lake. |
| 138 | Boleosoma nigrum | Floyd and Elkhorn rivers; Spirit and East Okoboji lakes. |
| 138 | Hadropterus aspro | Floyd River. |
| 138 | Etheostoma iowæ | Platte and Elkhorn rivers at Fremont; State fish commission ponds at South Bend; Floyd River at Lemars and Sioux City; Spirit Lake. |
| 138 | Perca flavescens | East Okoboji and Spirit lakes. |
| 138 | Stizostedion vitreum | West Okoboji and Spirit lakes. |
| 138 | Stizostedion canadense | Floyd and Platte rivers; Spirit Lake. |
| 138 | Aplodinotus grunniens | Elkhorn River. |

**1896.** ALBERT J. WOOLMAN. A report upon ichthyological investigations in western Minnesota and eastern North Dakota. < Report U. S. Fish Comm., 1893 (1896), 343-373.

During the months of July and August, 1892, Mr. Woolman made extensive collections of fishes in western Minnesota and eastern North Dakota, in the interests of the United States Fish Commission. He was assisted by Mr. Ulysses O. Cox, instructor in biology in the State Normal School, Mankato, Minn. The work was confined chiefly to the basins of the Minnesota River and the Red River of the North, but some work was done in the Dakota or James River, which is a tributary of the Missouri.

Collections were made in this river basin at the following places:

(*a*) Dakota River at Lamoure, about 100 miles southwest from Fargo.
(*b*) Dakota River at Jamestown, about 55 miles northeast from Lamoure.
(*c*) Pipestem Creek near Jamestown.

The total number of species obtained at these stations was 20. The following is the list:

| Page. | Name under which recorded. | Name adopted. | Locality. |
|---|---|---|---|
| 359 | Amciurus nebulosus | Amciurus nebulosus | Lamoure; Jamestown. |
| 359 | Amciurus natalis | Amciurus natalis | Lamoure. |
| 359 | Amciurus melas | Amciurus melas | Dakota River; Pipestem Creek. |
| 359 | Catostomus teres | Catostomus commersonii | Lamoure; Jamestown. |
| 359 | Moxostoma macrolepidotum duquesnei. | Moxostoma aureolum | Jamestown. |
| 359 | Campostoma anomalum | Campostoma anomalum | Do. |
| 359 | Pimephales notatus | Pimephales notatus | Lamoure; Jamestown. |
| 359 | Pimephales promelas | Pimephales promelas | Lamoure. |
| 360 | Hybognathus nuchalis | Hybognathus nuchalo | Jamestown. |
| 360 | Notropis megalops | Notropis cornutus | Lamoure; Jamestown. |
| 360 | Notropis deliciosus | Notropis blennius | Do. |
| 360 | Notropis cayuga | Notropis cayuga | Jamestown, in the river. |
| 360 | Hybopsis kentuckiensis | Hybopsis kentuckiensis | James River; Pipestem Creek. |
| 360 | Semotilus atromaculatus | Semotilus atromaculatus | Do. |
| 360 | Rhinichthys atronasus | Rhinichthys atronasus | Lamoure; Jamestown. |
| 360 | Lucius lucius | Lucius lucius | Jamestown. |
| 360 | Etheostoma nigrum | Boleosoma nigrum | Do. |
| 360 | Etheostoma aspro | Hadropterus aspro | Do. |
| 360 | Etheostoma iowæ | Etheostoma iowæ | Do. |
| 360 | Perca flavescens | Perca flavescens | Do. |

## CHARACTER OF THE FISH FAUNA OF THE MISSOURI RIVER BASIN.

The total number of species and subspecies of fishes at present known from the Missouri Basin is 143. These are distributed among 24 families and 68 genera, as may be seen from the table on pages 426–428. This table also shows the distribution of the species among the 9 different States of the Missouri Basin. It will be seen that the great majority of the species do not extend westward beyond the eastern counties of Kansas, Nebraska, and South Dakota. Only 55 of the 143 species are known from North Dakota, Montana, Wyoming, and Colorado, and but 10 of these are limited to those 4 States. On the other hand Missouri and the small part of Iowa drained by the Missouri furnish 94 species, or, if we include the narrow-timbered and abundantly-watered strip of eastern Kansas, Nebraska, and South Dakota, we have about 100 species occurring in this eastern or lower belt of the Missouri Basin.

The middle belt, or that portion lying between the one hundredth and the one hundred and fifth meridians, has such characteristic species as *Platygobio gracilis*, *Hybopsis gelidus*, *Rhinichthys cataractæ dulcis*, *Hybognathus nuchale evansi*, and the like. Few if any of these are confined to this belt, but they probably all extend more or less into the lower and upper belts.

The upper belt comprises the elevated mountain region where the water is comparatively clear and cold. The characteristic species here are the trout, whitefish, grayling, two or three species of suckers (*P. jordani*, *C. catostomus*, and *C. griseus*), and the western blob. These are all practically limited to this belt.

In the lower belt is found the limit in the westward extension of spiny-rayed fishes. West of the ninety-sixth meridian, which is approximately the eastern boundary of Nebraska and the Dakotas, not over a dozen species of spiny-rayed fishes are known to occur. This fact becomes interesting when we recall that a single small creek in Indiana (Bean Blossom Creek, Monroe County) is known to contain not fewer than 18 species of spiny-rayed fishes, and from the streams of Indiana alone we know at least 51 species of that group, nearly as many as the total number of species found in the entire fish fauna of the Missouri Basin west of the ninety-eighth meridian.

In the Missouri itself and in its larger tributaries are found such large river species as *Polyodon spathula*, *Scaphirhynchus platorynchus*, *Leptops olivaris*, *Ictalurus punctatus*, species of *Ictiobus*, and the like; but in the smaller streams *Catostomus*, *Hybognathus*, and *Notropis* are the principal genera represented. *Micropterus*, *Perca*, *Lepomis*, and *Etheostoma* are not rare on the eastern edge of this region, but they become more and more rare as we go westward and very soon disappear altogether. *Perca* has not been found west of Dakota River (98°30′ W.);

*Micropterus* has not been found west of Ravenna, Nebr. (98°30′ W.), and it is not likely that it occurs naturally even that far west.

Of the four darters whose range extends farthest west in this basin, *Boleosoma nigrum* reaches only to Dakota River, *Hadropterus aspro* to Ewing, Nebr. (98° 20′ W.), and to Jamestown, N. Dak. (98° 30′ W.). *Etheostoma iowæ* extends still farther west, it having been found by us at Valentine, Nebr. (100° 30′ W.), while *Boleichthys exilis*, a somewhat doubtful species, was found by Dr. Suckley even a little farther west in North Dakota.

## THE ICHTHYOLOGIC PECULIARITIES OF THE BLACK HILLS.

The fish fauna of that portion of the Missouri system lying in and about the Black Hills is peculiarly restricted in its character, and presents a number of interesting problems in geographic distribution. The physical conditions of the region are briefly these:

(1) An isolated, mountainous region, approximately 75 by 100 miles in extent, covered with heavy pine forests and drained by more than a dozen good-sized creeks, whose waters are naturally cold, clear, and pure, and all flowing east, northeast, or southeast to the north or south fork of the Cheyenne.

(2) Surrounding this region on all sides is a broad plain 100 to 200 miles wide, in which the soil is full of alkali, where the rainfall is not great, where there are no forests, and where even herbaceous vegetation is very scant, where the soil is eroded with great ease, the streams are shallow, their beds constantly shifting, the water warm in the summer time and always strongly alkaline and full of solid matter in suspension. To the east and northeast, country of this character extends from the base of the Hills to the Missouri River at least, a distance of not less than 150 to 200 miles. To the southward is a broad strip almost equally uninviting, while on the west, extending from the base of the Hills to the Powder River, the country is barren in the main and the streams are of the same general character. Among the low hills on the east of the Powder River Valley are the headwaters of two streams; one of these is the Belle Fourche or north fork of the Cheyenne, which flows to the northeast and sweeps around the north base of the Black Hills; the other is the south fork of the Cheyenne, which, flowing east and south, hugs the south base of the Hills a little less closely, and then turning northeast unites with the north fork 30 or 40 miles east of the Hills, thereby forming the Big Cheyenne, which, after a course of more than 100 miles in a northeasterly direction, flows into the Missouri. Into one or the other of these two forks flow all the streams of the Hills.

Most of these streams were examined by us and collections made from them at many different places. Only 15 species of fishes were secured, and no other species has ever been reported from any definite locality of this region. The 15 species known from the Black Hills represent

but 4 families, viz: 2 catfishes, 4 suckers, 8 cyprinoids, and one member of the codfish family. Eight of the 15 species belong to one family, the *Cyprinidæ*. Not a single species of spiny-rayed fish has ever been found in any of the streams in or about the Hills and it is not probable that any will be found there. Many of the streams in or near the Hills would apparently furnish congenial homes for sunfishes, bass, and even several of the different species of darters. That these are not there must be due to the nature of the lower courses of the streams draining the Hills, and that of the Cheyenne to which they are all tributary. The Cheyenne is ordinarily a shallow stream whose waters are always more or less alkaline and filled with solid matter in suspension from the extremely easily eroded country through which it flows; and fishes would not ascend such streams from choice.

The lower courses of the streams flowing from the Hills are through the same Cretaceous beds and partake of the same character. Only those species with which the struggle has become most severe will be driven to seek protection and food in the muddy, alkaline streams, and they alone would eventually find their way into purer, clearer waters above. This, of course, means the soft-rayed, non-rapacious fishes, the suckers and minnows and other mud-loving forms.

The spiny-rayed species are aggressive, extending their attacks to all weaker forms about them, while the soft-rayed species are defensive and seek protection in retreat. A spiny-rayed fish has no occasion to ascend into the muddy, alkaline, and uncongenial portions of these streams; the only thing which would cause him to do so would be a quest for food, but he finds it easier and more agreeable to get food of sufficient quantity and quality where he is.

Not so with the soft-rayed fish; he must not only search for suitable food but he must also see that his enemy, the spiny-rayed fish, does not catch him. The attacks of his enemies were probably the first cause impelling him to take refuge in the turbid water. Finding suitable and sufficient food in this new environment, and total relief from the persecutions of his old enemies, he finds the struggle for existence easy, the surroundings in time become bearable and perhaps agreeable, and he moves about at will through all parts of the muddy stream and even into the headwaters where, still finding an abundant food supply and none of his old enemies, he is content to make his home.

Before mining began in the Hills in 1875 and 1876, nearly every stream possessed all the natural conditions necessary to make it an excellent trout stream. The waters were clear and cold, not subject to contamination from any source, and suitable food, such as insects and insect larvæ, and the smaller crustacea and mollusca, was undoubtedly found then, as now, in abundance. With the exception of a few streams which are now ruined by mining operations, the creeks of this region are yet excellent for trout.

The explanation of their absence is practically the same as that which accounts for the absence of spiny-rayed fishes. Land barriers have evidently proved competent to prevent trout getting in from the headwaters of the trout streams to the westward, and the mud and alkali which they encountered in the lower portion of the Yellowstone, the Missouri, and the Big Cheyenne have as certainly proved an impassable barrier from that direction. Among the many regions of the United States which possess the necessary natural conditions for trout, the Black Hills district is the only one of any considerable area, if we except portions of the Yellowstone National Park, in which one or more specimens of *Salmonidæ* are not or have not been indigenous. The absence of trout and all other species of fish from the various lakes and streams of Yellowstone National Park (i. e., Lewis and Shoshone lakes, Gibbon, Firehole, and Little Firehole rivers, and Indian, Glen, Nez Perce, and Sentinel creeks) is undoubtedly accounted for by the presence of impassable falls where these waters leave the great rhyolite sheet which covers the park, as shown by the investigations made by Dr. Jordan in 1889. The presence of trout in Yellowstone Lake and tributary streams, notwithstanding the fact that the outlet of Yellowstone Lake (Yellowstone River) has two enormous falls which wholly prevent the ascent of fish, is quite evidently due to the most interesting and curious fact that there is a continuous waterway furnishing easy passage for trout from the upper tributaries of Snake River by way of Two-Ocean Pass into the Upper Yellowstone River. That Yellowstone Lake could have been, and almost certainly was, stocked in this way from the Columbia Basin was demonstrated by the investigations which were made by Professor Evermann during a visit to Two-Ocean Pass in August, 1891.[1]

The presence of trout in the upper tributaries of the Colorado, Rio Grande, Arkansas, and South Platte, whose lower courses are, in some cases at least, not unlike those of the Cheyenne and Missouri, is a matter whose explanation is not without some difficulties. The relationships of the various species or subspecies of *Salmo* found in those different basins are very close and indicate a common origin at no remote date. It is certain that they are all descended from a form which came up from the Pacific Coast and that the headwaters of the Columbia, Colorado, Rio Grande, Arkansas, and South Platte have been connected in some way at some time or other, thus permitting the trout to spread into these various basins.[2]

That there are no trout in the Cheyenne Basin would seem to indicate that the streams of this system became separated and differentiated as a distinct drainage system earlier than did those of the South Platte, Arkansas, Rio Grande, Colorado, and Columbia; or else that they are

[1] See Bull. U. S. Fish Comm., XI, 1891, 24-28; also, Popular Science Monthly for June, 1895.

[2] For an interesting discussion of the origin of the varieties of *Salmo* of our western waters see "How the trout came to California," by Dr. Jordan, in Recreation, for October, 1894.

streams of more recent origin and have never been connected at any time with any of the streams containing trout. Such a history as this for the Cheyenne, together with the shallow, muddy, alkaline character of its lower portion, seems to be a reasonable explanation of the absence of trout from the Black Hills.[1]

The effect of the peculiar alkaline water of the Cheyenne and the lower courses of the streams flowing from the Black Hills has been to reduce the fishes to a nearly uniform pale, faded, or bleached appearance. Except those found above the alkali water, they are apparently almost wholly without pigment cells of any kind. Perhaps the most extreme case of bleaching is that of the flat-headed minnow, *Platygobio gracilis*, which, of all American fishes, seems to be the one most perfectly adapted to these alkali streams.

## ANNOTATED LIST OF THE FISHES FOUND IN THE MISSOURI RIVER BASIN.

In this list we give under each species all the localities in this basin from which it has been recorded. The references are arranged in chronological order, and the localities are given in the terms of the original record, except when a modification of the wording seemed desirable for sake of clearness. When in the original reference the fish was designated by some name different from the one by which it is now recognized, the name employed in the original reference is given in parenthesis. The name of the authority and the date of each reference are also given in parenthesis, thus enabling the reference to be connected with the appropriate title in the bibliography given on pages 350–379.

The nomenclature and sequence of species adopted in this paper agree essentially with the forthcoming "Fishes of North and Middle America," by Jordan & Evermann.

1. **Ichthyomyzon concolor** (Kirtland). *Silver Lamprey.* One small specimen, 4¼ inches long, from Crow Creek, Chamberlain, South Dakota. This is the most western point from which this species has been reported. It has also been recorded from Kansas by Professor Snow, and from Cottonwood Creek, Kans. (as *Petromyzon argenteus*, Graham, 1885); Osage River (Cragin, 1885*a*).
2. **Ichthyomyzon castaneus** Girard. *Chestnut-colored Lamprey.* The only reference to the occurrence of this lamprey in the Missouri Basin is by Prof. F. W. Cragin (1885), who obtained four specimens at the mouth of Mill Creek, Shawnee County, Kans. These specimens were found attached to buffalo-fish.

[1] In his paper "On the North American species of salmon and trout," printed in the U. S. Fish Commission Report for 1872–73, Dr. Suckley, in giving the habitat of *Salmo lewisi*, credits it to the "Black Hills, Nebraska (Dr. Hayden)." We have been unable to verify this reference, and believe it to be erroneous. It is possible the specimen came from the headwaters of the North Platte, in what is now known as the Laramie Range. In that case the trout was *Salmo mykiss stomias*.

3. **Lampetra wilderi** Gage. *Brook Lamprey.* Wild Cat Creek, near Manhattan (as *Ammocœtus niger*, Graham, 1885); Kansas River at Lawrence (Cragin, 1885*a*).

4. **Polyodon spathula** (Walbaum). *Spoonbill Cat; Paddle-fish.* Fort Pierre, Nebr. (as *P. folium*, Girard, 1858); St. Mary River (Jordan, 1878); Kansas River (Graham, 1885); Kansas River at Lawrence (Cragin, 1885*a*); Missouri River, Harrison County, Iowa (Meek, 1891).

   A large male fish of this species was caught in White River, at the ford 12 miles from Chamberlain, S. Dak., June 24. Total length, 4 feet 5 inches; length to base of caudal fin, 3 feet 10 inches; tip of paddle to edge of gill flap, 2 feet 7 inches; to origin of dorsal fin, 2 feet 10¼ inches; stretch of caudal fin, 1 foot; weight, 18 pounds.

   The water was not over 18 inches deep where this fish was caught. This species has not hitherto been reported from any point so far west, but it is probably not uncommon in the Missouri and its large tributaries even farther west than this place. Mr. Walker, who lives near the mouth of White River, says the spoonbill cat is occasionally seen there in the spring, and that one was taken near this same place, about the 1st of June of this year, which was about 5 feet long.

   While this curious and interesting fish is probably common in all the larger streams and bayous of the Mississippi Valley, especially in the lowland waters, it is very rarely caught or seen. During several years collecting in the Mississippi Valley, we have taken not more than 6 or 8 examples, all of which were rather large, the smallest being at least 15 inches long. Special search for the young has been made by us in the ponds and bayous along the lower Wabash River, but without finding any. Prof. Harrison Garman, who has made a careful study of the fauna of the waters of the Mississippi bottoms near Quincy, Ill., took but a single example, which was about 14 inches long. "The adults," he says, "are common in the Mississippi River, where they were occasionally seen leaping about the water."

5. **Acipenser rubicundus** Le Sueur. *Red Sturgeon; Common Sturgeon.* Upper Missouri River (as *Acipenser copei* type, Duméril, 1870); Osage River (as *Acipenser rauchi* type, Duméril, 1870); and Missouri River (as *Acipenser anasimos* type, Duméril, 1870); Kansas River (Graham, 1885); Kansas River at Lawrence (Cragin, 1885*a*).

   Not seen by us, but Mr. Walker informs us that sturgeon are often taken in White and Missouri rivers, near Chamberlain, in the spring, and we have learned from others that this species is of considerable importance as a food-fish in this portion of the Missouri River. In the vicinity of Yankton considerable numbers were formerly caught, but the fish is less abundant during the last few years.

6. **Scaphirhynchus platorynchus** (Rafinesque). *Shovel-nose Sturgeon.* Missouri River (Girard, 1858); Missouri River, at Fort Buford, N. Dak. (Jordan, 1878); Missouri River, at Fort Benton (Cope, 1879); "Common over the State of Kansas" (Graham, 1885); Kansas River at Lawrence and Topeka (Cragin, 1885*a*); Missouri River, Iowa (Meek, 1892).

   Specimens of this species were obtained from North Platte River at Casper and Douglas. The single specimen in the collection from Casper is 18 inches long. At Douglas numerous specimens were taken, the largest being about 2 feet long. Armed plates before the dorsal, 16; lateral plates, 42. A very small specimen from North Platte, at Grand Island, measures 4¾ inches in total length. Smaller individuals than this are not often taken in miscellaneous collecting. While at Creighton we were told of the capture of a shovel-nosed sturgeon 2 feet long in Bazile Creek, 15 miles from that place, a few weeks before our visit.

7. **Lepisosteus osseus** (Linnæus). *Long-nosed Gar.* Kansas River near Fort Riley (as *L. otarius* type, Cope, 1865); pools of the Missouri near mouth of Battle Creek, S. Dak. (as *L. otarius*, Cope, 1879); Osage River and tributaries and Missouri River at St. Joseph (Jordan & Meek, 1885); common in all streams of Kansas (Graham, 1885); Kansas and Osage rivers (Cragin, 1885*a*); Solomon River at Beloit (Hay, 1887); Spirit Lake (Meek, 1894). It was reported to us as being seen frequently in the Missouri at Niobrara and Chamberlain, and in the White River near the latter place. We examined one large example, 2½ feet long, which was taken in Crow Creek, near Chamberlain, while we were there. The distance from the tip of the bill to the eye was 6¼ inches, or about one-fifth total length. There were no dark spots except on the caudal and one on the dorsal fin.

8. **Lepisosteus platostomus** Rafinesque. *Short-nosed Gar.* Pools of the Missouri River near Battle Creek, S. Dak. (as *Lepidosteus productus*, Cope, 1879); Kansas River (Graham, 1885); Kansas River at Topeka and Osage River (Cragin, 1885*a*). Not seen by us.

9. **Amia calva** Linnæus. *Mudfish; Dogfish.* Not seen by us. The only record for the upper Missouri is that of Cope in 1865, who reports it from "Platte [Kansas] River, Fort Riley." It is also recorded from the branches of Missouri River, Osage River, etc. (Graham, 1885). This species doubtless occurs in all the bayous along the lower Missouri.

10. **Ictalurus furcatus** (Le Sueur). *Chuckle-head Cat.* Missouri River, Leavenworth, Kans. (Gilbert, 1885); Missouri River, St. Joseph (Jordan & Meek, 1885); "Large streams" [in Kansas] (Graham, 1885); Kansas River and Osage River (Cragin, 1885*a*).

11. **Ictalurus punctatus** (Rafinesque). *Channel Cat; Blue Cat.* Fort Pierre, Nebr.; Milk and Yellowstone rivers; and Nebraska (as *Pimelodus olivaceus* types, Girard, 1858); Fort Riley, Kans. (as *Pimelodus hammondii* and *Pimelodus notatus* types, Abbott, 1860); Milk River (as *Pimelodus olivaceus*, Suckley, 1860); "Big Sandy River of Kansas" [Platte River] (as *Ictalurus simpsonii* type, Gill, 1862 and 1876); Kansas River near Fort Riley (as *I. caruleus* and *I. notatus*, Cope, 1865); Big Muddy River (Jordan, 1878); Missouri River pools near mouth of Battle Creek, S. Dak. (Cope, 1879); Hundred and Two River at Bedford, Iowa, and Maryville, Mo.; Missouri River at St. Joseph; Tabo Creek at Lexington, Mo.; Grand and Osage rivers at Clinton, Mo. (Jordan & Meek, 1885); "quite common" [in Kansas] (Graham, 1885); Ward Creek, Shawnee County, Kans. (Gilbert, 1885); Kansas River, Silver Lake, Ward Creek, Mill Creek, Manhattan, Blue River, and Osage River (Cragin, 1885*a*); Blacksmith and Mission creeks, Shawnee County, Kans. (Gilbert, 1886); Republican River at Concordia, Saline River at Wakeeney, and Solomon River at Beloit (Hay, 1887); Piney River, Texas County, Mo. (Call, 1887); Osage River at La Cygne, Kans.; Solomon River at Harlan, Kans. (Gilbert, 1889); Gasconade River, Mo. (Meek, 1891); Missouri River at St. Joseph and Big Sioux River at Sioux City (Meek, 1892).

Obtained by us at the following localities: White River at Chamberlain; Choteau Creek at Springfield; Bazile Creek at Niobrara; South Loup River and Mud Creek at Ravenna, and Clear Creek at Clermont, Wyo. It was also obtained by Professor Meek in Blue River at Crete, Salt Creek at Lincoln, and at Fremont in the Elkhorn and Platte rivers (Meek, 1894). In most of the streams where we found this fish at all it was rather abundant, but not many specimens were saved. It was especially abundant in White River near Chamberlain and in the channel of South Loup River. Most of the individuals seen were young fish. The largest were a 15-inch specimen at Ravenna and one 16 inches long at Clermont. One of the best and most valuable food-fishes of the lower and middle Missouri Basin.

12. **Ameiurus natalis** (Le Sueur). *Yellow Cat.* Missouri River, St. Joseph (Jordan & Meek, 1885); Kansas River (Graham, 1885); Kansas River (Cragin, 1885*a*); Shunganunga Creek, Topeka, and Blacksmith and Mission creeks, Shawnee County, Kans. (Gilbert, 1886); Dakota River at Lamoure (Woolman, 1896).

13. **Ameiurus nebulosus** (Le Sueur). *Common Bullhead.* "Plentiful" [in Kansas] (Graham, 1885); Topeka, Lawrence, and Ottawa (Cragin, 1885*a*); Osage Fork of Gasconade River, Mo. (Meek, 1891); Dakota River at Lamoure and Jamestown, N. Dak. (Woolman, 1896).

14. **Ameiurus melas** (Rafinesque). *Black Bullhead.* Nebraska (as *A. obesus* type, Gill, 1862 and 1876); Kansas River at Topeka (Gilbert, 1884); Hundred and Two River at Bedford, Iowa, and Maryville, Mo.; Missouri River at St. Joseph; Tabo Creek, Lexington, Mo.; La Mine River and tributaries at Sedalia, Mo; Osage River at Clinton, Mo.; Grand River and Tabo Creek at Calhoun, Mo. (Jordan & Meek, 1885); "common over the State" [of Kansas] (Graham, 1885); Shunganunga and Ward creeks, Shawnee County, Kans. (Gilbert, 1885); Smoky Hill River at Wallace, Republican River at Concordia, Solomon River at Beloit, Saline River at Wakeeney, north fork of Solomon River at Kirwin (Hay, 1887); Sappa Creek at Oberlin, Middle Beaver Creek, Smith County, Kans., Solomon River at Logan and Harlan, Kans. (Gilbert, 1889); Big Piney River near Cabool and Marais River at Dixon, Mo. (Meek, 1891); Silver Lake, Iowa; Soldier River at Charter Oak, and Boyer River at Arion, Iowa (Meek, 1892); Platte and Elkhorn rivers at Fremont, Salt Creek at Lincoln, Floyd River at Lemars, and Spirit Lake (Meek, 1894); Dakota River and Pipestem Creek at Jamestown, N. Dak. (Woolman, 1896).

Found by us at the following places: Blue River, Seward; Ingalls Lake, Long Pine; Bazile Creek, Niobrara; Long Pine Creek, Long Pine; pond at Creighton; pond at Norfolk Junction; pond at Ewing; canal at Niobrara; Lincoln and Beaver creeks, York; Carp Lake near Long Pine; Big Blue River at Seward; Lone Tree Creek, Chadron; Rock and Enemy creeks, Mitchell; Firesteel, Choteau, and Emanuel creeks, Springfield; Crow Creek, Chamberlain; and Prairie Creek, Scotland. The western limit in the range of this species seems to be near the western boundaries of Kansas and Nebraska, and is marked by the western limit of the small prairie lakes and stagnant ponds. It was not found in any of the alkaline streams, nor in any of the clear, cold streams of the Black Hills; but in the ponds in eastern Nebraska and South Dakota it was very abundant, particularly at Scotland, Mitchell, Chamberlain, Creighton, and Long Pine. It grows to a size which makes it of considerable value in those States as a pan-fish.

15. **Leptops olivaris** (Rafinesque). *Mud Cat.* Osage River, Mo., and Missouri River, St. Joseph (Jordan & Meek, 1885); Kansas River (Graham, 1885); Topeka, Lawrence, and Ottawa (Cragin, 1885*a*); Gasconade River, Mo. (Meek, 1891). A single specimen of this species was caught with the seine in the White River near Chamberlain. It was a female measuring 3 feet 6 inches in total length, and weighing 32 pounds. The following additional measurements were taken: Tip of nose to origin of dorsal fin, 15 inches; to adipose fin, 28 inches; distance over head between pectorals, 15¼ inches; distance between posterior nostrils, 3¼ inches; distance between eyes, 6¼ inches; length of maxillary barbel, 7¼ inches. This fish was very sluggish, and made no effort to escape until we began lifting it out of the water, when it became greatly excited and hard to handle. The mud cat probably occurs in all the larger streams of the Missouri Basin, but we have not seen any record of its occurrence west of Omaha, except the general statement of Graham cited above.

16. **Noturus flavus** Rafinesque. *Stone Cat; Yellow Cat.* Platte River (as *Noturus occidentalis* type, Gill, 1862 and 1876); Platte River (Cope, 1871); Osage River., Mo., La Mine River, Mo., and Hundred and Two River at Bedford, Iowa, and Maryville, Mo.; Blackwater Creek, Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo.; Osage River, Clinton, Mo.; Tabo Creek, Calhoun, Mo. (Jordan & Meek, 1885); Mission Creek, Shawnee County, Kans. (Gilbert, 1886); Smoky Hill River, Wallace, Kans., and North Fork of Solomon River, Lenora, Kans. (Hay, 1887); Mission Creek, Shawnee County, Kans.; Snokomo Creek, Wabaunsee County, Kans., and Missouri River, Leavenworth, Kans. (Gilbert, 1886); Solomon River at Harlan and Logan, Kans., and Osage River at La Cygne, Kans. (Gilbert, 1889); Missouri River, St. Joseph; Big Sioux River, Sioux Falls, S. Dak., and Sioux City, Iowa (Meek, 1892); Missouri River, Craig, Mo. (Eigenmann, 1894); Salt Creek, Lincoln, Nebr. (Meek, 1894). It was found by us at the following places: Emanuel Creek, Springfield; Norfolk Creek, Norfolk Junction; Elkhorn River, Ewing; Beaver Creek, York; Lincoln Creek, York; Platte River, Grand Island; Middle Loup River, Dunning; Chadron Creek, Chadron; White River, Chadron; Cheyenne Falls; Belle Fourche River, Belle Fourche; Beaver Creek, Buffalo Gap; Platte River, Douglas; Beaver Creek near Newcastle; Powder River, Arvada; Big Goose Creek, Sheridan, and Salt Creek, Lincoln. Quite abundant in the south fork of the Cheyenne at Cheyenne Falls, where numerous specimens, 5 to 10 inches long, were taken. It is said to be a common fish in the Cheyenne and is of some importance as a food-fish. The specimens from Cheyenne Falls are all extremely pale.

17. **Schilbeodes gyrinus** (Mitchill). Big Sioux River, Sioux Falls, S. Dak. (Meek, 1892); Platte River, Fremont, Nebr.; Floyd River, Lemars and Sioux City, Iowa (Meek, 1894); Choteau Creek, Springfield; Prairie Creek, Scotland; Enemy, Firesteel, and Rock creeks, Mitchell; Norfolk Creek, Norfolk Junction.

    This small catfish appears to be not uncommon about Mitchell and Scotland, but we did not find it elsewhere except at Norfolk Junction, where a single specimen was obtained. The largest specimens secured by us are 4 inches long, and are very plump. The head is very broad and heavy. The interorbital region is concave, especially posteriorly, the postocular region being quite fleshy and prominently rounded. The pectoral spine is equal to one-third of the distance from the tip of the snout to the origin of dorsal fin. Most of these specimens are very dark, but the dark lateral lines show plainly on all. These lines are three in number, one following the axis of the body from just back of the pectoral to the middle of the base of the caudal fin, another above from the dorsal fin to the caudal; the median line of the back also is dark.

18. **Schilbeodes exilis** (Nelson). Osage River, etc. (Graham, 1885); Jones Creek, Dixon, Mo., and Little Piney River, Cabool, Mo. (Meek, 1891).

19. **Schilbeodes miurus** (Jordan). Branches of Missouri River (Graham, 1885).

20. **Ictiobus cyprinella** (Cuvier & Valenciennes). *Common Buffalo-fish.* Missouri River, St. Joseph, Mo. (Jordan & Meek, 1885); eastern Kansas (Graham, 1885); Soldier Creek and Osage River (Cragin, 1885*a*); Marais River, Dixon, Mo. (Meek, 1891); Elkhorn River, Fremont, Nebr. (Meek, 1894). Small specimens were obtained in Platte River at Grand Island, in the Elkhorn at Ewing, and in the Middle Loup River at Dunning. The confusion which exists among the species of *Ictiobus* and *Carpiodes* is very great and it is doubtful if any of the descriptions given in the books is correct. The species as now understood are certainly hard to distinguish, and the confusion can only be removed by an exhaustive study of a very large amount of material.

**21. Ictiobus urus** (Agassiz). *Mongrel Buffalo.* Missouri River, St. Joseph (Jordan & Meek, 1885); Kansas River and branches of the Missouri (Graham, 1885); Silver Lake and Soldier Creek (Cragin, 1885*a*).

**22. Ictiobus bubalus** (Rafinesque). *Small-mouth Buffalo.* Missouri River, St. Joseph, Mo. (Jordan & Meek, 1885); plentiful over Kansas (Graham, 1885); Kansas River (Cragin, 1885*a*); Marais River, Dixon, Mo. (Meek, 1891); Floyd River, Sioux City, Iowa, and East Okoboji Lake, Iowa (Meek, 1894). Found by us only in Crow Creek near Chamberlain, S. Dak. The two small specimens in the collection give the following measurements: Head 4; depth 2¾ and 3; eye 4; snout 4; scales 7-37-5 and 7-38-5. D. 23 and 26; A. 8. The number of dorsal rays is fewer than the usual number for this species, and the axis of the body is scarcely below the lateral line. These are the only dark-colored specimens of buffalo-fish that we secured, and they are paler than more eastern examples.

Either this or the following species is said to be very abundant in Okoboji Lake and the other lakes of northwestern Iowa and southern Minnesota. We were unable to secure specimens, and can not be sure which species it is. Some species of buffalo-fish, probably this one, is said to be excessively abundant in most of the small lakes of South Dakota, where it is of much importance as an article of food.

**23. Carpiodes carpio** (Rafinesque). *Carp Sucker.* Osage River, Mo. (as *Carpiodes bison* type, Agassiz, 1855); Manhattan, Kans., and Ward Creek, Shawnee County, Kans. (Gilbert, 1884); Silver Lake, Ward Creek, and Fort Riley (Cragin, 1885*a*); Belle Fourche River, Belle Fourche, S. Dak. (Evermann, 1893); Niobrara River north of Long Pine; Mud Creek at Ravenna; Wood Creek at Grand Island; Middle Loup River at Dunning and Emanuel Creek near Springfield. Only young specimens were obtained. These seemed to differ from typical *carpio* in being more slender and in having fewer rays in dorsal fin. The depth is 3 to 3⅓ and the dorsal 25.

**24. Carpiodes velifer** (Rafinesque). *Quillback.* Milk River (as *Carpiodes damalis* type, Girard, 1856); Fort Pierre (Girard, 1858); Milk River (as *Carpiodes damalis*, Suckley, 1860); Kansas River near Fort Riley (as *Carpiodes damalis*, Cope, 1865); "Probably from one of the Western States" (as *Carpiodes grayi* type, Cope, 1870); Hundred and Two River, Bedford, Iowa, and Maryville, Mo.; Blackwater Creek, Brownsville, Saline County, and Flat Creek, near Sedalia, Mo.; Osage River, Clinton, Mo.; Grand River, Clinton, Mo.; Tabo Creek, Calhoun, Mo. (as *Ictiobus velifer*, Jordan & Meek, 1885); Kansas River (as *Ictiobus velifer* and *Ictiobus velifer bison*, Graham, 1885); Ottawa and Eureka Lake (Cragin, 1885*a*); Republican River, Concordia, Kans.; Solomon River, Beloit, Kans.; Saline River, Wakeeney, Kans. (Hay, 1887); Missouri River, Iowa; Big Sioux River, Sioux City, Iowa (Meek, 1892); Poplar River, Poplar, Mont. (Eigenmann, 1894); Blue River, Crete, Nebr.; Platte and Elkhorn rivers, Fremont, Nebr., and Floyd River, Sioux City, Iowa (Meek, 1894). Found by us in the South Loup at Ravenna, which is the most western point from which this species has been reported.

**25. Cycleptus elongatus** (Le Sueur). *Gourd-seed Sucker; Missouri Sucker; Black Sucker.* Kansas River (Graham, 1885; Cragin, 1885*a*). This interesting sucker does not seem to have been taken often in the Missouri Basin, and how it came by the name "Missouri sucker" is not apparent.

**26. Pantosteus jordani** Evermann.

*Pantosteus virescens* Jordan, Bull. 4, vol. IV., U. S. Geol. and Geogr. Survey of Territories, 780, 1878, Sweet Grass Hills, Montana (specimens collected by Dr. Elliott Coues).

*Catostomus discobolus* Evermann, Bull. U. S. Fish Comm., XI, 1892, pl. XVIII, fig. 1, 41, Red Rock and Beaverhead rivers, Mont.

*Pantosteus jordani* Evermann, Bull. U. S. Fish Comm., XII, 1892, January 27, 1893, art. 2, 51–56, Red Rock and Beaverhead rivers, Mont., and various Black Hills localities, types; Gilbert & Evermann, Bull. U. S. Fish Comm., XIV, 1894, 189, various places in the Columbia River basin.

*Pantosteus columbianus* Eigenmann & Eigenmann, American Naturalist, February 4, 1893, 151, Boise River, Caldwell, Idaho; types.

In the third paper referred to above will be found the description of this species, together with a discussion of the relationships of the various known species of *Pantosteus* and the closely related species of *Catostomus*. In the paper is also given the complete synonymy of each species of *Pantosteus*. In October, 1892, numerous specimens of this species were obtained as follows: Whitewood Creek, Deadwood; Spearfish Creek, Spearfish; Chicken Creek near Spearfish; Crow Creek, Gammon's Ranch; Belle Fourche River, Belle Fourche; Rapid Creek, Rapid, and Hat Creek, Ardmore.

All the specimens found in Whitewood and Spearfish creeks were young individuals. In all the other streams named, good-sized specimens were found, the largest and finest one being about 7 inches in length and from Rapid Creek. During the investigation in South Dakota, Nebraska, and Wyoming, carried on in 1893, it was found in the following places: Chadron Creek, Chadron; Cheyenne River, Edgemont; Cheyenne River near Hot Springs; Beaver Creek, Buffalo Gap; Spearfish Creek, Spearfish; Redwater Creek near Spearfish; creek at Hill City; French Creek, Custer; Beaver Creek, Newcastle; Powder River, Arvada; Clear Creek at Clermont; south fork of Tongue River, Sheridan; Big Goose Creek, Sheridan. This small sucker is abundant in most of the smaller, clearer streams in and about the Black Hills. It seems most abundant in the streams tributary to the Cheyenne. South of the Cheyenne it was found in only one place, this being at Chadron in the basin of White River, which, however, is separated from the south fork of Cheyenne River by a distance of less than 20 miles. This is the most eastern and southern point from which it has yet been obtained. The only other place outside of the Cheyenne basin where we found it was in the streams about Sheridan. It probably does not occur in the North or South Platte, but will doubtless be found to inhabit all suitable streams of the upper Missouri Basin.

The recent finding of this fish at many places in the Columbia Basin shows it to be a species of wide distribution, and, as is usually the case with such species, it is subject to great variations in some of its characters. This is true particularly as regards the squamation. The specimens from Spearfish and Hill City are noticed to have very small scales, the number in the course of the lateral line ranging from 94 to 108 in the several specimens counted; the usual number seems to be 17–104–13. Those from Sheridan, Chadron, and Hot Springs have larger scales, the number in the lateral line running from 77 to 89 in numerous examples counted. From Big Goose Creek the usual formula was found to be 14–80–11 or 12. In the Newcastle specimens the scales are a little smaller, the number being about 88 or 89, thus approximating the fine-scaled Hill City form. There is not much variation among the individuals from any one place. The fine-scaled specimens were found in very cold water, and it may be that they represent a slight geographic variety inhabiting the smaller and colder mountain streams of the Black Hills. The Hill City specimens have the mouth unusually broad and 3 or 4 rows of papillæ upon the upper lip. The Chadron specimens have the mouth narrower and more numerous papillæ upon the upper lip. The color is somewhat darker. This species evidently does not reach a large size. We have examined about 500 specimens, and the largest individual measures less than 10 inches in the total length.

**27. Catostomus griseus** (Girard). *Milk River Sucker.* Sweetwater River (as *Catostomus* (*Acomus*) *griseus* type, Girard, 1856 and 1858); Milk River (as *Catostomus* (*Acomus*) *lactarius* type, Girard, 1856 and 1858); Milk River, Mont. (as *Catostomus retropinnis* type, Jordan, 1878); Horse Creek, Red Cloud Creek, and Platte River (as *C. griseum*, Cope, 1871); South Platte River, Denver and Hartsel Hot Springs, Colo.; Bear Creek, Morrison, Colo.; Middle Boulder Creek, Boulder, Colo. (Jordan, 1891); Yellowstone and Gardiner rivers (Jordan, 1891*a*); Missouri River, Craig, Mont. (Eigenmann, 1894). Two specimens were taken from the North Platte River at Douglas, Wyo. They give the following measurements:

| Total length. | Head. | Depth. | Eye. | Snout. | Dorsal. | Anal. | Scales. |
|---|---|---|---|---|---|---|---|
| *Inches.* | | | | | | | |
| 7 | 4⅛ | 4⅜ | 5 | 2¼ | 10 | 7 | 15-88-10 |
| 5 | 3⅝ | 4⅛ | 5 | 2¼ | 10 | 7 | 15-95-10 |

Compared with specimens of *C. commersonii sucklii* of the same size, the following differences are noted: Body rather heavier or stouter; caudal peduncle shorter and deeper, the least depth being 2¼ in head, while in *C. commersonii sucklii* it is more than 3; the top of the head is less arched and the snout more prominent; the mouth is a little narrower and the lobes of the lower lip are longer; the scales are very small, particularly on the anterior part of the body; the color is much paler, the three dark spots usually present on younger specimens of var. *sucklii* not being present on *griseus* at all. Compared with smaller specimens of *C. catostomus*, the distinguishing characters are found to be very slight. In *C. griseus* the top of the head is flatter and the snout is less decurved; the upper lip is larger and more pendant, and has more papillæ; the lobes of the lower lip are rather longer, and the cartilaginous sheath is less developed; the dorsal fin is smaller, it having but 10 rays.

**28. Catostomus catostomus** (Forster). *Long-nosed Sucker.* This sucker was obtained at the following places: North Platte River; Deer Creek, Glenrock; Clear Creek, Clermont; Powder River, Arvada; Big Goose Creek, Sheridan, and south fork of Tongue River, Sheridan. It was not found anywhere in Nebraska or South Dakota, and probably does not occur in the Missouri Basin east of Wyoming. It was obtained in 1892 by Dr. Eigenmann in the Red River of the North at Winnipeg, Swift Current Creek, and Bow, Elbow, Vermillion, and Saskatchewan rivers, all in the Saskatchewan Basin. The important characters of the larger specimens collected by us are given in the following table:

| Locality. | Total length in inches. | Head in length. | Depth in length. | Eye in head. | Eye in snout | Dorsal. | Anal. | Rows of papillæ on upper lip. | Scales. |
|---|---|---|---|---|---|---|---|---|---|
| Arvada, Wyo.... | 11 | 4⅛ | 6 | 6 | 3 | 10 | 7 | 3 | 17- 95-13 |
| Sheridan, Wyo... | 8 | 4¼ | 5½ | 6 | 2½ | 10 | 7 | 4 | 15-105-12 |
| Clermont, Wyo.. | 7⅛ | 4⅛ | 5⅞ | 6 | 2⅜ | 10 | 7 | 3 | 17-102-12 |
| Do..... | 7⅛ | 4⅛ | 5 | 6 | 2⅜ | 10 | 7 | 2 | 16- 96-13 |
| Douglas, Wyo.... | 7 | 4⅛ | 5 | 5⅔ | 2½ | 10 | 7 | 3 | 15- 89-12 |
| Sheridan, Wyo... | 11 | 4⅜ | 4⅜ | 6⅔ | 3⅛ | 10 | 7 | 3 | 17-100-13 |
| Do..... | ..... | ..... | ..... | 6½ | 3⅛ | 10 | 7 | 4 | 14-100-16 |
| Do..... | ..... | ..... | ..... | 6¼ | 3⅛ | 10 | 7 | 4 | 17-100-13 |

The Sheridan specimens are badly decayed and accurate measurements can not be taken. In all of these specimens the scales are considerably smaller than the examples of *C. griseus* from Douglas, the top of the head is more curved, and the snout less prominent. The upper lip is incised nearly to the base, there being but a single row of papillæ across the base.

**29. Catostomus commersonii** (Lacépède). *Common White Sucker.* Milk River (as *Catostomus sucklii* type, Girard, 1856 and 1858); upper Missouri and tributaries (as *Catostomus sucklii*, Suckley, 1860); Kansas (as *Catostomus chloropteron* type, Abbott, 1860); Kansas River near Fort Riley (as *Catostomus chloropteron*, Cope, 1865); Platte River (as *C. sucklii*, Cope, 1871); Five Forks and headwaters of Milk River (as *C. teres*, Jordan, 1878); Shunganunga Creek and Kansas River, Topeka (as *C. teres*, Gilbert, 1884); Hundred and Two River, Bedford, Iowa, and Maryville, Mo.; Blackwater Creek, Brownsville, Saline County, Mo.; and Flat Creek, Sedalia, Mo.; Osage River, Clinton, Mo.; Grand River, Clinton, Mo., and Tabo Creek, Calhoun, Mo. (as *C. teres*, Jordan & Meek, 1885); common over the State [of Kansas] (as *C. teres*, Graham, 1885); Shunganunga Creek and Kansas River, Topeka (as *C. teres*, Gilbert, 1885); Shunganunga and Wild Cat creeks, and Kansas and Osage rivers (Cragin, 1885*a*); Blacksmith Creek, Shawnee County, Kans. (as *C. teres*, Gilbert, 1886); Solomon River, Beloit, Kans.; north fork of Solomon River, Lenora, Kans.; Saline River, Wakeeney, Kans.; Smoky Hill River, Wallace, Kans. (Hay, 1887); north fork of Solomon River, Logan, Kans.; Middle Beaver Creek, Smith County, Kans. (as *C. teres*, Gilbert, 1889); Big Piney River, Cabool, Mo.; Marais River, Dixon, Mo.; Niangua River, Marshfield, Mo. (as *C. teres*, Meek, 1891); South Platte River, Denver (as *C. teres sucklii*, Jordan, 1891); Big Sioux River, Sioux City, Iowa; Boyer River, Arion, Iowa (Meek, 1892); Middle, Crow, Chicken, Cottonwood, and Hat creeks, S. Dak., and Belle Fourche River, Belle Fourche, S. Dak. (Evermann, 1893); Poplar River, Poplar, Mont. (Eigenmann, 1894); Floyd River at Lemars and Sioux City, Iowa (Meek, 1894); Dakota River at La Moure and Jamestown (Woolman, 1896).

This is apparently the most abundant sucker in the region covered by these investigations, as may be seen from the following list of localities from which we obtained it: Enemy Creek, Mitchell; Dakota River, Mitchell; Firesteel Creek, Mitchell; Rock Creek, Mitchell; Crow Creek, Chamberlain; Prairie Creek, Scotland; Emanuel Creek, Springfield; Choteau Creek, Springfield; canal at Niobrara; Bazile Creek, Niobrara; Verdigris Creek, Verdigris; pond at Creighton; Spring Creek at Bazile Mills; Elkhorn River at Ewing; Long Pine Creek, Long Pine; Niobrara River, Marsland; Chadron Creek, Chadron; Lone Tree Creek, Chadron; Wood Creek, Grand Island; Dismal River, Dunning; Deer Creek, Glenrock; North Platte River, Glenrock; North Platte River, Douglas; French Creek, Custer; small creek at Hill City; Beaver Creek, Buffalo Gap; Cheyenne River, Hot Springs; Cheyenne River, Edgemont; Redwater Creek, Spearfish; Beaver Creek, Newcastle; Clear Creek, Clermont; Powder River, Arvada; south fork of Tongue River, Sheridan; Big Goose Creek, Sheridan. In October, 1892, it was found at the following places: Middle Creek and Belle Fourche River at Belle Fourche; Crow Creek at Gammon's ranch, near Spearfish; Chicken Creek, near Spearfish; Rapid Creek, Rapid City, S. Dak.; Cottonwood Creek, Edgemont, and Hat Creek, Ardmore, S. Dak.

We have spent a good deal of time in studying this large amount of material and have found it extremely difficult to reach any satisfactory conclusion regarding the status of this and the other species of *Catostominæ* of the Missouri Basin. Among the individuals which we refer to this species there is great variation, particularly in the size and arrangement of the scales, the number of dorsal fin rays, and in the mouth. Such of these variations as can be well presented in tabular form are given in the following table. The localities are arranged approximately, beginning with those farthest east and ending with those farthest west at which this species was found:

| Locality. | Head. | Depth. | Eye. | Snout. | Dorsal. | Anal. | Scales. | Rows of papillæ on upper lip. |
|---|---|---|---|---|---|---|---|---|
| Mitchell, S. Dak | 4 | 4⅓ | 5 | 2¼ | 11 | 7 | 10-64-8, crowded anteriorly | 3 |
| Do | 3⅔ | 4⅔ | 4⅔ | 1¾ | 11 | 7 | 10-60-7, crowded anteriorly | 3 |
| Do | 3⅔ | 4⅔ | 4⅔ | 2 | 11 | 7 | 10-59-7, crowded anteriorly | 3 |
| Do | 3⅔ | 5 | 5 | 2⅓ | 13 | 7 | 9-60-8, somewhat crowded | 3 |
| Ewing, Nebr | 4 | 4½ | 5 | 2½ | 12 | 7 | 10-58-9 | 3 |
| Do | 4⅓ | 5 | 5½ | 2⅓ | 11 | 7 | 10-62-8 | 3 |
| Bazile Mills, Nebr | 4⅓ | 6 | 5 | 2⅓ | 11 | 7 | 10-62-9, crowded anteriorly | |
| Niobrara, Nebr | 3⅔ | 5 | 4½ | 2 | 11 | 7 | 9-60-8, crowded anteriorly | 3 |
| Do | 4¼ | 5 | 5 | 2⅓ | 11 | 7 | 10-62-8, crowded anteriorly | |
| Scotland, S. Dak | 4 | 5 | 5⅓ | 2⅓ | 11 | 7 | 9-61-7, not much crowded | 4 |
| Chamberlain, S. Dak | 4 | 5⅓ | 5⅓ | 2⅓ | 11 | 7 | 9-59-7, crowded anteriorly | |
| Creighton, Nebr | 4 | 4½ | 4½ | 2 | 11 | 7 | 10-60-8, crowded anteriorly | 3 |
| Long Pine, Nebr | 4 | 5⅓ | 6 | 2⅓ | 10 | 7 | 10-63-7, crowded anteriorly | |
| Do | 4 | 4⅔ | 4⅔ | 2⅓ | 10 | 7 | 10-62-9, not much crowded | 3 |
| Do | 4 | 5 | 4 | 1⅔ | 11 | 7 | 9-60-8, not much crowded | 3 |
| Do | 4 | 5⅓ | 4⅔ | 2⅓ | 10 | 7 | 10-60-8, not much crowded | 3 |
| Dunning, Nebr | 4 | 4⅔ | 4⅓ | 2 | 11 | 7 | 9-59-8 | 3 |
| Grand Island, Nebr | 4 | 4⅔ | 4⅔ | 2⅓ | 10 | 7 | 9-62-7, scarcely reduced anteriorly. | 3 |
| Chadron, Nebr | 4 | 4⅔ | 5⅓ | 2⅓ | 11 | 7 | 10-60-8, not much crowded | 4 |
| Do | 4⅓ | 5 | 5 | 2 | 12 | 7 | 10-63-9, not much crowded | 3 |
| Do | | | | | | | 10-60-7 | |
| Cheyenne Falls, S. Dak | 3⅔ | 5 | 5 | 2⅓ | 11 | 7 | 9-56-7 | 2 or 3 |
| Do | 3⅔ | 4⅔ | 4⅔ | 2⅓ | 9 | 7 | 9-56-7 | 2 or 3 |
| Custer, S. Dak | 3⅔ | 4⅔ | 5 | 2⅔ | 11 | 7 | 11-63-9, somewhat crowded | 3 |
| Do | 3⅔ | 4⅓ | 4⅔ | 2 | 11 | 7 | 10-62-8 | 3 |
| Do | 3⅓ | 5 | 4⅓ | 2 | 12 | 7 | 10-64-9 | 4 |
| Hill City, S Dak | 3⅓ | 4⅓ | 5⅓ | 2⅓ | 11 | 7 | 10-62-7, rather crowded | 3 |
| Redwater Creek, S. Dak | 4 | 4⅓ | 5 | 2⅓ | 10 | 7 | 9-60-7, not much crowded | 3 |
| Do | 3⅔ | 4⅔ | 4⅔ | 2⅓ | 10 | 7 | 9-58-7, not much crowded | 4 |
| Do | 4 | 4⅔ | 5 | 2⅓ | 11 | 7 | 10-62-7, not much crowded | 3 |
| Do | 4 | 5 | 5 | 2⅓ | 11 | 7 | 9-58-8, not much crowded | 3 |
| Glenrock, Wyo | 3⅔ | 5 | 4⅓ | 2⅓ | 11 | 7 | 58-19, no lateral line | 2 or 3 |
| Do | 3⅔ | 4⅔ | 4⅔ | 2⅓ | 10 | 7 | 9-60-8 | 3 |
| Do | 3⅔ | 4⅓ | 4⅔ | 2⅓ | 10 | 7 | 10-61-8, somewhat crowded | 3 |
| Do | | | | | 11 | | 10-58-7 | |
| Douglas, Wyo | 3⅔ | 5 | 5 | 2⅔ | 11 | 7 | 9-61-7, somewhat crowded | 3 |
| Newcastle, Wyo | 4 | 5 | 4⅔ | 2⅓ | 10 | 7 | 9-54-6, somewhat crowded | 3 |
| Do | 3⅔ | 5⅓ | 4⅔ | 2⅓ | 10 | 7 | 9-54-6, somewhat crowded | 3 |
| Do | | | | | 11 | 7 | 9-58-6, somewhat crowded | 3 |
| Marsland, Nebr | 4 | 4⅓ | 5 | 2 | 11 | 7 | 10-61-9, not much crowded | 4 |
| Buffalo Gap, S. Dak | | | | | 12 | | 9-64-8 | |
| Do | | | | | 11 | | 9-59-8 | 4 |
| Arvada, Wyo | 3⅓ | 4⅔ | 5⅓ | 2⅔ | 11 | | 9-59-7, not much crowded | 4 or 5 |
| Do | 3⅓ | 4⅓ | 5⅓ | 2⅓ | 11 | 7 | 9-58-8, crowded, but regular | 4 or 5 |
| Do | 3⅓ | 5 | 5 | 2⅓ | 11 | 7 | 10-57-6, crowded, but regular | 2 |
| Clermont, Wyo | 3⅔ | 4 | 5⅓ | 2⅓ | 13 | 7 | 11-61-9, much crowded and irregular. | 2 |
| Do | 3⅔ | 4⅓ | 6 | 2 1/6 | 11 | 7 | 10-56-7, crowded and irregular | 3 |
| Do | 3⅔ | 5 | 4⅔ | 2⅓ | 11 | 7 | 10-60-8, crowded, but regular | 3 |
| Sheridan, Wyo | 3⅔ | 5 | 5 | 2⅓ | 12 | 7 | 9-59-7, not much crowded | |

An inspection of this table shows that the variation in the length of head is from 3⅔ to 4¼, and in depth from 4 to 6; the usual length of head and depth of body is about 4 and 5, respectively. These variations, however, are not unusual, and need give us no trouble. The same may be said of the eye and snout; these differences are no greater than can be accounted for as due to differences in age. The range of the dorsal fin rays is through 5, i. e., from 9 to 13, the usual number being 10 or 11. This is a larger range than has hitherto been noticed in this species and is, of course, independent of age. The variation in the scales is rather remarkable, the number in a transverse series ranging from 15 to 20, and those in the course of the lateral line from 54 to 64, the most usual formula being 9 or 10-59 to 61-7 or 8. The scale formula for *Catostomus commersonii* has usually been given as 10-64 to 70-9. In the original description of *Catostomus sucklii* the dorsal rays are given as 14 (including rudimentary ones), but Girard does not give the number of scales, merely remarking that "the scales are large and but little smaller anteriorly than posteriorly." The two figures which he gives in the Pacific Railroad report show the scales as 10-64-8 and 9-55-9, the latter being a young specimen. The specimens in our collection which we have examined

from Mitchell, Bazile Mills, Niobrara, Chamberlain, Long Pine, and Clermont, have the scales decidedly crowded and irregular on the anterior part of the body; this is especially so in the two large specimens from Clermont. Those from Chadron, Custer, Hill City, Redwater Creek, Douglas, and Newcastle are not much crowded, but they are irregular in arrangement.

Five of the eight small specimens from Glenrock are peculiar in that there is no trace of the lateral line. In the three others the lateral line is normally developed. The number of rows of papillæ upon the upper lip varies from 2 to 5, the usual number being 3 or 4. These differences do not possess any geographic significance; specimens from the same stream or from the same sub-basin show both extremes of variation in this regard. Nor have we been able to discover that these variations in lip characters are coordinated with any other characters. Upon comparing these Missouri specimens with others from Ohio and Pennsylvania, it appears that in the western specimens the scales average somewhat larger and the papillæ on the upper lip are arranged in more rows. The eye is somewhat smaller in the western specimens. The two forms may be diagnosed as follows:

*a.* Scales small, 60 to 70 in lateral line, much crowded anteriorly; eye less than 5 in head; upper lip with 2 or 3 rows of papillæ ..... *commersonii.*

*aa.* Scales large, 54 to 64 in lateral line, less crowded anteriorly; eye smaller, usually more than 5 in head; upper lip with 3 or 4 rows of papillæ ..... *sucklii.*

We doubt, however, if *sucklii* should be recognized even as a subspecies, and for the present we combine the two.

In nearly all the young western specimens the dark spot at base of caudal fin is quite distinct; there is often a similar dark spot above the ventral and one just above the middle of the pectoral. All these disappear with age.

**30. Catostomus nigricans** Le Sueur. *Hog Sucker; Stone-lugger.* Kansas River (Graham, 1885); Osage River (Cragin, 1885*a*); Little Piney River, Osage Fork, Lock Fork, and Jones Creek, Mo.; Marais, Niangua, and Sac rivers, at Dixon, Marshfield, and Springfield, Mo. (Meek, 1891). This common eastern species seems not to occur in Nebraska, South Dakota, or Wyoming, but reaches its western limit in the lower Missouri Basin.

**31. Erimyzon sucetta oblongus** (Mitchill). *Chub Sucker.* Professor Snow reports this fish from the Kansas River at Lawrence (Cragin, 1885*a*).

**32. Minytrema melanops** (Rafinesque). *Spotted Sucker; Striped Sucker.* Missouri River at Fort Pierre and Yellowstone River (as *Ptychostomus haydeni* type, Girard, 1856 and 1858); Osage River and Mill Creek (Cragin, 1885*a*). The fact that this species has not been taken west of Missouri by any recent collector makes its occurrence in the upper Missouri region questionable.

**33. Moxostoma bucco** (Cope). St. Joseph, Mo. (as *Ptychostomus bucco* type, Cope, 1871). Only the type known; a doubtful species.

**34. Moxostoma aureolum** (Le Sueur). *Common Redhorse.* Blackwater Creek at Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo. (as *Moxostoma macrolepidotum duquesnei*, Jordan & Meek, 1885); plentiful in Kansas (Graham, 1885); Soldier and Shunganunga creeks, Silver Lake, Osage River, Blue River, and Kansas River (Cragin, 1885*a*); La Mine River, Mo. (Jordan & Meek, 1885); Shunganunga Creek, Topeka (as *M. macrolepidotum*, Gilbert, 1885); Solomon River, Beloit, Kans. (Hay, 1887); Osage River, Marshfield, Mo.; Lock Fork, Mansfield, Mo.; Big Piney River, Cabool, Mo.; Little Piney River, Newburg, and Arlington, Mo.; Gasconade River, Arlington, Mo.; Marais River, Dixon, Mo.; Niangua River, Marshfield (as *M. macrolepidotum duquesnei*, Meek, 1891); Big Sioux River at Sioux Falls and Sioux City (Meek, 1892); Belle Fourche River, Belle Fourche, S. Dak.; Redwater Creek, Belle Fourche, S. Dak.; and south fork of Cheyenne River, Cheyenne Falls, S. Dak.

(Evermann, 1893); Poplar River, Poplar, Mont. (Eigenmann, 1894); Floyd River, Lemars, Iowa, and Blue River, Crete, Nebr. (as *M. macrolepidotum duquesnei*, Meek, 1894); Dakota River at Jamestown (Woolman, 1896).

Many good-sized examples were obtained in 1892 at Belle Fourche from the Redwater and the Belle Fourche. The collection of 1893 contains specimens from the following places: Dakota River, Mitchell; Emanuel Creek, Springfield; Choteau Creek, Springfield; Crow Creek, Chamberlain; canal at Niobrara; Verdigris Creek, Verdigris; Elkhorn River, Norfolk Junction; Elkhorn River, Ewing; South Loup River, Ravenna; Long Pine Creek, Long Pine; Niobrara River, Long Pine; North Platte River, Douglas; North Platte River, Casper; Deer Creek, Glenrock; Clear Creek, Clermont. There is but little variation among the specimens from different localities, either in number of fin rays, size of scales, or proportion of parts. The scales are, in many specimens counted, 6 or 7–42 to 45–4 or 5. D. 12 or 13; head 4¼ to 4⅖; depth 3⅔ to 4. In large specimens the upper caudal lobe is the longer. This species is of sufficient size and abundance to make it of considerable value as a food fish in this region.

35. **Placopharynx duquesnii** (Le Sueur). *Big-jawed Sucker.* Floyd River at Sioux City and Lemars, Iowa (as *P. carinatus*, Meek, 1894).

36. **Campostoma anomalum** (Rafinesque). *Stone-roller.* Platte River at Fort Kearney (as *C. hippops* type, Cope, 1864 and 1865); Alma, Wabaunsee County, Kans.; Kansas River, Topeka; Ellis, Ellis County, Kans. (Gilbert, 1884); Blackwater Creek, Brownsville, Mo.; Flat Creek, Sedalia, Mo.; Grand River, Clinton, Mo.; Tabo Creek, Calhoun, Mo. (Jordan & Meek, 1885); common in small streams in Kansas (Graham, 1885); Shunganunga Creek and Kansas River at Topeka; Ward Creek, Shawnee County, Kans.; Alma and Ellis, Kans. (Gilbert, 1885); Kansas River, Shunganunga, Mill, and Wild Cat creeks, and Ellis (Cragin, 1885*a*); Blacksmith Creek, Shawnee County, Kans. (Gilbert, 1886); Solomon River, Beloit, Kans.; north fork of Solomon River, Lenora, Kans.; Saline River, Wakeeney, Kans.; Smoky Hill River, Wallace, Kans. (Hay, 1887); Middle Beaver Creek and Spring branch of Spring Creek, Smith County, Kans. (Gilbert, 1889); Jones Creek, Dixon, Mo.; Big Piney River, Cabool, Mo.; Osage Fork, Marshfield, Mo.; Lock Fork, Mansfield, Mo.; Marais River, Dixon, Mo.; Niangua River, Marshfield, Mo.; Sac River, Springfield, Mo. (Meek, 1891); Floyd River, Sioux City, Iowa (Meek, 1894); Dakota River at Jamestown (Woolman, 1896).

Obtained by us as follows: Floyd River, Sioux City; Emanuel Creek, Springfield; Enemy Creek, Mitchell; Prairie Creek, Scotland; Firesteel Creek, Mitchell; Crow Creek, Chamberlain; Wood Creek, Grand Island; Chadron Creek, Chadron; Deer Creek, Glenrock. Not found in any of the streams in or about the Black Hills; nor was it found in any of the streams that are strongly alkaline in character. The largest specimens are those from Chadron, some of which are about 5 inches long. No differences between these and eastern specimens are apparent. Head 4¼; depth 4⅓; eye 5¼; snout 2½; D. 8; A. 7; scales 8–52–7. The black band in the dorsal and anal fins distinct in males; those from Glenrock paler. Glenrock, Wyo., is the most western point from which this fish is known.

37. **Chrosomus erythrogaster** Rafinesque. *Red-bellied Dace.* Marais des Cygnes, Kans. (Graham, 1885); north fork of Solomon River, Lenora, Kans. (Hay, 1887); Jones Creek, Dixon, Mo.; Big Piney River, Cabool, Mo.; Osage Fork, Marshfield, Mo.; Marais River, Dixon, Mo.; Niangua River, Marshfield, Mo.; Sac River, Springfield, Mo. (Meek, 1891).

38. **Chrosomus dakotensis** sp. nov. Type locality: Crow Creek, Chamberlain, S. Dak., where 11 specimens were collected June 22, 1893. (Type, No. 45680, U. S. Nat. Mus.)

Closely related to *Chrosomus erythrogaster*. Head 3⅞; depth 4½; eye 3½; snout 4½; D. 8; A. 8; scales about 80, 24 in cross series. Teeth 4–4, hooked, and with a slight grinding surface. Body moderately stout, head heavy, caudal peduncle shorter than in related species. Eye moderate, interorbital width 3 in head; mouth small and oblique, maxillary short, not nearly reaching vertical at front of eye, its length 1½ in eye; lower jaw projecting. Fins moderate; height of dorsal 1½ in head, its origin behind the base of the ventrals a distance greater than length of snout; anal similar to dorsal; pectorals short, 1½ in head; ventrals very short, not reaching anal. Color as in *C. erythrogaster*, except that the back is darker and the upper dark line is continuous and not broken up into spots; the lower black line is also more distinct. Besides the 11 specimens obtained in Crow Creek we have two from a pond at Niobrara and one from Minnechaduza Creek at Valentine, Nebr. The specimens from Battle Creek, S. Dak., referred by Professor Cope (1879) to *Chrosomus* sp., probably belong to this species.

**39. Hybognathus nuchale** Agassiz. Ward Creek, Menoken, Kans., and Kansas River, Topeka (Gilbert, 1884); Hundred and Two River at Bedford, Iowa, and Maryville, Mo.; Missouri River, St. Joseph (Jordan & Meek, 1885); Kansas River, Ward Creek, and Fort Riley (Cragin, 1885*a*); Piney Creek, Texas County, Mo. (Call, 1887); Smoky Hill River, Wallace, Kans. (Hay, 1887); north fork of Solomon River, Logan, Kans. (Gilbert, 1889); Missouri River, Iowa; Big Sioux River, Sioux City, Iowa; Soldier River, Charter Oak, Iowa (Meek, 1892); Platte and Elkhorn rivers, Fremont, Nebr.; Salt Creek, Lincoln, Nebr.; Floyd River at Sioux City and Lemars, Iowa (Meek, 1894); Dakota River at Jamestown (Woolman, 1896).

**40. Hybognathus nuchale evansi** (Girard). Missouri River at Fort Pierre, Nebr. (as *H. evansi* type, Girard, 1856); Fort Pierre and Sweetwater River (Girard, 1858); upper Platte River (Cope, 1864*a*); Kansas River near Fort Riley (Cope, 1865); Battle Creek, S. Dak. (Cope, 1879); Kansas River and other branches of the Missouri (as *H. placita*, Graham, 1885); South Platte River, Denver (as *H. nuchalis placita*, Jordan, 1891); Cottonwood, Hat, and Middle creeks, and south fork of Cheyenne and Belle Fourche rivers, Black Hills (as *H. nuchalis placita*, Evermann, 1893); Poplar River, Poplar, Mont. (as *H. placita*, Eigenmann, 1894).

Our collections contain specimens from the following localities: Ponca Creek near Niobrara; Bazile Creek, Niobrara; Platte River, Grand Island; Wood Creek, Grand Island; Middle Loup River, Dunning; Niobrara River north of Long Pine; South Loup River, Ravenna; Mud Creek, Ravenna; Platte River, Fremont; White River, Chadron; Lone Tree Creek, Chadron; Choteau Creek, Springfield; Cheyenne River near Hot Springs; Hat Creek, Ardmore; Cottonwood Creek, Edgemont; Crow Creek, Chamberlain; Emanuel Creek, Springfield; Belle Fourche River, Belle Fourche; Cheyenne River, Edgemont; White River, Chamberlain; Middle Creek, Belle Fourche; Powder River, Arvada; Beaver Creek, Newcastle; Platte River, Douglas; Platte River, Casper.

The following notes are from a specimen 5 inches long, from Belle Fourche River: Head 5; depth 4½; eye 5; snout 3½; D. I, 8; A. I, 9; scales 6–40–7, 18 before dorsal; mouth small, slightly oblique, lower jaw included; maxillary short, not reaching eye. Origin of dorsal a little in front of ventral, and nearer snout than base of caudal; height of dorsal nearly equal to length of head; interorbital width equal to length of snout to middle of pupil. In a specimen from Ravenna the scales count 6–43–5, 16 before the dorsal. There is considerable variation in the snout, it being much more blunt in some than in others, those from Ardmore being especially blunt. This minnow seems to be peculiarly liable to be affected by parasites, a considerable percentage of the specimens from Belle Fourche, Ravenna, and Cheyenne Falls showing psorosperms embedded among the scales over different parts

of the body. Girard's types of *H. evansi* came from Fort Pierre, Nebr., and if identical with *placitus* the name *evansi* has precedence, and the form may stand as *Hybognathus nuchale evansi* Girard.

41. **Hybognathus argyrite** Girard. Milk River (as *H. argyritis* type, Girard, 1856 and 1858, and Suckley, 1860). This is a doubtful species, probably identical with *H. evansi*.

42. **Hybognathus nubilum** (Forbes). Piney Creek, Texas County, Mo. (Call, 1887); Jones Creek and Marais River, Dixon, Mo.; Little Piney River at Arlington and Newburg, Mo.; Osage Fork, Marshfield, Mo.; Lock Fork, Mansfield, Mo.; Niangua River, Marshfield, Mo.; Sac River, Springfield, Mo. (Meek, 1891). Obtained by us at the following places: Floyd River, Sioux City; Bazile Creek, Niobrara; Verdigris Creek, Verdigris; Elkhorn River, Norfolk Junction; Norfolk Creek, Norfolk; pond at Long Pine; Ponca Creek, Niobrara; canal at Niobrara; pond at Creighton; Niobrara River north of Long Pine; Emanuel Creek, Springfield; Choteau Creek, Springfield; Crow Creek, Chamberlain; White River, Chamberlain; Platte River, Casper; Powder River, Arvada.

A very large series of specimens of *Hybognathus* was collected, but we find it extremely difficult to decide just how many and what species are represented. For the present it seems best to recognize *nubila*, *argyrite nuchalis*, and var. *evansi*. The range of variation in each is great. *H. nubila* is the more common form in eastern Nebraska and southwestern South Dakota, and is distinguished by the much larger eye (less than 4 in head), the larger mouth, more pointed snout, and the plumbeous lateral stripe; ordinarily this lateral stripe is quite distinct and characteristic. This species is found chiefly in the clearer, colder streams. Typical *nuchale* was found in Salt Creek at Havelock, and Fremont, Nebr., and by Dr. Gilbert at several places in Kansas. It is not unlikely that some of the specimens from middle Nebraska, that we have identified with *evansi*, are really *nuchale*. The two forms are very close and can be distinguished with difficulty. We identify with *evansi* that form with a small eye (4⅓ to 5½ in head), short, blunt snout, small mouth, and very pale coloration; it is perhaps more slender, also. The specimens of *H. nuchale* have a somewhat larger eye (about 4 in head), rather larger, sharper snout, and slightly darker coloration, in these respects approaching *nubilum*.

43. **Pimephales promelas** Rafinesque. *Fat-head; Black-head Minnow.* Yellowstone River (as *P. fasciatus* type, Girard, 1856); Yellowstone River and Milk River (as *P. fasciatus*, Girard, 1858); Milk River (as *P. fasciatus*, Suckley, 1860); Kansas River near Fort Riley (Cope, 1865); Missouri River near St. Joseph (as *Colisous parietalis* type, Cope, 1871); Battle Creek, S. Dak. (as *Hyborhynchus nigellus*, Cope, 1879); Ward Creek, Menoken, Kans.; Shunganunga Creek and Kansas River, Topeka; Ellis, Kans. (as *P. confertus*, Gilbert, 1884); Hundred and Two River at Bedford, Iowa, and Maryville, Mo. (Jordan & Meek, 1885); Kansas River (Graham, 1885); Kansas River at Topeka, and small streams in Shawnee, Wabaunsee, and Ellis Counties, Kans. (Cragin, 1885*a*); Blacksmith Creek, Shawnee County, Kans. (Gilbert, 1885); Solomon River, Beloit, Kans.; north fork of Solomon River at Kirwin and Lenora, Kans.; Saline River, Wakeeney, Kans.; Smoky Hill River, Wallace, Kans. (as *P. promelas confertus*, Hay, 1887); north fork of Solomon River at Logan, Kans., and Middle Beaver Creek, Smith County, Kans. (Gilbert, 1889); Silver Lake, Iowa; Soldier River, Charter Oak, Iowa; Boyer River, Arion, Iowa (Meek, 1892); Blue River, Crete, Nebr.; Platte and Elkhorn rivers, Fremont, Nebr.; Salt Creek, Lincoln, Nebr.; Floyd River at Sioux City and Lemars, Iowa (Meek, 1894); Dakota River at Lamoure (Woolman, 1896); Dover, S. Dak. (Butler, 1896).

Numerous specimens obtained by us at the following places: Enemy Creek, Mitchell; Rock Creek, Mitchell; Dakota River, Mitchell; Choteau Creek, Springfield; Emanuel Creek, Springfield; Prairie Creek, Scotland; Crow Creek, Chamberlain; Rapid Creek, Rapid City; Hat Creek, Ardmore; Cottonwood Creek, Edgemont; Middle Creek, Belle Fourche; French Creek at Custer; Bazile Creek, Niobrara; pond at Niobrara; pond at Creighton; Elkhorn River, Fremont; Elkhorn River, Norfolk Junction; Elkhorn River, Ewing; Spring Creek, Bazile Mills; Salt Creek, Havelock; Mud Creek, Ravenna; Long Pine Creek and ponds, Long Pine; Bone Creek, Long Pine; Ingalls Lake, Long Pine; Chadron Creek, Chadron; South Loup River, Ravenna; Dismal River, Dunning; Platte River, Fremont; Beaver Creek, York; Niobrara River, Marsland; Blue River, Seward; Lincoln and Beaver creeks, York; Minnechaduza Creek, Valentine; Clear Creek, Clermont.

In all the warmer, sluggish creeks with muddy bottom, and in all the warmer ponds and stagnant pools of the prairie region from Illinois to Wyoming, this, the fat-head or black-head minnow, is one of the most abundant species. During the dry season many of the small streams are reduced to isolated pools, mere mudholes, which are kept stirred up and rendered filthy by the cattle which visit them to slake their thirst. In these pools, however shallow and filthy they might be, we never failed to find this hardy, little fish. There is no doubt that all the nominal species cited in the above synonymy belong to a single species. There is considerable variation in the development of the lateral line, the position of the dorsal, the shape of the head, and the color; all of these, except the variation in the lateral line, are accessory sexual characters. In breeding males the head is short, the snout very blunt, and the origin of dorsal fin nearer tip of snout than base of caudal; the males are very dark, sometimes the upper parts and entire head being blue-black, while the females are much paler. The females are more elongate, head larger, snout less blunt, and correlated with this is the more posterior portion of the dorsal. Among two dozen examples studied, all the females have the dorsal midway between the snout and base of caudal, while in all the males the dorsal was nearer snout than base of caudal. The lateral line is usually better developed on the females than on the males.

On a number of male examples we find from 9 to 28 pores and these are often scattered (*parietalis*.) In several females we find the number of pores varying from 20 to 46, or complete. A female 2⅞ inches long, from Ingalls Lake, is described as follows: Head 3¼; depth 3¼; eye 4; snout 4⅜; D. 1, 8; A. 7; scales 9–47–3, lateral line developed on 9 scales on one side and 2 on the other. Body short and stout; snout blunt; caudal peduncle compressed, deep, its least depth 2 in head. Origin of dorsal nearer snout than base of anal, directly opposite ventrals. Entire head, except preopercle and free edge of opercle, and upper parts blue-black, middle of side with a broad plumbeous band; lower parts pale; fins all more or less thickly dusted with fine dark spots; a long dark blotch on anterior rays of dorsal; snout with about 25 large tubercles, about 7 on tip of lower jaw. A female about 3 inches long from Lincoln Creek has the following characters: Head 4⅛; depth 4⅛; eye 4⅜; snout 3⅝; D. 1, 8; A. 7; scales 9–46–4, the lateral line nearly complete, 2 or 3 isolated scales without pores. Body more slender; snout and head less blunt; caudal peduncle more slender, its least depth more than 2 in head. Color pale; back and upper part of sides dusted with fine dark specks; plumbeous lateral band faint; under parts pale; few fine punctulations on fins; dorsal with a long black blotch on anterior rays.

The specimens from Hat Creek, 1½ to 2 inches long, present the following characters: Head 3¾, = depth; eye 3½, = snout; dorsal 1, 8; anal 1, 7; scales 10–55–5; lateral line decurved and incomplete; scales small and crowded anteriorly, about 30 before the dorsal; origin of dorsal in front of

ventrals, nearer snout than caudal. Snout blunt, mouth terminal, small, oblique; head broad, interorbital width 2½ in length of head. Teeth 4–4, with rather broad grinding surface. Intestine more than twice the length of body; peritoneum black. Color very pale; upper part of body with numerous very small dark specks, a few narrow, indistinct lines on anterior half, running from median line upward and backward; a dark line from occiput to origin of dorsal; a rather distinct plumbeous band along lateral line; base of caudal dark. The specimens from Middle and Beaver creeks are considerably paler, the lateral plumbeous band being evident on caudal peduncle.

**44. Pimephales notatus** (Rafinesque). *Blunt-nosed Minnow.* Ward Creek, Menoken, Kans. (Gilbert, 1884); Hundred and Two River at Bedford, Iowa, and Maryville, Mo.; Blackwater Creek, Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo.; Grand River, Clinton, Mo., and Tabo Creek, Calhoun, Mo. (Jordan & Meek, 1885); Shunganunga and Ward creeks, Topeka (Gilbert, 1885); Shunganunga and Ward creeks, Kans. (Cragin, 1885*a*); Solomon River, Beloit, Kans.; north fork of Solomon River, Kirwin and Lenora, Kans.; Saline River, Wakeeney, Kans. (Hay, 1887); Big Piney River, Cabool, Mo.; Little Piney River, Arlington and Newburg, Mo.; Osage Fork, Marshfield, Mo.; Lock Fork, Mansfield, Mo.; Marais River, Dixon, Mo.; Niangua River, Marshfield, Mo.; Sac River, Springfield, Mo. (Meek, 1891); Big Sioux River at Sioux City and Sioux Falls; Silver Lake, Iowa (Meek, 1892); Blue River, Crete, Nebr.; Elkhorn River, Fremont, Nebr.; Floyd River at Sioux City and Lemars, Iowa (Meek, 1894); Dakota River at Lamoure and Jamestown (Woolman, 1896).

**45. Semotilus atromaculatus** (Mitchill). *Creek Chub.* Fort Pierre, Nebr. (as *S. macrocephalus* type, Girard, 1856 and 1858); Sweetwater River (as *S. speciosus* type, Girard, 1856); tributary of Platte River (as *S. speciosus*, Girard, 1858); Kansas River near Fort Riley (as *S. hammondii* type, Abbott, 1860); Platte River (Cope, 1865); Kansas River near Fort Riley (as *S. corporalis* and *S. pallidus*, Cope, 1865); Red Cloud Creek (Cope, 1870); Battle Creek, S. Dak. (as *S. corporalis*, Cope, 1879); Shunganunga Creek, Topeka (as *S. corporalis*, Gilbert, 1884); Hundred and Two River at Bedford, Iowa, and Maryville, Mo.; Tabo Creek, Lexington and Calhoun, Mo.; Blackwater Creek, Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo.; Grand River, Clinton, Mo. (Jordan & Meek, 1885); Mill Creek, Wabaunsee County, Kans. (Gilbert, 1885); Shunganunga and Mill Creeks and Fort Riley, Kans. (Cragin, 1885*a*); Mission and Blacksmith creeks, Shawnee County, Kans. (Gilbert, 1886); Bear Creek, Boone County, Mo. (Call, 1887); Solomon River, Beloit, Kans.; north fork of Solomon River, Kirwin and Lenora, Kans.; Saline River, Wakeeney, Kans.; Smoky Hill River, Wallace, Kans. (Hay, 1887); Republican River, Wano, Kans.; Middle Beaver Creek, Smith County, Kans.; Spring Creek, Smith Center, Kans. (Gilbert, 1889); Big Piney River, Cabool, Mo.; Little Piney River at Newburg and Arlington, Mo.; Jones Creek, Dixon, Mo.; Gasconade River, Arlington, Mo.; Lock Fork, Mansfield, Mo.; Osage Fork, Marshfield, Mo.; Marais River, Dixon, Mo.; Niangua River, Marshfield, Mo.; Sac River, Springfield, Mo. (Meek, 1891); South Platte River, Denver (Jordan, 1891*a*); Soldier River at Charter Oak and Boyer River at Arion, Iowa (Meek, 1892); Floyd River at Sioux City (Meek, 1894); Dakota River and Pipestem Creek at Jamestown (Woolman, 1896).

Obtained by us at the following places: Floyd River, Sioux City; Bazile Creek, Niobrara; Norfolk Creek, Norfolk Junction; Verdigris Creek, Verdigris; Long Pine Creek, Long Pine; Bone Creek, Long Pine; Minnechaduza Creek, Valentine; Chadron Creek, Chadron; Lone Tree Creek, Chadron; White River, Crawford; Beaver Creek at York; Emanuel Creek, Springfield; Crow Creek, Chamberlain; Beaver Creek, Buffalo Gap; Rapid Creek, Rapid

City; Redwater Creek, Spearfish; Spring Creek, Hill City; Crow Creek, Gammon's ranch; Chicken Creek, Spearfish; Belle Fourche River, Belle Fourche; French Creek at Custer; Deer Creek, Glenrock; Big Goose Creek, Sheridan. At most of these places it was quite abundant, especially in the clear and moderately cold streams with gravelly bottoms. The largest specimens obtained are from the Belle Fourche and from Rapid Creek, some of which are over 8 inches in total length. Head 3⅗; depth 4½; eye 7½; snout 3; D. 8; A. 8; scales 11–56 to 59–6. These western specimens do not differ appreciably from eastern specimens of this species.

46. **Leuciscus elongatus** (Kirtland). North fork of Solomon River, Lenora, Kans. (as *Squalius elongatus*, Hay, 1887). This reference to the occurrence of this fish in the Missouri Basin needs verification.

47. **Leuciscus neogæus** (Cope). Fifteen specimens from Cox Lake and 10 from Montana Lake. These examples vary in length from 2 to 3½ inches, the average being about 2¾ inches. Head 3⅛ to 4; depth 4 to 5; eye 3⅛ to 4; D. 1, 8; A. 1, 8; scales about 80, 20 to 26 in transverse series, very small, embedded and hard to count. Body stout, not compressed; head very broad and heavy; snout moderate, oblique, the maxillary reaching orbit. Color dark olive above, sides paler, under parts straw color, median line of back black; middle of side with a narrow plumbeous band, ending in a small black caudal spot. The band greenish posteriorly.

48. **Leuciscus milnerianus** (Cope). Probably Battle Creek, S. Dak. (as *Phoxinus milnerianus* type, Cope, 1879). A species of doubtful validity.

49. **Abramis crysoleucas** (Mitchill). *Golden Shiner; Roach.* Blackwater Creek, Brownsville, Saline, County, Mo.; Flat Creek, Sedalia, Mo. (as *Notemigonus americanus chrysoleucus*, Jordan & Meek, 1885); eastern Kansas (as *Notemigonus chrysoleucus*, Graham, 1885); Marais River, Dixon, Mo. (Meek, 1891); Big Sioux River at Sioux Falls and Silver Lake, Iowa (Meek, 1892); Platte River at Fremont; Floyd River at Sioux City, and Spirit Lake (Meek, 1894). Not obtained by us except in ponds near Long Pine Creek, 10 miles north of Long Pine, where it was common, and in bayous of Elkhorn River near Ewing.

50. **Cliola vigilax** (Baird & Girard). Grand River at Clinton, Mo., and Tabo Creek at Calhoun, Mo. (Jordan & Meek, 1885); Norfolk Creek, Norfolk Junction; Floyd River, Sioux City; Elkhorn River at Fremont, Norfolk Junction, and Ewing. This species was, contrary to what we had expected, found to be rather uncommon in this region. Eastern Nebraska seems to be the limit of its range northwestward. The largest specimens are 2¾ inches in total length. A typical example from Ewing shows the following characters: Head 4¼; depth 4¼; eye 4; snout 4; D. 1, 8; A. 1, 7; scales 7–46–3, 21 before dorsal; lateral line complete, decurved. Body rather slender; snout, blunt; top of head, flat; back, little arched; caudal peduncle, long; mouth small, subinferior, nearly horizontal, maxillary barely reaching eye; color, pale; back and upper parts of sides with small black specks on borders of the scales forming cross-hatching on back; lower parts pale; black caudal spot, not large; fins all plain, except a dark spot on front of dorsal. On some specimens the caudal and dorsal spots were quite indistinct.

51. **Cliola smithii** sp. nov. Type locality: Prairie Creek near Scotland, S. Dak., where 5 specimens were obtained June 26, 1893 (collectors, Evermann, Cox, and Rutter). Associate type localities: Pond near Niobrara, Nebr., 1 specimen, June 28, 1893 (collectors, Evermann, Cox, and Rutter); Dismal River, Dunning, Nebr., August 9, 1 specimen (collectors, Cox and Gillum). (Type, No. 45681, U. S. Nat. Mus. Co-type, No. 3136, L. S. Jr. Univ. Mus.)

Head 4; depth 3⅘; eye 4; snout 4; interorbital width 3; D. 1, 8; A. 7; scales 9–47–6, 27 before the dorsal. Teeth 4–4, not hooked, grinding surface slightly developed. Intestine not long. Body short and stout, compressed;

head moderate; mouth small, terminal, slightly oblique; maxillary not reaching eye; preorbital broad. Back considerably arched, caudal peduncle deep, its least depth 2 in head. Origin of dorsal fin over ventrals, nearer snout than base of caudal. Color, above densely covered with fine, black specks, giving a general blue-black appearance; sides with a broad plumbeous band two-thirds as broad as eye, darkest and best defined on caudal peduncle; sides below this band with a few scattered specks anteriorly; lower part of caudal peduncle pale; top and upper parts of sides of head bluish-black; dorsal, anal, and pectorals with a few dark specks; other fins plain. Length, 2½ inches.

Named for Dr. Hugh M. Smith, chief of the Statistical Division of the United States Fish Commission.

**52. Notropis cayuga** Meek. Big Piney River, Cabool, Mo.; Osage River and Lock Fork, Mansfield, Mo.; Niangua River, Marshfield, Mo. (Meek, 1891); Big Sioux River, Sioux City, Iowa (Meek, 1892); Floyd River, Sioux City and Lemars, Iowa (Meek, 1894); Dakota River at Jamestown (Woolman, 1896); Floyd River, Sioux City; Dakota River and Enemy, Firesteel and Rock creeks, Mitchell; Prairie Creek, Scotland; Choteau and Emanuel creeks, Springfield; pond at Niobrara; Bazile Creek, Niobrara; pond at Verdigris; pond at Creighton; Norfolk Creek, Norfolk Junction; Elkhorn River at Ewing; creek at Ewing; ponds and creeks, Long Pine; Minnechaduza Creek, Valentine; Chadron Creek, Chadron; Mud Creek, Ravenna.

From the above it will be seen that this small minnow is one of the most abundant species in eastern South Dakota and Nebraska. The most westerly point at which we obtained it is Chadron, Nebr., and as but a single specimen was found there, its occurrence at that place is probably exceptional. At Valentine, about 130 miles east of Chadron, it was found in considerable numbers, and eastward from Valentine it was abundant in all suitable places.

This is preeminently a species of the pools, ponds, and small lakes. While we might not find it, even with careful seining, in the clear running streams, we seldom failed to take it in abundance in any overflown pond or small lake that we found along the streams. It was very abundant in the ponds at Creighton and Long Pine. Choteau Creek, in which it was also abundant, is a slow, sluggish creek, much like a pond in many respects. In such waters as these, when the bottom was of mud, or mud and coarse gravel, and where there was considerable vegetation, *Potamogeton*, *Chara*, and various species of *Algæ*, would we find *Notropis cayuga* in greatest numbers. The last week of June seems to be its spawning season in this region; many of the specimens taken at Creighton, June 29, were full of ripe spawn.

Considerable variation in the intensity of the coloration is shown by these collections, the specimens from the cooler, clearer ponds being much darker than those from warmer streams.

The following description is drawn up from a typical specimen, 2½ inches long, from Prairie Creek: No. 1745. Head 3⅝; depth 4⅓; eye 3⅓; snout 4; D. 1, 8; A. 8; scales 6-35-3, 15 before dorsal; lateral line incomplete, irregularly broken. Body slender, head moderate, back little arched, peduncle long and slender, mouth moderate, somewhat oblique, terminal; maxillary not reaching eye; eye large. Origin of dorsal slightly behind ventrals, midway between snout and base of caudal; pectorals short; 1½ in head, not reaching ventrals; ventrals shorter than pectorals, reaching vent; caudal deeply forked. Color of back dark, covered with fine brownish points, thickest on edges of scales, forming cross-hatching on entire length of back; middle of sides with a broad dark band from base of caudal fin along course of lateral line across opercle, and meeting its fellow around snout, not on lower lip; under parts pale, except a dark line from anus along base of anal fin and

under side of caudal peduncle and on to caudal fin; fins all more or less dusted with fine dark points. The only species with which this fish is likely to be confused are the closely related species *N. heterodon* and *N. anogenus*.

These three species bear a very close superficial resemblance to each other. They were first critically compared and their differential characters pointed out by Dr. Meek in his Fishes of the Cayuga Lake Basin. The following key will enable one to distinguish them:

*a*. Black of nose not extending to lower lip; snout blunt, mouth small, subinferior, little oblique.....*cayuga*.
*aa*. Black of nose upon lower lip as well as upon upper.
*b*. Snout sharp; mouth large, oblique, the lower jaw scarcely included.*heterodon*.
*bb*. Snout more blunt; mouth very small, very oblique.....*anogenus*.

A comparison of our specimens of *cayuga* with others from northern Indiana shows no marked differences.

**53. Notropis heterodon** (Cope). Smoky Hill River, Wallace, Kans. (as *N. germanus* type, Hay, 1887); Silver Lake, Iowa (Meek, 1892).

**54. Notropis blennius** (Girard). Missouri River at St. Joseph (as *Hybopsis missuriensis* type, Cope, 1874); Ward Creek, Shawnee County, Kans. (as *Cliola straminea*, Gilbert, 1884); Hundred and Two River at Bedford, Iowa, and Maryville, Mo.; Missouri River, St. Joseph; Tabo Creek, Lexington, Mo.; Blackwater Creek, Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo.; Grand River, Clinton, Mo.; Tabo Creek, Calhoun, Mo. (as *N. deliciosus*, Jordan & Meek, 1885); Kansas River branches (as *N. deliciosa*, Graham, 1885); Piney River, Texas County, Mo. (as *N. deliciosus*, Call, 1887); Solomon River, Beloit, Kans.; north fork of Solomon River at Kirwin and Lenora, Kans.; Saline River, Wakeeney, Kans.; Smoky Hill River, Wallace, Kans. (as *N. deliciosus*, Hay, 1887); Republican River, Wano, Kans.; Sappa Creek, Oberlin Kans.; Logan, Kans.; Middle Beaver Creek, Smith County, Kans.; Spring Creek, Smith Center, Kans.; Osage River, La Cygne, Kans. (as *N. deliciosus lincolatus*, Gilbert, 1889); Sac River, Springfield, Mo. (as *N. deliciosus*, Meek, 1891); Big Sioux River at Sioux Falls and Sioux City; Boyer River at Arion, Iowa (as *N. deliciosus*, Meek, 1892); Platte and Elkhorn rivers at Fremont; Blue River at Crete; Salt Creek at Lincoln; and Floyd River at Sioux City and Lemars (Meek, 1894); Dakota River at Lamoure and Jamestown (Woolman, 1896).

Found by us at the following places: Floyd River, Sioux City; Verdigris Creek, Verdigris; Norfolk Creek, Norfolk Junction; Salt Creek, Havelock; Chadron Creek, Chadron; Mud Creek, Ravenna; Schlegel Creek, Valentine; Minnechaduza Creek, Valentine; Elkhorn River, Norfolk Junction; Elkhorn River, Ewing; Bazile Creek, Niobrara; Long Pine Creek, Long Pine; White River, Chadron; canal at Niobrara; Niobrara River, Valentine; Niobrara River, north of Long Pine; Wood Creek, Grand Island; South Loup River, Ravenna; Lincoln Creek, York; Dismal River, Dunning; Middle Loup River, Dunning; Beaver Creek, York; Ingalls Lake, Long Pine; Platte River, Grand Island; White River, Crawford; Niobrara River, Marsland; Belle Fourche River, Belle Fourche; Middle Creek, Belle Fourche; Cheyenne River, Hot Springs; Cottonwood Creek, Edgemont; Hat Creek, Ardmore; Rapid Creek, Rapid City; Beaver Creek, Buffalo Gap; Dakota River, Mitchell; Crow Creek, Chamberlain; Redwater Creek, Spearfish; Deer Creek, Glenrock; Platte River, Glenrock; Garden Creek, Casper; Platte River, Douglas.

This is one of the most abundant and widely distributed of the *Cyprinidæ*, it being found from the Great Lakes to Virginia, and westward to Wyoming and south to Texas. It is subject to great variation, and many nominal species have been based upon the differences in eye, snout, or scales presented by specimens from different parts of its range. None of these is, however, worthy of specific recognition, though several of the more pronounced forms may be recognized as subspecies.

The very large series of specimens and the numerous localities represented in the present collection show most perplexing variations even in this basin. As a rule the individuals from any particular stream can be told from those from any other stream. The differences lie chiefly in the relative bluntness of the snout, the stoutness of the body, size of eye, size and arrangement of the scales, and in the color. A typical specimen from Glenrock, Wyo., has the head 4; depth 4; eye $3\frac{1}{2}$; snout $4\frac{1}{2}$; D. 1, 8; A. 7; scales 6–34–3. One from Floyd River, Sioux City, has the eye somewhat larger ($3\frac{1}{3}$), and the snout shorter and more blunt (4). One from Rapid City, head $4\frac{2}{5}$; depth $4\frac{1}{8}$; eye $3\frac{2}{3}$; snout 4; scales 6–35–3. All the specimens from this place have short, blunt heads and rather large eyes. One from Belle Fourche agrees with the Rapid City specimens except that the scales are rather smaller, 7–36–4. The lot from Fremont has larger scales (6–33–3), sharper snout, and more distinct plumbeous lateral band than those from farther west. The number of scales before the dorsal varies from 14 to 20, the usual number being 15 or 16. This does not seem to be correlated with any other variable character. The teeth, in numerous examples examined, were 4–4, hooked, and with slight grinding surface on two or three teeth.

**55. Notropis scylla** (Cope). Osage River, Mo. (as ? *Alburnus lineolatus* type, Agassiz, 1863); Red Cloud Creek, tributary of Platte River (as *Hybopsis scylla* type, Cope, 1871); upper Missouri region (as *Cliola chlora* type, Jordan, 1878); Marais des Cygnes (as *N. lineolatus*, Graham, 1885); South Platte River, Denver (Jordan, 1891*a*). If all of these references really belong to one species, it would stand as *Notropis lineolatus* (Agassiz).

**56. Notropis topeka** (Gilbert).

*Cliola* (*Hybopsis*) *topeka* Gilbert, Bull. Washburn Lab. Nat. Hist., vol. 1, No. 1. 13, September, 1884. Type locality: Shunganunga Creek, Topeka, Kans.

*Notropis æneolus* Hay, Proc. U. S. Nat. Mus. 1887, 245. Type locality: Saline River, Wakeeney, Kans.

Hundred and Two River, Bedford, Iowa (Jordan & Meek, 1885); Shunganunga Creek and Ellis, Kans. (Cragin, 1885*a*); Smoky Hill River, Wallace, Kans.; north fork of Solomon River, Kirwin, Kans.; Solomon River, Beloit, Kans. (Hay, 1887); Sappa Creek, Oberlin, Kans. (Gilbert, 1889); Boyer River at Arion, Iowa; Big Sioux River, Sioux City, Iowa (Meek, 1892); Floyd River at Sioux City and Lemars, Iowa; Salt Creek, Lincoln, Nebr.; and Blue River at Crete, Nebr. (Meek, 1894); Firesteel and Enemy, Rock creeks, Mitchell; Prairie Creek, Scotland; pond at Creighton.

The localities in which we found this pretty little fish are, as may be noticed, all close together. In Kansas it was found by Drs. Gilbert and Hay considerably farther west. All the waters in which we took it were pond-like, isolated portions of streams which dry up in parts of their course during dry weather. These ponds are partly supplied from small springs, the water is usually rather clear and cool, and there is an abundance of water vegetation. The bottom is mostly soft mud.

Male: Head $3\frac{4}{5}$; depth $3\frac{1}{3}$; eye $4\frac{1}{3}$; snout $3\frac{1}{3}$; interorbital width $2\frac{2}{3}$; D. 1, 8; A. 1, 7; scales 6–35–4, about 12 scales before the dorsal; lateral line more or less broken, slightly decurved; body short, compressed, and deep; head rather small, snout blunt; mouth somewhat oblique, subterminal, lower jaw included; maxillary not reaching eye; back somewhat elevated; caudal peduncle deep, 2 in head; fins moderate; dorsal inserted opposite ventrals, its height $1\frac{1}{2}$ in head; pectorals short, $1\frac{1}{2}$ in head. Color greenish above, orange below; scales above lateral line dark-edged; a rather distinct plumbeous lateral band; fins all rich red in life. Snout, top of head, and back as far as dorsal fin thickly covered with strong tubercles; scattered tubercles on sides; scales on ventral surface in front of ventral fins greatly thickened.

Female: Head a little shorter, fins not so red, and no tubercles.

Of the 31 specimens from Creighton, all but 8 are females, most of which

are nearly ripe with spawn. All but 8 of those from Prairie Creek are nearly ripe females; while all of those from Firesteel Creek are males.

**57. Notropis gilberti** Jordan & Meek.

*Notropis gilberti* Jordan & Meek, Proc. U. S. Nat. Mus. 1885, 4. Type locality: Valley Creek, Ottumwa, Iowa.

Grand River, Clinton, and Tabo Creek, Calhoun, Mo. (Jordan & Meek, 1885); South Platte River at Denver (Jordan, 1891*a*); Boyer River, Arion, Iowa; Soldier River, Charter Oak, Iowa (Meek, 1892); Verdigris Creek, Verdigris; canal at Niobrara; creek at Norfolk Junction; creek at Ewing; Bone Creek, Long Pine. This little fish seems to be quite rare. We found it in but five places and secured but 18 specimens. It appears to prefer the small streams or rivulets with sandy bottom and some current.

**58. Notropis piptolepis** (Cope). Red Cloud Creek, a tributary of the North Platte (as *Photogenis piptolepis* type, Cope, 1871). Not obtained by any other collector.

**59. Notropis shumardi** (Girard). Jones Creek, Dixon, Mo.; Little Piney River at Newburg and Arlington, Mo.; Gasconade River, Arlington, Mo. (as *N. boops*, Meek, 1891).

**60. Notropis hudsonius** (Clinton). "Kansas River branches" (Graham, 1885); Wild Cat Creek, Kans. (Cragin, 1885*a*); Big Sioux River at Sioux City (Meek, 1892); Floyd River at Sioux City; Spirit, East Okoboji, and West Okoboji lakes (Meek, 1894). This species was obtained by us at Mitchell, S. Dak., in Rock and Firesteel creeks, and in the Dakota River, where 45 specimens were collected. In the Dakota River, just below the milldam, we found it in abundance; none of the specimens, however, was over 3 inches in length. In Spirit Lake and the other lakes about it this is the most abundant minnow, and the principal live bait used by the anglers who frequent these lakes. From all other *Cyprinidæ* of the Missouri River this species may be known by the large black spot at the base of the tail, and the broad silver band on the side. The teeth of this species have usually been given as 1, 4–4, 0 or 1. As early as 1886 it was shown by Evermann & Bollman* that they are often 1, 4–4, 2, or even 2, 4–4, 2. An examination of numerous specimens in the present collection shows the same range in variation, even in examples from the same locality. The form described in 1893 from Winnipeg as *Notropis scopiferus*, by Eigenmann & Eigenmann, seems to be this species, with the teeth 2, 4–4, 2.

**61. Notropis lutrensis** (Baird & Girard). Big Creek, Hays City, Kans. (Evermann, collector, 1879); St. Joseph, Mo. (as *Cyprinella billingsiana* type and as *Moniana jugalis* type, Cope, 1871); Ward Creek, Shawnee County, Kans. (as *Cliola* (?) *gibbosa*, Gilbert, 1884); Hundred and Two River at Bedford, Iowa, and Maryville, Mo.; Tabo Creek, Lexington, Mo.; Blackwater Creek, Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo.; Grand River, Clinton, Mo.; Tabo Creek, Calhoun, Mo. (Jordan & Meek, 1885); Kansas River and Missouri River at St. Joseph (as *N. billingsiana*, Graham, 1885); "very abundant in Kansas" (Graham, 1885); Shunganunga and Ward creeks, Shawnee County, Kans. (Gilbert, 1885); Missouri River at St. Joseph, and Shunganunga and Ward creeks, Kans. (Cragin, 1885*a*); Republican River, Concordia, Kans.; Solomon River, Beloit, Kans.; north fork of Solomon River at Kirwin and Lenora, Kans.; Saline River, Wakeeney, Kans.; Smoky Hill River, Wallace, Kans. (Hay, 1887); Sappa Creek, Oberlin, Kans.; Logan, Kans.; Middle Beaver Creek, Smith County, Kans.; Spring Creek, Smith Center, Kans.; Osage River, La Cygne, Kans. (Gilbert, 1889); Little Piney River at Arlington and Newburg, Mo.; Marais River, Dixon, Mo. (Meek, 1891); South Platte River, Denver (Jordan, 1891*a*); Boyer River at Arion, Iowa (Meek,

* Notes on a collection of fishes from the Monongahela River, by Barton W. Evermann and Charles H. Bollman. Proc. N. Y. Ac. Sci. 1886, 335–340.

1892); Blue River at Crete; Elkhorn and Platte rivers at Fremont; Salt Creek at Lincoln; Floyd River at Sioux City and Lemars (Meek, 1894); canal at Niobrara; Elkhorn River, Norfolk Junction and Ewing; Verdigris Creek, Verdigris; Bazile Creek, Niobrara; Niobrara River at Long Pine and Valentine; Long Pine Creek at Long Pine; Beaver Creek at York; Lincoln Creek at York and Seward; creek at Ewing; Blue River, Crete; Salt Creek, Havelock; Mud Creek, Ravenna; South Loup River, Ravenna; Middle Loup River, Dunning; Blue River, Seward; Wood Creek, Grand Island; Dismal River at Dunning; Platte River, Grand Island; Dakota River at Mitchell; Enemy and Rock creeks at Mitchell; Crow Creek, Chamberlain; Emanuel and Choteau creeks, Springfield; North Platte River, Douglas.

As will appear from the localities given above, this is an abundant and generally distributed fish in Nebraska and South Dakota. It has been found by Professor Meek as far east as Des Moines, and by Mr. A. J. Woolman as far south as Chihuahua. It was found by us in nearly all the streams which we examined in eastern South Dakota and in Nebraska. In northwestern Nebraska and in the region in and about the Black Hills we did not find it; and Douglas, Wyo., is the only place in that State where we met with it. The most western place in Nebraska at which it was obtained is Ravenna. The longest specimens we have are 3¼ inches long. A fine male from Platte River, Grand Island, is described as follows: Head 4; depth 3; eye 4½; snout 3½; interorbital width 2¾; D. I, 8; A. I, 9; scales 7–36–3, 16 before dorsal. Body short and deep, greatly compressed; back elevated and keel-like before dorsal; head pointed, mouth moderate, terminal, oblique; maxillary scarcely reaching the eye. Dorsal high, its longest rays 1⅓ in head; anal lower, 1⅔ in head; pectorals and ventrals short, about 1⅔ in head; caudal deeply forked, the lobes 1⅓ in head. Color steel-blue above, belly and all fins, except dorsal, blood-red; dorsal pale; postocular and subocular region red; a violet and crimson crescent behind opercle, changing to dull bluish in alcohol; nose, top of head, nuchal region, and sides along base of anal fin, profusely tuberculate; middle of side under dorsal fin with a patch of tubercles. In other specimens the caudal peduncle is thickly covered with strong tubercles. Very small individuals, not over 1¼ inches long, are strongly tuberculate and brightly colored, and have evidently reached the breeding age. The females average slightly smaller than the males and are not brightly colored.

62. **Notropis macrostomus** (Girard). Solomon River, Beloit, Kans. (Hay, 1887); Solomon River at Beloit and Saline River at Wakeeney, Kans. (as *N. umbrifer* type, Hay, 1887). Not seen by us.

63. **Notropis notatus** (Girard). Osage River, Mo. (as *Alburnus notatus* type, Agassiz, 1863); Piney River, Texas County, Mo. (Call, 1887).

64. **Notropis whipplii** (Girard). *Silver-fin; Satin-fin.* Little Piney River at Newburg and Arlington, Mo.; Osage Fork, Marshfield, Mo. (Meek, 1891); Big Sioux River at Sioux City (Meek, 1892).

65. **Notropis cornutus** (Mitchill). *Common Shiner.* Sweetwater River (as *Plargyrus bowmani* type, Girard, 1856 and 1858); Red Cloud Creek (as *Hypsilepis cornutus*, Cope, 1871); Ellis, Ellis County, Kans. (as *Minnilus cornutus*, Gilbert, 1884); Hundred and Two River at Bedford, Iowa, and Maryville, Mo.; Blackwater Creek, Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo.; Grand River, Clinton, Mo.; Tabo Creek, Calhoun, Mo. (as *N. megalops*, Jordan & Meek, 1885); Shunganunga and Ward creeks, Shawnee County, Kans.; Ellis, Kans.; Mill Creek, Alma, Kans. (as *N. megalops*, Gilbert, 1885); Shawnee, Wabaunsee, and Ellis counties, Kans. (Cragin, 1885*a*); Blacksmith Creek, Shawnee County, Kans. (as *N. megalops*, Gilbert, 1886); Solomon River, Beloit, Kans.; north fork of Solomon River at Kirwin and Lenora,

Kans.; Saline River, Wakeeney, Kans.; Smoky Hill River, Wallace, Kans. (as *N. megalops*, Hay, 1887); Big Piney River, Cabool, Mo.; Lock Fork at Mansfield, Mo. (as *N. megalops*, Meek, 1891); South Platte River, Denver (as *N. megalops*, Jordan, 1891*a*); Big Sioux River at Sioux City; Boyer River at Arion, Iowa; and Silver Lake, Iowa (as *N. megalops*, Meek, 1892); Floyd River at Lemars and Sioux City; Elkhorn River at Fremont and Salt Creek at Lincoln (as *N. megalops*, Meek, 1894); Dakota River at Lamoure and Jamestown (Woolman, 1896).

Obtained by us at the following places: Floyd River, Sioux City; Elkhorn River at Fremont, Norfolk Junction, and Ewing; creek at Ewing; Verdigris Creek, Verdigris; Norfolk Creek, Norfolk Junction; Rock Creek, Mitchell; Enemy Creek, Mitchell; Firesteel Creek, Mitchell; Prairie Creek, Scotland; Choteau Creek, Springfield; Emanuel Creek, Springfield; Deer Creek, Glenrock.

The shiner is abundant in the northeastern corner of Nebraska and the adjacent parts of Iowa and South Dakota. It is not uncommon in eastern Kansas, but appears to be rare in western Nebraska and in Wyoming. The only Wyoming localities from which it has been reported are Glenrock and the Sweetwater. We did not find it about the Black Hills. All the specimens obtained by us are small, the largest being but 4¼ inches long, from Scotland, S. Dak. Head 3⅓; depth 3¾; eye 3⅔; snout 3⅔; D. I, 8; A. I, 8; scales 7–36–4, about 26 before dorsal. Body stout, compressed, head moderate; mouth moderate, terminal, oblique, the maxillary not quite reaching vertical at front of eye; caudal peduncle compressed and deep, least depth 2¼ in head. Origin of dorsal opposite ventrals; scales closely imbricated and thin, deeper than long, especially in front; lateral line somewhat decurved. Sides silvery, with bluish reflections; back darker; cheek silvery, with fine dark punctulations on opercles; under parts pale; fins all pale, except dorsal and caudal, which have some fine dark specks. Not differing greatly from eastern specimens. A voracious minnow, taking the hook eagerly when better fish are wanted, but not without its value as an addition to the small boy's string.

**66. Notropis zonatus** (Agassiz). Osage River, Mo. (as *Alburnus zonatus*, Putnam, 1863); Ozark region of Missouri (Call, 1887); Big Piney River, Cabool, Mo.; Jones Creek, Dixon, Mo.; Gasconade River, Arlington, Mo.; Lock Fork, Mansfield, Mo.; Osage Fork, Marshfield, Mo.; Marais River, Dixon, Mo.; Niangua River, Marshfield, Mo.; Sac River, Springfield, Mo. (Meek, 1891).

**67. Notropis jejunus** (Forbes). Sappa Creek, Oberlin, Kans. (Gilbert, 1889); Platte and Elkhorn rivers at Fremont (Meek, 1894).

Found by us at the following places: Platte River, Grand Island; Wood River, Grand Island; South Loup River, Ravenna; Middle Loup River, Dunning; Dismal River, Dunning; North Platte River, Douglas.

This interesting species was found only in a few places. We found it in none of the small sluggish creeks which we examined and it seemed to frequent only the open channels of the large, clear streams with considerable current and sandy bottom. It is not found in deep water, nor in water that is very cold; nor on gravel or rocky bottom; nor in pools or streams without some current. The specimens from Dunning and Grand Island are particularly fine, the longest measuring 3½ inches. Head 4 to 4⅓; depth 3⅝ to 4; eye 3½; D. I, 8; A. I, 7; scales 6–35 or 36–3. Teeth 2, 4–4, 2, hooked, and without grinding surface. Body rather heavy, compressed; head heavy; mouth large, terminal, oblique; maxillary reaching eye; caudal peduncle deep. Dorsal in front of ventrals; equidistant between snout and base of caudal fin. Scales large, thin, about 15 before the dorsal; lateral line somewhat decurved. Color, median line of back with a narrow but distinct dark line from head to caudal fin; upper part of side pale straw-color, but dusted

with numerous dark spots; middle of side with a broad plumbeous band, broader than eye, chiefly above lateral line; the upper edge of this band distinctly defined, the lower less distinct; lower sides and under parts pale; top of head dark, rest of head pale; cheeks and opercles silvery; fins all pale, dorsal and caudal with some dark specks.

68. **Notropis atherinoides** Rafinesque. Big Sioux River at Sioux City (Meek, 1892); Poplar River, Poplar, Mont. (Eigenmann, 1894).

69. **Notropis dilectus** (Girard). Kansas (as *Alburnus oligaspis* type, Cope, 1864*a*); Grand River, Clinton, Mo.; Tabo Creek, Calhoun, Mo. (Jordan & Meek, 1885); Missouri River at Sioux City and Big Sioux River at Sioux Falls (Meek, 1892); Floyd River at Sioux City and Elkhorn River at Fremont (Meek, 1894); Elkhorn River, Norfolk Junction; Bazile Creek, Niobrara; Platte River, Grand Island; South Loup River, Ravenna; Dakota River, Mitchell. This species, like *N. jejunus*, is found usually in the clear, shallow streams on sandy bottom, but where the water is only moderately cold. It does not seem to be widely or generally distributed in the Missouri Basin. Many of the specimens obtained by us are unusually large, particularly those from Fremont and Ravenna, the largest measuring 3¼ inches in total length. Head 4⅓; depth 5; eye 3⅓; snout 4; D. I, 8; A. I, 13; scales 6–40–3, 20 before the dorsal, closely imbricated and deeper than long; lateral line decurved. Body long and slender, compressed; head moderate, snout pointed; mouth large, oblique, terminal; maxillary reaching vertical of front of eye; eye large, equal to interorbital width; caudal peduncle long; its least depth 2½ in head. Origin of dorsal fin much behind insertion of ventrals nearer base of caudal than tip of snout. Color pale, upper parts dusted over with fine brown punctulations, thickest on edges of scales, thus resulting in faint cross-hatching; median line of back dark, darkest on caudal peduncle; middle of side with a broad silvery band, plumbeous above; under parts pale straw-color; head dusted above and on lips and chin; cheeks and opercles bright silvery; fins all pale except dorsal and anal, which have some fine dark specks. This trim minnow resembles *N. jejunus* in general appearance, but can be readily distinguished from all other species of *Notropis* found in the Missouri Basin by its large anal fin and the posterior position of the dorsal.

70. **Notropis rubrifrons** (Cope). St. Joseph, Mo. (as *Alburnellus percobromus* type, Cope, 1871); Blackwater River, Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo. (Jordan & Meek, 1885); Kansas and Missouri rivers (Graham, 1885); Osage River, La Cygne, Kans. (Gilbert, 1889); Osage Fork, Marshfield, Mo.; Lock Fork, Mansfield, Mo.; Little Piney River at Arlington and Newburg, Mo.; Sac River, Springfield, Mo. (Meek, 1891).

71. **Notropis umbratilis umbratilis** (Girard). *Redfin.* Shunganunga Creek, Topeka (as *Minnilus* (*Lythrurus*) *nigripinnis* type, Gilbert, 1884); Shunganunga Creek (Cragin, 1885*a*); Hundred and Two River at Bedford, Iowa, and Maryville, Mo.; Blackwater Creek, Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo.; Grand River, Clinton, Mo.; Tabo Creek, Calhoun, Mo. (Jordan & Meek, 1885); Shunganunga Creek, Topeka (as *N. nigripinnis*, Gilbert, 1885); north fork of Solomon River, Lenora, Kans. (Hay, 1887); Lock Fork, Mansfield, Mo.; Osage Fork, Marshfield, Mo.; Marais River, Dixon, Mo.; Sac River, Springfield, Mo. (Meek, 1891).

72. **Phenacobius mirabilis** (Girard). Ward Creek, Shawnee County, Kans. (Gilbert, 1884); Hundred and Two River at Bedford, Iowa, and Maryville, Mo.; Tabo Creek, Lexington and Calhoun, Mo.; Blackwater Creek, Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo.; Grand River, Clinton, Mo. (Jordan & Meek, 1885); common throughout Kansas (Graham, 1885); Shunganunga and Ward creeks, Shawnee County, Kans. (Gilbert, 1885); Shunganunga and Ward creeks (Cragin, 1885*a*); Solomon River, Beloit, Kans.; north fork

of Solomon River, Lenora, Kans.; Saline River, Wakeeney, Kans.; Smoky Hill River, Wallace, Kans. (Hay, 1887); Sappa Creek, Oberlin, Kans.; Logan, Kans.; Osage River, La Cygne, Kans. (Gilbert, 1889); Boyer River at Arion, Iowa (Meek, 1892); Blue River at Crete (Meek, 1894).

This does not appear to be an abundant fish in the Missouri Basin, but it is rather widely distributed. It was found by us only in Crow Creek near Chamberlain, S. Dak., and at Ravenna, Nebr., in Mud Creek. Head 4½; depth 4¾; eye 4¾; snout 2¾; interorbital width 3¼. D. I, 8; A. I, 7; scales 6–48–4, about 17 before the dorsal. Largest example about 3 inches long.

**73. Phenacobius scopifer** (Cope). Missouri River near St. Joseph, Mo. (as *Sarcidium scopifer* type, Cope, 1871); Bear Creek, Boone County, Mo. (Call, 1887). This species may not be distinct from the preceding.

**74. Rhinichthys cataractæ dulcis** (Girard). *Western Dace.* Sweetwater River (as *Argyreus dulcis* type, Girard, 1856 and 1858); Kansas (as *R. maxillosus* type, Cope, 1864*a*); Kansas River near Fort Riley (as *R. maxillosus*, Cope, 1865); Red Cloud Creek and Platte River (as *R. maxillosus*, Cope, 1871); Battle Creek, S. Dak. (as *R. maxillosus*, Cope, 1879); northeastern Wyoming and Montana (as *R. ocella* type, Garman, 1881); Cheyenne, Wyo. (as *R. dulcis*, Garman, 1881); Kansas (as *R. maxillosus*, Garman, 1881); South Platte River at Denver and Hartsel Hot Springs, and Middle Boulder Creek, Boulder, Colo. (Jordan, 1891); Gardiner River (Jordan, 1891*a*); Beaverhead River at Dillon, Mont.; Red Rock River at Red Rock, Mont.; junction of Firehole and Gibbon rivers (Evermann, 1892); Poplar River at Poplar and Missouri River at Craig, Mont. (Eigenmann, 1894).

This species has been described as new three times from the Missouri Basin, as indicated above. The present collection contains about 500 specimens from 34 different localities, as follows: Creek at Verdigris; Minnechaduza Creek, Valentine; Niobrara River, Marsland; Bone Creek near Long Pine; Long Pine Creek, Long Pine; Middle Loup River, Dunning; White River at Chadron; Lone Tree Creek at Chadron; White River, Crawford; Chadron Creek, Chadron; Cheyenne River, Cheyenne Falls; Cheyenne River, Edgemont; Cottonwood Creek, Edgemont; Chicken Creek, Gammon's Ranch; Spearfish Creek, Spearfish; Redwater Creek, Beulah; Cox Lake near Beulah; Beaver Creek, Buffalo Gap; Rapid Creek, Rapid City; Fall River, Hot Springs; Whitewood Creek, Deadwood; Crow Creek, Gammon's Ranch; creek at Hill City; creek at Custer; Crow Creek, Chamberlain; Choteau Creek, Springfield; Big Goose Creek, Sheridan; Powder River, Arvada; south fork of Tongue River, Sheridan; Platte River, Glenrock; Garden Creek, Casper; Platte River, Casper; Deer Creek, Glenrock; Beaver Creek, Newcastle; overflow pond at Sheridan; Platte River, Douglas.

The variations shown by this large amount of material are very great, but the differences found among the individuals from one locality are often as great as are found among specimens from different localities. In mature individuals the origin of the dorsal is nearer base of caudal than tip of snout; or in about half of the specimens examined it is about midway between nostril and base of caudal, while in the others it is nearer nostril. The length of the snout varies from 1½ to 2 times the diameter of the eye, and the extent to which it projects beyond the mouth is subject to variation. The thickness of the lips, the size of the barbel, the angle made by the two sides of the lower jaw, the number of scales, and the color are all subject to considerable variation. The specimens from Cheyenne Falls and other alkaline streams are very pale, while those from purer waters are usually dark. In the warm water from Hot Springs at Hot Springs, S. Dak., this was the only species found, it occurring there in great abundance. We examined this stream at many different places and found this fish everywhere abun-

dant, not only in the more open, swifter current, but in the more quiet nooks among the dense growth of *Chara* and about the outlets of springs whose water was very warm. This is a very interesting and remarkable fact, and was not what we expected. *Rhinichthys* is a group of fishes whose species seem to prefer cold water. If in any given region we wished to find *Rhinichthys* we looked for it in the coldest parts of the smaller streams, but here we found it in the warmest parts of a very warm stream.

**75. Rhinichthys atronasus** (Mitchill). *Black-nosed Dace.* This species has been reported from the Dakota River at Jamestown and La Moure, N. Dak., by Woolman (1896).

**76. Hybopsis æstivalis** (Girard). This species was found by us at Dunning, Nebr., in Middle Loup River, and at Ravenna, Nebr., in the South Loup River and Mud Creek, from which places 44 specimens were obtained. The largest of these are 2½ inches in total length. This species is readily distinguished from *H. gelidus* by its much shorter, blunter snout, and larger eye; the color is also different, both lobes of the caudal being pale and the fine dark dustings are more evident on both back and sides,

**77. Hybopsis hyostomus** (Gilbert). Blue River at Crete; Platte and Elkhorn rivers at Fremont (Meek, 1894).

**78. Hybopsis gelidus** (Girard). Milk River (as *Gobio gelidus* type, Girard, 1856 and 1858, and Suckley, 1860). Obtained by us at the following places: Powder River, Arvada; North Platte River, Douglas; North Platte River, Grand Island; Bazile Creek, Niobrara; White River, Chamberlain. Upon comparing these specimens with those collected at St. Joseph, Mo., in 1884, by Drs. Jordan and Meek, and which were identified by them as *H. gelidus*, we found important differences and were disposed to regard our specimens as being an undescribed species. But a reexamination of Girard's original description showed that our specimens were the true *H. gelidus*, and that the St. Joseph specimens had been erroneously referred to that species. These have since been described by Jordan and Evermann[1] under the name *Hybopsis meeki*.

The considerable number of excellent specimens which we have enables us to give a more detailed description of *H. gelidus* than has hitherto been published. Head 4; depth 5; eye 6¼; snout 2⅔; D. 8; A. 9; scales 6–44–4. Body slender, not much compressed, back little arched, head long and slender; mouth inferior, horizontal, broad, overhung by the very long pointed snout, which is considerably decurved; barbel short, 1⅔ in head; eyes very small, high up, midway of head; interorbital width equal to width of mouth, origin of dorsal a little nearer snout than base of caudal, directly over base of ventrals; free edge of dorsal fin slightly concave, the anterior ray but little produced, its length 1⅔ in head; free edge of anal little concave, length of first rays 1⅔ in head; pectorals much shorter than in *H. meeki*, 1⅓ in head, the first rays not produced or filamentous and not reaching ventrals; ventrals barely reaching vent, 1⅔ in head; caudal very long and deeply forked, the lobes as long as head, the lower slightly the longer. Lateral line complete, straight; teeth, 4–4, strongly hooked. Color, sides silvery, pale below; scales of back each with a group of fine dark specks on posterior border, these extending almost to lateral line; rest of back and upper part of sides sparsely dusted over with minute brownish specks; fins all pale except the caudal, the lower lobe of which is dark, with a narrow white border below; upper lobe slightly dark at base. From *Hybopsis meeki*, which it most closely resembles, this species may be distinguished by the much longer and more pointed snout, the smaller eye, the much shorter pectoral fins, and the darker coloration of the back.

[1] *Fishes of North and Middle America*, Part I, 317, 1896.

**79. Hybopsis meeki** Jordan & Evermann.

*Ceratichthys gelidus* Jordan & Gilbert, Synopsis, 216, 1883; in part.

*Hybopsis gelidus* Jordan & Meek, Proc. U. S. Nat. Mus. 1885, 10; branches of Missouri River, Graham, 1885; Missouri River at Sioux City, Meek, 1892.

*Hybopsis meeki* Jordan & Evermann, Fishes North and Middle America, Part 1, 317, 1896. Type locality: Missouri River, St. Joseph, Mo.

Head 4; depth 5½; D. 8; A. 8; lateral line 44. Body very slender, not elevated. Snout long, thick, blunt, overhanging the rather large mouth. Barbel as long as eye. Head slender and elongate. Eye small, rather high, 4½ in head. Mouth small, subterminal, the maxillary not extending to the eye. Fins all large; pectoral as long as head; caudal deeply forked. Lateral line decurved, scales rather large. Coloration silvery, unspotted; a dusky lateral streak ending in a blackish spot at base of caudal; lower lobe of caudal abruptly black, edged below with white. Male with the nuptial tubercles excessively developed, covering most of body. Length, 2 inches. Missouri River at St. Joseph in river channel. A curious little fish, hitherto confounded with *H. gelidus*. (Named for Dr. Seth Eugene Meek.)

**80. Hybopsis montanus** Meek. Upper Missouri region (type, Meek, 1884). The exact locality from which these specimens came is not known. They are three in number (Nos. 36882, U. S. Nat. Mus.) and are said to have been collected by Dr. F. V. Hayden.

**81. Hybopsis dissimilis** (Kirtland). Gasconade River, Arlington, Mo.; Little Piney River at Newburg and Arlington, Mo. (Meek, 1891).

**82. Hybopsis storerianus** (Kirtland). Grand River at Clinton, Mo., and Tabo Creek at Calhoun, Mo. (Jordan & Meek, 1885); Osage River and branches (Graham, 1885); Floyd River at Sioux City and Elkhorn River at Fremont (Meek, 1894); Mud Creek, Ravenna; Elkhorn River, Norfolk Junction; Platte River, Grand Island; Wood Creek, Grand Island. Very abundant at Ravenna, where 35 large specimens, 5 to 6 inches long, were obtained.

**83. Hybopsis kentuckiensis** (Rafinesque). *River Chub.* Sweetwater River (as *Nocomis nebracensis* type, Girard, 1856 and 1858); Kansas River near Fort Riley (as *Ceratichthys cyclotis*, Cope, 1865); Hundred and Two River at Bedford, Iowa, and Maryville, Mo.; Blackwater Creek, Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo. (as *H. biguttatus*, Jordan & Meek, 1885); Mill Creek and Fort Riley, Kans. (Cragin, 1885*a*); very common in Kansas (as *H. biguttatus*, Graham, 1885); Mill Creek, Alma, Kans. (as *H. biguttatus*, Gilbert, 1885); Mission and Blacksmith creeks, Shawnee County, Kans. (as *H. biguttatus*, Gilbert, 1887); Smoky Hill River, Wallace, Kans. (as *H. biguttatus*, Hay, 1887); Osage River, La Cygne, Kans. (as *H. biguttatus*, Gilbert, 1889); Big Piney River, Cabool, Mo.; Little Piney River at Arlington and Newburg, Mo.; Jones Creek, Dixon, Mo.; Gasconade River, Arlington, Mo.; Lock Fork, Mansfield, Mo.; Osage River, Marshfield, Mo.; Marais River, Dixon, Mo.; Niangua River, Marshfield, Mo.; Sac River, Springfield, Mo. (Meek, 1891); Big Sioux River at Sioux Falls (Meek, 1892); Elkhorn River at Fremont (Meek, 1894); Dakota River and Pipestem Creek at Jamestown (Woolman, 1896).

**84. Couesius dissimilis** (Girard). Milk and Little Muddy rivers (as *Leucosomus dissimilis* type, Girard, 1856 and 1858); Poplar River, Poplar, Mont. (Eigenmann, 1894). Numerous specimens of this species were obtained by us as follows: Minnechaduza Creek, Valentine; Schlegel Creek, Valentine; Crow Creek, Chamberlain; Long Pine Creek, Long Pine; Beaver Creek, Buffalo Gap; Rapid Creek, Rapid City; creek at Hill City; creek at Custer; Big Goose Creek, Sheridan; south fork of Tongue River, Sheridan.

All of the streams in which it was found are clear and cold, and it probably does not occur in any of the warmer alkaline streams in the eastern and

central part of the region examined. It appears to be common, however, in certain Wyoming streams. The finest, largest, individuals obtained are those from Rapid Creek and Tongue River, the largest of these measuring about 6 inches in total length. Head 4⅛ to 4½; depth 4 to 5; eye 4 to 5; snout 3 to 4; D., 8; A., 8. There is considerable variation in the scales, the extremes being 12-72-8 and 12-64-8, the usual number, however, being 12-68-8. Occasionally there are 11 to 13 scales above (and including) the lateral line.

In the fifth edition of Jordan's Manual of Vertebrates, *Couesius dissimilis* is distinguished from *C. plumbeus* as having fewer scales in the lateral line, the number given for *dissimilis* being 60 and for *plumbeus* 68. This is evidently a mistake. Specimens in the National Museum of what have been called *plumbeus*, from Lake Superior and the Adirondacks, have 70 to 75 scales in the lateral line. This is not sufficiently different from western specimens to be of any specific value. While we can not see how these species can be distinguished by the scales, we think we have discovered a character which will serve to distinguish them, viz: The differences in the dorsal and anal fins, which may be stated thus:

*a.* Height of dorsal fin 1 to 1⅛ in head, free margin of fin concave, the anterior rays produced and extending beyond the others when the fin is depressed. Length of longest anal ray 1⅛ to 1⅓ in head, the free margin of the fin more or less concave, the anterior rays somewhat produced, and when deflexed extending slightly beyond other rays ..... *plumbeus.*

*aa.* Height of dorsal 1⅛ to 1⅓ in head; free margin of fin nearly straight, the anterior rays little if at all produced, and when depressed barely reaching beyond end of other rays. Length of longest anal ray 1⅛ in head, free margin of fin straight, anterior rays not produced and not extending beyond end of others when depressed ..... *dissimilis.*

These differences are well marked between the specimens of *dissimilis* examined and all specimens of *plumbeus* from the upper Great Lakes region. A specimen (U. S. N. M., No. 34388) collected in the Adirondacks by Mr. Fred Mather, seems to belong to *Couesius plumbeus*, though it does not wholly agree with those from Lake Superior. The height of the dorsal fin is 1⅛ in head, the anterior rays are somewhat produced and extend some beyond the other rays when the fin is depressed; the free margin is but slightly concave. The longest anal rays are contained 1⅜ times in length of head, the anterior rays are but little produced and do not reach beyond the others when deflexed; the free margin of the anal fin is nearly straight. The origin of the dorsal fin is midway between middle of pupil and base of caudal. This posterior position of the dorsal is a character, however, not possessed by the other specimens of *C. plumbeus* examined. This species differs from *C. greeni* of the Columbia and Frazer River basins in the smaller scales and in having the scales more crowded on the anterior part of the body. There is considerable variation in the squamation of this species, however. Examination of ten examples from Sheridan gives the following results:

| Number of rows of scales between front of dorsal fin and lateral line. | Number of scales in lateral line. | Number of rows of scales between lateral line and base of ventrals. | Number of scales in front of dorsal fin. |
|---|---|---|---|
| 11 | 60 | 8 | 32 |
| 12 | 63 | 10 | 40 |
| 12 | 63 | 8 | 40 |
| 12 | 66 | 8 | 35 |
| 12 | 63 | 9 | 40 |
| 11 | 60 | 9 | 36 |
| 11 | 60 | 9 | 35 |
| 12 | 65 | 9 | 36 |
| 15 | 70 | 9 | 40 |
| 12 | 60 | 9 | 40 |

The type of *C. dissimilis* has the head $3\frac{6}{7}$; depth $4\frac{2}{7}$; eye 4; snout $3\frac{5}{7}$; interorbital 3; scales 12-66-9, 38 before dorsal. Of 21 specimens of *Couesius* from Rapid Creek all but one are infested more or less with a parasitic trematode embedded under the scales and showing as small black spots. All of those from Hill City and many from Custer and Sheridan are similarly affected.

**85. Platygobio gracilis** (Richardson). *Flat-headed Chub.* Fort Pierre, Fort Union, above Fort Union, Milk River, Yellowstone River, and Sweetwater River (as *Pogonichthys communis* type, Girard, 1856 and 1858); Milk River (as *Pogonichthys communis*, Suckley, 1860); near Bridger Pass (as *Pogonichthys* (*Platygobio*) *gulonellus* type, Cope, 1864*a*); Kansas River near Fort Riley (as *P. gulonellus*, Cope, 1865); Platte Valley (as *P. communis*, Gill, 1876); Fort Benton and Judith River (as *Pogonichthys communis*, Cope, 1879); Missouri River, St. Joseph, Mo. (Jordan & Meek, 1885); Kansas River (Graham, 1885); Missouri River at Sioux Falls (Meek, 1892); Poplar River at Poplar, and Missouri River at Craig, Mont. (Eigenmann, 1894); Platte River at Fremont (Meek, 1894).

This abundant minnow was found by us at the following places: White River near Chamberlain; Redwater Creek near Spearfish; canal at Niobrara; Bone Creek and Niobrara River near Long Pine; Middle Loup River at Dunning; Chadron Creek, Lone Tree Creek, and White River near Chadron; Platte River at Grand Island; Niobrara River near Valentine; Mud Creek and South Loup River at Ravenna; Clear Creek, Clermont; North Platte River at Glenrock, Casper, and Douglas; Cheyenne River at Edgemont and Cheyenne Falls; Powder River at Arvada; Deer Creek at Glenrock.

The flat-headed chub is preeminently the characteristic fish of the shallow alkaline streams of the middle Missouri Basin, and shows better than any other the peculiar bleaching effect of the alkaline waters of that region. The fishes are all reduced to a nearly uniform pale or faded appearance. Except those found in the headwaters above the alkali, they are almost wholly without pigment cells of any kind. Perhaps the most extreme case of bleaching is that of *P. gracilis*, which, of all American fishes, seems to be the one most perfectly adapted to life in these alkaline streams.

**86. Anguilla chrysypa** Rafinesque. *Common Eel.* "Believed to be common throughout the State" of Kansas (as *A. rostrata*, Graham, 1885); Kansas River at Lawrence and Topeka (Cragin, 1885*a*). The eel probably occurs abundantly in the lower portion of the Missouri Basin, but no definite records are known.

**87. Hiodon alosoides** (Rafinesque). *Toothed Herring.* Quaking Asp River (as *Hyodon chrysopsis*, Jordan, 1878); Missouri River, St. Joseph, Mo.; Tabo Creek, Lexington, Mo. (Jordan & Meek, 1885); Silver Lake (Cragin, 1885*a*); Republican River, Concordia, Kans.; Saline River, Wakeeney, Kans. (Hay, 1887); Missouri and Big Sioux rivers, Sioux City (Meek, 1892); Poplar River, Poplar, Mont. (Eigenmann, 1894); Floyd River at Sioux City, and Platte River at Fremont (Meek, 1894).

Young examples of this species were obtained as follows: Crow Creek, Chamberlain; Choteau Creek, Springfield; Bazile Creek and Ponca Creek, Niobrara; Loup River, Ravenna; White River, Chadron; Wood and Platte rivers, Grand Island; Platte River, Casper; and Clear Creek, Clermont. The largest specimens obtained do not exceed 6 inches in length. Though it was not secured in many of the streams examined by us, this species is no doubt generally distributed throughout the lower and middle Missouri River basin in all suitable waters. It is a fish of the open stream, being found where there is some current and where the depth is not great. It reaches a length of a foot or more, and is a handsome fish possessing some game qualities, though not of much food value. At Hot Springs we were told that this fish is found at Cheyenne Falls in considerable numbers in the spring, that it is locally known as the "whitefish," and that it affords some sport for the local anglers.

**88. Hiodon tergisus** Le Sueur. *Moon-eye.* West of Fort Union (as *Hyodon tergisus*, Suckley, 1860); Kansas River near Fort Riley (as *Hyodon tergisus*, Cope, 1865); Judith River and river pools near Battle Creek, S. Dak. (as *Hyodon tergisus*, Cope, 1879); "common in Kansas" (Graham, 1885); Kansas River at Topeka (Cragin, 1885*a*).

**89. Dorosoma cepedianum** (Le Sueur). *Hickory Shad; Mud Shad.* Missouri River, St. Joseph, Mo.; Tabo Creek, Lexington, Mo.; Grand River, Clinton, Mo.; Tabo Creek, Calhoun, Mo. (Jordan & Meek, 1885); "very common" in Kansas (Graham, 1885); Shunganunga and Ward creeks, Kans. (Cragin, 1885*a*); Osage River, La Cygne, Kans. (Gilbert, 1889); Little Piney River at Newburg and Arlington, Mo. (Meek, 1891); Missouri River and Big Sioux River at Sioux City (Meek, 1892); Floyd River at Sioux City and Elkhorn River at Fremont (Meek, 1894).

**90. Pomolobus chrysochloris** Rafinesque. *Skipjack; Blue Herring.* "Abundant in large streams" in Kansas (Graham, 1885).

**91. Coregonus williamsoni cismontanus** Jordan. *Rocky Mountain Whitefish.* Headwaters of the tributaries of the upper Missouri as (*C. williamsonii*, Cope, 1879); Madison, Yellowstone, and Gardiner rivers, and Horsethief Creek, Mont., types, Jordan, 1891*b*); Red Rock River, Red Rock, Mont.; Beaverhead River, Dillon, Mont.; junction of Firehole and Gibbon rivers (Evermann, 1892); Missouri River, Craig, Mont. (Eigenmann, 1894).

Whitefish were found only in Tongue River and Big Goose Creek near Sheridan, 13 small specimens being secured. In Tongue River they are said to be quite common. This variety of Williamson's whitefish is found in most of the cold streams of the upper Missouri Basin, particularly in the streams about the Yellowstone Park. The differences which are assigned as distinguishing the Missouri River whitefish from Williamson's are scarcely perceptible, if at all. The body is said to be somewhat more slender and the fins lower. All the young examples in the present collections show the parr marks very distinctly.

**92. Salmo mykiss lewisi** (Girard). *Cut-throat Trout; Yellowstone Trout.* Falls of Missouri River (as *Salar lewisi* type, Girard, 1858); Falls of Missouri River (as *Salmo* (*Salar*) *lewisi*, Suckley, 1860); Yellowstone River, Yellow Creek, Gallatin Fork, and Yellowstone Lake (as *Salmo pleuriticus* type, Cope, 1872); St. Mary River (as *S. clarki*, Jordan, 1878); Yellowstone River at Livingston, Mont.; Gardiner River below the Falls; Solution Creek, Riddle Lake; Canyon Creek and Madison River, Yellowstone National Park (Jordan, 1891*b*); Atlantic Creek in Two-Ocean Pass and below the pass; upper Yellowstone River; Meadow Creek in Yellowstone Park; east fork of Gardiner River, and McClellan Creek, Helena, Mont. (Evermann, 1892).

Two specimens of the black-speckled trout are in the collection from south fork of Tongue River and two from Big Goose Creek near Sheridan. Numerous other examples were caught with hook from these streams. In these and in nearly all the streams in this part of Wyoming trout are abundant and afford excellent sport to the angler. Small parties often report catches of 400 to 600 as the result of two or three days' fishing. Upon comparing the specimens from Sheridan with others of the same size from Big Wood River at Galena, Idaho, the following differences are noted: The Sheridan specimens have the eye a little larger, the snout a little shorter, the maxillary notably longer and heavier, and the fins all much larger; the height of the dorsal is less than 2 in head and that of the anal is 1¾ in head. In the Idaho specimens the dorsal and anal are at least a fourth lower; the pectorals and ventrals are also correspondingly shorter. The Sheridan specimens have smaller scales and differ somewhat in coloration. In both, the back is profusely spotted throughout the entire length, but in the Sheridan specimens there are but few spots below the lateral line, while those from Idaho are almost as thickly spotted below the lateral line as on the back; in the Sher-

idan specimens the head has scarcely any spots; in the other, the head is well spotted; there is also a marked difference in the size of the spots, those on the Idaho specimens being much the larger. Contrasting these differences in tabular form we have the following:

| Characters contrasted. | Specimen (male) 10 inches long, Sheridan, Wyo. | Specimen (male) 9½ inches long, Galena, Idaho. |
|---|---|---|
| Eye | 4⅛ in head | 5½ in head. |
| Snout | 5⅜ in head | 4⅜ in head. |
| Maxillary | Long and broad, upper edge convex. | Shorter and narrower, the two sides nearly parallel. |
| Dorsal fin | Large, its height less than 2 in head | Small, its height 2¼ in head. |
| Anal fin | Large, 1⅜ in head | Smaller, 2½ in head. |
| Pectoral fins | Long, 1⅜ in head | Shorter, 2 in head. |
| Ventral fins | Long, 2 in head | Shorter, 2¼ in head. |
| Scales | Small | Somewhat larger. |
| Coloration | Back and sides above lateral line profusely spotted, the spots small. Sides below lateral line with few spots. Head almost plain with only 2 or 3 spots behind eye. Red on throat in life. | Not materially different, except that the spots are smaller and less thickly placed on antedorsal region. Almost as numerous as above. Top of head and postorbital area with numerous spots; 2 or 3 spots on snout. No red on throat in life. |

These differences are very marked, and would certainly be of sufficient importance to justify the specific separation of the two if found to hold good throughout the range of each. But various more or less intermediate characters are shown in specimens from other localities, and it is probably best, for the present at least, to regard these forms as subspecies of typical *mykiss;* in which case the form found throughout the upper Missouri Basin and in the Snake River above Shoshone Falls will stand as *Salmo mykiss lewisi* (Girard), and the common form of the Snake River basin below Shoshone Falls, as *Salmo mykiss gibbsii* (Suckley). The eastern limit in Wyoming in the range of the black-speckled trout is only approximately known. We know that trout are abundant in Yellowstone Lake[1] and in the streams in and about the park, from which they are not barred by waterfalls; they are also in the Yellowstone River and its upper tributaries. It is undoubtedly in the Clark Fork of the Yellowstone and Big Horn River, though no specimens have been received from those streams. We know it is an abundant fish in the Tongue River basin, and it is probably found in the headwaters of Powder River, though we have no definite record of the fact. It is not found in any of the streams in or about the Black Hills, as we have already stated in this paper. At present the most eastern point from which specimens have been obtained, of which we have definite record, is Sheridan, Wyo., from south fork of Tongue River, and Big Goose Creek. Further investigations in Wyoming are very much to be desired, especially in the region drained by the Clark Fork of the Yellowstone, the Big Horn, Powder River, the North Platte, and the Sweetwater.

**93. Salmo mykiss stomias** (Cope). *Platte River Trout.* Kansas River near Fort Riley,[2] Kans. (as *Trutta lewisi*, Cope, 1865); Platte [Kansas] River near Fort Riley, Kans. (as *Salmo* (*Salar*) *stomias* type, Cope, 1871); Platte [Kansas] River (in part as *S. pleuriticus* type, Cope, 1872); Bear Creek, Morrison, Colo. (Jordan, 1891).

[1] In Ludlow's Report of a Reconnaissance from Carroll, Mont. Ter., on the Upper Missouri, to the Yellowstone National Park and return, made in the summer of 1875 (War Dept., 1876), we find the following interesting note (p. 20) concerning the trout of this lake: "There seem to be two varieties of trout here, the bulky ones of the Yellowstone, with bright yellow bellies and stripings of red, and a smaller kind, more silvery in appearance and exhibiting much greater activity and game qualities. These latter seemed to come generally from the [Tower] creek."

[2] Locality probably erroneous. The specimens more likely came from some point near the headwaters of the South Platte, where variety *stomias* is found.

[Introduced species.] **Salvelinus fontinalis** (Mitchill). *Eastern Brook Trout.* This species has been planted in a number of the streams of Nebraska, South Dakota, and Wyoming. Specimens were obtained by us in Spearfish Creek at Spearfish, Spring Creek at Bazile Mills, Long Pine Creek at Long Pine, Beaver Creek near Newcastle, and Big Goose Creek near Sheridan. In Spring Creek we found the brook trout abundant and doing well. At three hauls with a short seine we caught at least 15 trout (which were returned to the streams), mostly yearlings, though one was nearly a foot long. Mr. George Brooks, of Bazile Mills, informs us that recently a trout weighing 2 pounds 9 ounces was caught in this little stream. The plant was made here by the Nebraska fish commission some six or seven years ago, and has proved very successful. The stream is so small, however, that the trout will not, as a rule, attain a large size, and, unless fishing is carefully regulated, the stream will become fished out.

Long Pine Creek is a very good trout stream and we saw a number of very fine trout there. This creek has become noted throughout Nebraska and affords more and better trout fishing than any other stream in the State. The creek is a large one, the water is excellent, and there is an abundant food supply, consequently the trout grow to a large size and are of superior flavor. Spearfish Creek is apparently the best trout stream in the Black Hills, surpassing in length and volume of water any of the other streams suitable for trout in that region. Sufficient plants of trout have been made in the vicinity of Spearfish to demonstrate the excellent character of the water. These fish appear to be doing remarkably well, and the stream is able to support a much larger supply than it now contains. Beaver Creek, near Newcastle, is another excellent trout stream in which eastern brook trout and rainbow trout have been planted. There are, of course, numerous other streams in the Black Hills well suited to trout, but, so far as we were able to learn, no plantings of importance have been made in them.

**94. Thymallus ontariensis montanus** (Milner). *Montana Grayling.* Yellow Creek and Gallatin River and headwaters of Yellowstone River (as *Thymallus tricolor*, Cope, 1872); tributary of Missouri River at Camp Baker, Mont. (as *T. montanus* type, Milner, 1874); Madison River, Gallatin River, and Horsethief Creek, Mont. (as *T. signifer ontariensis*, Jordan, 1891*a*); Red Rock River, Red Rock, Mont.; Beaverhead River, Dillon, Mont.; junction of Firehole and Gibbon rivers (Evermann, 1892); Missouri River, Craig, Mont. (Eigenmann, 1894).

**95. Lucius lucius** (Linnæus). *Pike; Northern Pickerel.* St. Mary River (as *Esox lucius*, Jordan, 1878); Boyer River at Arion, Iowa (Meek, 1892); Floyd River at Lemars and Sioux City; East Okoboji, West Okoboji, and Spirit lakes (Meek, 1894); Dakota River at Jamestown (Woolman, 1896). This species was found in Elkhorn River near Norfolk, and in Rock Creek near Mitchell, where a single specimen a foot in length was secured. We were surprised not to find pickerel in any of the other waters examined, as the sluggish grassy streams and the small lakes would seem to be well suited to it. Further collecting will probably show it to be more common in eastern Nebraska and South Dakota than now appears.

**96. Fundulus diaphanus** (Le Sueur). Kansas River (Graham, 1885).

**97. Fundulus zebrinus** Jordan & Gilbert. Kansas River and branches (Graham, 1885); Ellis, Kans. (Cragin, 1885*a*); Ellis, Ellis County, Kans. (Gilbert, 1885); north fork of Solomon River, Lenora, Kans.; Saline River, Wakeeney, Kans.; Smoky Hill River, Wallace, Kans. (Hay, 1887); Republican River, Wano, Kans.; Logan, Kans. (Gilbert, 1889); Big Sioux River at Sioux City; Silver Lake, Iowa (Meek, 1892); East Okoboji Lake (Meek, 1894).

**98. Fundulus catenatus** (Storer). Jones Creek, Dixon, Mo.; Gasconade River, Arlington, Mo.; Little Piney River at Newburg and Arlington, Mo. (Meek, 1891).

**99. Fundulus lineatus** (Garman). Northeastern Wyoming (as *Zygonectes lineatus* type, Garman, 1881).

**100. Fundulus macdonaldi** (Meek). Jones Creek, Dixon, Mo.; Osage River, Marshfield, Mo. (as *Zygonectes macdonaldi* types, Meek, 1891).

**101. Fundulus floripinnis** (Cope). South Platte River near Denver (*Haplochilus floripinnis* type, Cope, 1874); Denver, Colo. (as *Haplochilus floripinnis*, Cope & Yarrow, 1876); South Platte River at Denver (as *Zygonectes floripinnis*, Jordan, 1891).

**102. Fundulus sciadicus** Cope. "Nebraska or Platte River" (type, Cope, 1865); Floyd River at Lemars; Platte and Elkhorn rivers at Fremont (Meek, 1894). Numerous specimens of this species were obtained. It was found at the following places: Ponds at Niobrara, Creighton, and Long Pine; Creighton Creek, Niobrara; Long Pine Creek, Long Pine; Dismal and Middle Loup rivers, Dunning; Loup River, Ravenna; Prairie Creek, Scotland, and Rock Creek, Mitchell. Specimens have recently been sent to the Commission from Dover, McCook County, S. Dak., by Mr. Fred. S. Butler. The center of abundance for this region seems to be in northeastern Nebraska and southeastern South Dakota, the largest number of specimens having been obtained about Scotland, Niobrara, and Long Pine. It was also common at Dunning, and probably occurs in all suitable waters of Nebraska and South Dakota. It seems to prefer the small grassy ponds and lakes, but it also finds a congenial home in the sluggish grassy creeks so common in this region. In the small, isolated pools along the creeks among the *Chara*, *Potamogeton*, and *Myriophyllum*, in which they abound, these little "top minnows" could usually be found in large numbers swimming about at the surface. Usually the vegetation was so abundant that it was difficult to secure any of these fish with the seine. A dip net or a very short seine generally gave the best results. The largest specimens secured are 2¾ inches long, and may be described as follows: Head 3⅔; depth 4; eye 4; snout 3½; interorbital width 1½ times eye. D. 10; A. 12; scales 35-10. Body short and stout; head flat, snout pointed, the lower jaw slightly projecting; caudal peduncle compressed and deep, its least depth nearly equal to snout and eye. Teeth in each jaw in about 3 series, those of the outer enlarged and somewhat curved inward. Fins all small; the pectorals about as long as depth of caudal peduncle; ventrals much shorter; origin of dorsal behind that of anal and nearer tip of caudal than to occiput. Color in life, rosy olivaceous, profusely covered with fine brownish punctulations; middle line of back darker; in spirits, uniform olivaceous or brownish, paler below; dark line on back evident.

**103. Eucalia inconstans** (Kirtland). *Brook Stickleback.* Poplar River, Poplar, Mont. (*Eigenmann, 1894*). The brook stickleback was found only in Crow Creek, near Chamberlain, and in the ponds and creek at Long Pine. Mr. Fred S. Butler, of Dover, S. Dak., has kindly sent us specimens from that place. Over 50 specimens were secured, all but 4 of them from Long Pine. In the small grassy ponds at the head of Long Pine Creek it is very abundant. The largest specimens are 2 inches in total length. Head 3½; depth 3⅓; eye 3⅔; snout 3¼. D. IV or V-I, 10 or 11; A. I, 9 or 10. In 31 examples counted the dorsal was IV-I, 10 in 12; IV-I, 9 in 2; IV-I, 11 in 1; V-I, 10 in 10; V-I, 9 in 4, and V-I, 11 in 2. In the same examples the anal was I, 9 in 16 and I, 10 in the remaining 15. Body smooth throughout. Ventrals very short, wide apart, innominate bone covered by the skin about 1⅓ times length of ventrals. Color, dark brown above, pale below.

**104. Percopsis guttatus** Agassiz. *Trout Perch.* Kansas (as *P. hammondii* type, Gill, 1864); Kansas River near Fort Riley (as *P. hammondi*, Cope, 1865); Big Sioux River at Sioux City; Boyer River at Arion, Iowa (Meek, 1892); Floyd River at Lemars, and East Okoboji Lake (Meek, 1894).

**105. Labidesthes sicculus** (Cope). Blackwater Creek, Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo. (Jordan & Meek, 1885); Big Piney River, Cabool, Mo.; Osage Fork, Marshfield, Mo.; Marais River, Dixon, Mo.; Niangua River, Marshfield, Mo. (Meek, 1891).

**106. Pomoxis annularis** Rafinesque. *Crappie.* Missouri River, St. Joseph, Mo.; Blackwater Creek, Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo. (Jordan & Meek, 1885); Kansas River at Lawrence (Graham, 1885); Soldier Creek, Kans. (Cragin, 1885*a*); Bear Creek, Boone County, Mo. (Call, 1887). Both species of *Pomoxis* are being extensively introduced into the waters of Kansas, Nebraska, and South Dakota, and it is not easy to determine definitely the natural western limit of either. It will be very close to the truth, however, if we put it in the eastern part of Nebraska and the Dakotas on the border of the alkali region.

**107. Pomoxis sparoides** (Lacépède). *Calico Bass.* Osage River, Kans. (Cragin, 1885*a*); East Okoboji Lake (Meek, 1894).

**108. Ambloplites rupestris** (Rafinesque). *Red-eye; Goggle-eye.* Kansas River at Lawrence (Cragin, 1885*a*); Big Sioux River at Sioux City and Sioux Falls (Meek, 1892); Floyd River at Sioux City (Meek, 1894). The western limit of this species is apparently about the same as that of the two species of *Pomoxis*. All three species could doubtless be introduced successfully into many of the small lakes in Nebraska and the Dakotas.

**109. Chænobryttus gulosus** (Cuvier & Valenciennes). *Warmouth.* Kansas River (Graham, 1885). This species ought to be found in the lakes of Iowa and those of the Dakotas, but no specimens have been reported from any point in the Missouri Basin, except those recorded from Kansas River by Professor Graham.

**110. Apomotis cyanellus** (Rafinesque). *Green Sunfish.* Kansas River near Fort Riley (as *Bryttus longulus*, Cope, 1865); Hundred and Two River at Bedford, Iowa, and Maryville, Mo.; Tabo Creek at Lexington and Calhoun, Mo.; Blackwater Creek, Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo.; Grand River, Clinton, Mo.; Missouri River, St. Joseph, Mo. (Jordan & Meek, 1885); "common" in Kansas (Graham, 1885); Shunganunga and Ward creeks, Kans. (Cragin, 1885*a*); Ward and Shunganunga creeks, Shawnee County, Kans. (Gilbert, 1885); Blacksmith Creek, Shawnee County, Kans. (Gilbert, 1886); Solomon River, Beloit, Kans.; north fork of Solomon River, Lenora, Kans.; Saline River, Wakeeney, Kans.; Smoky Hill River, Wallace, Kans. (Hay, 1887); Osage River, La Cygne, Kans. (Gilbert, 1889); Marais River, Dixon, Mo.; Niangua River, Marshfield, Mo.; Jones Creek, Dixon, Mo.; Gasconade River, Arlington, Mo.; Big Piney River, Cabool, Mo.; Little Piney River at Newburg and Arlington, Mo. (Meek, 1891); Big Sioux River at Sioux City and Sioux Falls; Soldier River at Charter Oak, and Boyer River at Arion, Iowa (Meek, 1892); Platte River at South Bend and Fremont (Meek, 1894).

This common sunfish was obtained in the following places: Rock, Enemy, and Firesteel creeks and Dakota River, Mitchell; Emanuel and Choteau creeks, Springfield; Prairie Creek, Scotland; Creighton Creek, Niobrara; ponds at Verdigris, Creighton, Norfolk Junction, Long Pine, and Dunning; Minnechaduza Creek, Valentine; Lake George, Carp Lake, and Ingalls Lake near Long Pine; Elkhorn River at Norfolk Junction and Ewing; South Loup River at Ravenna; and Bone Creek near Long Pine.

The collections contain 146 specimens from these localities. The species is most abundant in southeastern South Dakota, as is shown by the numerous specimens from the vicinity of Mitchell. It is also quite abundant in suitable places in eastern Nebraska, but is not common westward. About Long Pine, in Brown County, we found it to be rather common, and 9 specimens were obtained still farther west from Minnechaduza Creek near

Valentine, in Cherry County, and 9 specimens are in the collection from the ponds along Dismal River near Dunning, in Blaine County. Very suitable ponds near Chamberlain did not contain this or any other species of sunfish, though some 60 miles east of the place where we found it in Minnechaduza Creek. It seems probable that the western limit in Nebraska, of this sunfish, is not far from the one hundredth meridian, and that in the Dakotas it is some miles farther east. This western limit seems coincident with the disappearance of the small lakes and ponds of pure water and the appearance of the shallow, uncertain, alkaline streams so characteristic of western Nebraska and South Dakota. There is a number of suitable ponds and lakes farther west, particularly about the Black Hills, where sunfish would probably do well, but that they are not there is apparently due to the fact that the alkaline streams to the eastward have served as a barrier. This sunfish attains a considerable size in this region, especially in the lakes, and is of no little importance as a pan fish. Our specimens from Mitchell, Verdigris, and the Brown County lakes are particularly large and fine. In life the colors are very brilliant; dark greenish above and on sides, with bright blue lines on cheek; belly and posterior portion of body orange; soft part of opercular flap lemon; ventrals orange with white border; anal black at base, rays orange toward tips, outer edge orange and white; caudal lobes with some deep orange.

**111. Lepomis megalotis** (Rafinesque). *Long-eared Sunfish.* Osage Fork, Marshfield, Mo. (Meek, 1891); Silver Lake, Iowa (Meek, 1892).

**112. Lepomis humilis** (Girard). *Red-spotted Sunfish.* Hundred and Two River at Bedford, Iowa, and Maryville, Mo.; Blackwater Creek, Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo.; Grand River, Clinton, Mo.; Tabo Creek, Calhoun, Mo. (Jordan & Meek, 1885); "locally abundant" in Kansas (Graham, 1885); Ellis, Kans.; Ward and Shunganunga creeks, Shawnee County, Kans. (Gilbert, 1885, and Cragin, 1885*a*); Blacksmith Creek, Shawnee County, Kans. (Gilbert, 1886); Bear Creek, Boone County, Mo. (Call, 1887); Solomon River, Beloit, Kans.; north fork of Solomon River, Kirwin, Kans.; Saline River, Wakeeney, Kans.; Smoky Hill River, Wallace, Kans. (Hay, 1887); Sappa Creek, Oberlin, Kans.; La Cygne, Kans.; Solomon River, Wano, Kans. (Gilbert, 1889); Marais River, Dixon, Mo. (Meek, 1891); Big Sioux River at Sioux City and Sioux Falls, and Boyer River at Arion, Iowa (Meek, 1892); Platte River at South Bend and Fremont; Elkhorn River at Fremont; Blue River at Crete; Salt Creek at Lincoln; Floyd River at Lemars and Sioux City (Meek, 1894); and Dover, S. Dak. (Butler, 1896).

This sunfish was obtained at the following places: Rock and Firesteel creeks and Dakota River, Mitchell; Prairie Creek, Scotland; pond at Norfolk Junction, and Blue River at Stewart. A total of 88 specimens are in the collection, all but 30 being from the streams about Mitchell. While this species is abundant about Mitchell it does not appear to be so elsewhere. The most westerly point at which we found it in Nebraska is Norfolk Junction. Evidently its range does not extend so far to the westward as does that of *A. cyanellus*. The life colors are very bright; belly, spots on sides and three or four rows on cheek rich orange; ventrals, anal, and tip of dorsal, orange; iris red. This sunfish does not reach so large a size as *A. cyanellus*, but it is, nevertheless, of considerable value as a pan fish.

**113. Lepomis macrochirus** Rafinesque. Osage Fork, Marshfield, Mo.; Lock Fork, Mansfield, Mo. (Meek, 1891).

**114. Lepomis pallidus** (Mitchill). *Blue-gill Sunfish.* Missouri River, St. Joseph, Mo. (Jordan & Meek, 1885); Little Piney River at Newburg and Arlington, Mo.; Big Piney River, Cabool, Mo.; Gasconade River, Arlington, Mo.; Osage Fork, Marshfield, Mo. (Meek, 1891); Spirit Lake (Meek, 1894).

**115. Eupomotis gibbosus** (Linnæus). *Common Sunfish; Pond Sunfish.* Osage River at Ottawa, Kans. (Cragin, 1885*a*); Spirit Lake (Meek, 1894).

**116. Micropterus dolomieu** Lacépède. *Small-mouthed Black Bass.* Marais des Cygnes (Graham, 1885); Ozark region of Missouri (Call, 1887); Gasconade River, Arlington, Mo.; Little Piney River at Newburg and Arlington, Mo.; Osage Fork, Marshfield, Mo.; Marais River, Dixon, Mo. (Meek, 1891); Spirit Lake (Meek, 1894).

**117. Micropterus salmoides** (Lacépède). *Large-mouthed Black Bass.* Missouri River, St. Joseph, Mo.; Blackwater, Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo.; Grand River, Clinton, Mo.; Tabo Creek, Calhoun, Mo. (Jordan & Meek, 1885); Kansas River at Lawrence (Graham, 1885); Soldier Creek, Kans. (Cragin, 1885*a*); Big Piney River, Cabool, Mo.; Little Piney River at Newburg and Arlington, Mo.; Osage Fork, Marshfield, Mo.; Lock Fork, Mansfield, Mo. (Meek, 1891); Floyd River at Lemars and Sioux City; Platte and Elkhorn rivers at Fremont; Spirit Lake (Meek, 1894).

This was not found at any point in South Dakota, and in Nebraska it was found only at Norfolk Junction, Ewing, and Ravenna. Only young individuals were seen. Whether the black bass is native in any of these streams is not absolutely certain. It has been planted extensively by the Nebraska fish commission and it is not unlikely that it has been introduced into these streams. At any rate the eastern parts of Nebraska and the Dakotas quite certainly mark the western limit of the natural habitat of the large-mouthed black bass. The numerous small lakes of these States seem to be well suited to it and it will no doubt prove profitable to keep them well stocked not only with the large-mouthed black bass, but with the rock bass, warmouth, ring perch, and the various species of sunfish. East of the Black Hills some of the tributaries of the Cheyenne are also well suited to the needs of these species and they could be very properly stocked.

**118. Stizostedion vitreum** (Mitchill). *Wall-eyed Pike.* Kansas River (Graham, 1885); Soldier Creek, Kans. (Cragin, 1885*a*); Big Sioux River (Meek, 1892); West Okoboji and Spirit lakes (Meek, 1894). Found by us only in Crow Creek near Chamberlain, in Rock Creek at Mitchell, Choteau Creek near Springfield, South Loup River at Ravenna, Long Pine Creek at Long Pine, and Clear Creek at Clermont. In all these places it is probably abundant, though we secured only a few small specimens. Large ones were seen in Choteau and Long Pine creeks, and we were informed that the wall-eyed pike is found in most of the larger creeks and rivers of eastern Nebraska and the Dakotas, and that it is the principal game fish. The larger lakes and the larger, more open streams of this region are fairly well adapted to the requirements of this fish; the waters are not unsuitable and an ample supply of desirable food is found in the various smaller fishes which, though not very great as to number of species, are abundant as regards individuals. The same is true of the next species, the sauger. We are of the opinion that these waters are capable of supporting a much larger supply of these species than now exists in them; judicious plantings of fry in the more suitable streams would, in a few years, result in a large increase in the abundance of this valuable food-fish and the angler would find the region an attractive one. Each of the 10 specimens examined possessed but 3 pyloric cæca.

**119. Stizostedion canadense boreum** (Girard). *Sand Pike; Gray Pike; Sauger.* Milk River (as *S. boreus*, Suckley, 1860); Kansas River near Fort Riley (as *Stizostedium americanum*, Cope, 1865); Missouri River at Fort Benton and elsewhere (as *Lucioperca borea*, Cope, 1879); Missouri River, St. Joseph, Mo. (Jordan & Meek, 1885); Kansas River and Mill Creek, Kans. (Graham, 1885); Big Sioux River (Meek, 1892); Poplar River, Poplar, Mont. (Eigenmann, 1894); Spirit Lake, Floyd River at Lemars and Sioux City, and Platte River at Fremont (Meek, 1894).

Found by us at the following places: Choteau Creek near Springfield; White River near Chamberlain; and North Platte River at Grand Island, Glenrock, and Casper. Only 7 specimens were secured, all of them being small. The sauger is probably equally abundant with the wall-eyed pike in this region, but its habitat seems to extend farther west. Though not attaining as large size as the wall-eyed pike, the sauger reaches a length of a foot or more and possesses game qualities which render it a fish of no little importance in the Missouri Basin. The number of pyloric cæca in six of the seven specimens examined was 4, in the other there were 5. It is not always easy to distinguish the young of these species by external characters, but the number and relative lengths of the pyloric cæca seem to constitute reliable differences.

**120. Perca flavescens** (Mitchill). *Yellow Perch; Ring Perch.* Big Sioux River at Sioux City and Sioux Falls, and Silver Lake, Iowa (Meek, 1892); East Okoboji and Spirit lakes (Meek, 1894); Dakota River at Jamestown (Woolman, 1896). This perch was found only in the streams about Mitchell, nine specimens being obtained from Enemy, Rock, and Firesteel creeks and Dakota River. This is the most western point from which it has been reported, and is probably near the western boundary of its habitat.

**121. Percina caprodes** (Rafinesque). *Log Perch; Hog-nosed Darter.* Eastern Kansas (Graham, 1885); Snokomo Creek, Wabaunsee County, Kans. (Gilbert, 1886); Osage Fork, Marshfield, Mo.; Lock Fork, Mansfield, Mo. (Meek, 1891).

**122. Hadropterus phoxocephalus** (Nelson). Grand River, Clinton, Mo.; Tabo Creek, Calhoun, Mo. (as *Hadropterus phoxocephalus*, Jordan & Meek, 1885); Marais des Cygnes (Graham, 1885); Osage River, La Cygne, Kans. (Gilbert, 1889).

**123. Hadropterus aspro** (Cope & Jordan). Snokomo Creek, Wabaunsee County, Kans. (Gilbert, 1886); Gasconade and Little Piney rivers, Arlington, Mo. (Meek, 1891); Big Sioux River (Meek, 1892); Floyd River at Sioux City (Meek, 1894); Dakota River at Jamestown (Woolman, 1896).

The black-sided darter is rare in these States. We found it only in Norfolk Creek at Norfolk Junction and Elkhorn River at Ewing, at which places 20 specimens were obtained. All are young fish except 4 from Norfolk Creek. Head $3\frac{2}{3}$; depth 5; eye $4\frac{1}{2}$; snout $4\frac{1}{2}$. Dorsal XII to XIV-14; anal II, 7. Scales 8 or 9-59 to 61-10. Body rather long and slender; head long, snout long and pointed, not much decurved, the upper lip on level with orbit; premaxillaries not protractile; maxillary reaching vertical of pupil; lower jaw slightly included; interorbital width narrow, $1\frac{1}{3}$ in eye; gill membranes scarcely united; fins large; longest dorsal spines about $2\frac{1}{3}$ in head; soft dorsal higher, its rays less than 2 in head; dorsal fins close together; origin of spinous dorsal midway between tip of snout and origin of soft dorsal; anal large, as high as soft dorsal; pectoral long, $1\frac{1}{3}$ in head, nearly reaching tip of ventrals. Breast and nape naked; cheeks with a few small scales; opercles with larger and more numerous scales; ventral line of scales somewhat enlarged; lateral line complete. Colors in alcohol not essentially different from more eastern specimens; back with about 9 large irregular black or brownish-black blotches, surrounded by paler vermiculations; side with about 6 or 7 large dark or black blotches which are more or less confluent; under parts pale, without dark markings; upper parts of opercle and cheek dark; a dark line downward and another forward from the eye; base of spinous dorsal pale, then a broad dark band more or less made up of oblong spots on the membranes becoming gradually paler toward top of fin; soft dorsal and anal barred with brownish; other fins all plain; young with a small black spot at base of caudal. Length of longest specimen, 3 inches.

**124. Hypohomus cymatotænia** (Gilbert & Meek). Osage Fork, Marshfield, Mo.; Little Piney River, Arlington, Mo.; Marais River, Dixon, Mo. (Meek, 1891).

**125. Hypohomus nianguæ** (Gilbert & Meek). Niangua River, Marshfield, Mo. (Meek, 1891).

**126. Cottogaster uranidea** (Jordan & Gilbert). Little Piney River and Gasconade River, Arlington, Mo. (Meek, 1891).

**127. Diplesion blennioides** (Rafinesque). Wild Cat Creek, Manhattan, Kans. (Graham, 1885); Lock Fork, Mansfield, Mo.; Osage Fork, Marshfield, Mo.; Little Piney River at Newburg and Arlington, Mo.; Gasconade River, Arlington, Mo.; Marais River, Dixon, Mo.; Sac River, Springfield, Mo. (Meek, 1891).

**128. Boleosoma nigrum** Rafinesque. *Johnny Darter.* Platte River near Fort Kearney, Nebr. (as *Pœciliichthys mesæus* type, Cope, 1864 and 1865; this second reference is by error made to Fort Riley, Kans.); Tabo Creek, Lafayette County, Mo. (as *Pœciliichthys beani* type, Jordan, 1884); Hundred and Two River at Bedford, Iowa, and Maryville, Mo.; Blackwater Creek, Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo.; Grand River, Clinton, Mo.; Tabo Creek, Calhoun, Mo. (as *Boleosoma olmstedi maculatum*, Jordan & Meek, 1885); Kansas River (as *B. olmstedi maculatum*, Graham, 1885); Shunganunga Creek and Blacksmith Creek, Shawnee County, Kans. (as *B. olmstedi maculatum*, Gilbert, 1886); Big Creek, Texas County, Mo., and Bear Creek, Boone County, Mo. (as *B. olmstedi ozarcanum*, Call, 1887); Solomon River, Beloit, Kans.; north fork of Solomon River, Lenora, Kans.; Saline River, Wakeeney, Kans. (as *B. olmstedi*, Hay, 1887); Sappa Creek, Oberlin, Kans. (as *Etheostoma olmstedi maculatum*, Gilbert, 1889); Marais River, Dixon, Mo.; Niangua River, Marshfield, Mo.; Lock Fork, Mansfield, Mo. (Meek, 1891); South Platte River, Denver (Jordan, 1891); Big Sioux River at Sioux City and Sioux Falls; Silver Lake, Iowa, and Boyer River at Arion, Iowa (Meek, 1892); Platte and Elkhorn rivers at Fremont; State fish commission ponds at South Bend, Nebr.; Spirit and East Okoboji lakes; Floyd River at Lemars and Sioux City; Elkhorn River at Fremont (Meek, 1894); Dakota River at Jamestown (Woolman, 1896).

Much less common than *E. iowæ*. We found it only at the following places: Enemy and Rock creeks, Mitchell; Norfolk Creek, Norfolk Junction, and Elkhorn River, Ewing. The total number of specimens obtained is 66, the majority being from Norfolk Junction and Ewing. They do not differ appreciably from more eastern examples, as the following description of specimens from Rock Creek shows: Head 3¾; depth 6½; eye 4; snout 4. D. VIII or IX–11 to 13; A. I, 7 or 8. Scales 6–46 to 50–6 or 7. Body slender, fusiform; head short; snout blunt and decurved, the upper lip below level of lower edge of orbit; maxillaries protractile; gill membranes scarcely connected. Eyes high up, the interorbital width narrow, 1¼ in eye. Cheeks and breast naked; opercles with a few scales; nape mostly scaled; lateral line nearly straight and usually complete, an occasional scale, especially in posterior portion, without pore; ventral line with ordinary scales. Opercular spine well developed; no black humeral scale. Colors as in typical *nigrum*.

**129. Etheostoma zonale** (Cope). Big Sioux River at Sioux City (Meek, 1892).

**130. Etheostoma iowæ** Jordan & Meek. This is by far the most abundant and widely distributed darter in this region. It was found by us in the following localities: Crow Creek, Chamberlain; Enemy and Rock creeks, Mitchell; Emanuel and Choteau creeks, Springfield; Prairie Creek, Scotland; Creighton Creek, Niobrara; pond at Creighton; Minnechaduza Creek, Valentine; pond at Verdigris; Elkhorn River, Norfolk Junction; ponds at Long Pine, and in the State fish commission ponds at South Bend. At most of these places we found it to be abundant, the collections containing not fewer than 350 excellent specimens. It is also an abundant species in the Dakota River at Jamestown (Woolman, 1896). This species is preeminently an inhabitant of small lakes, ponds, isolated overflow pools along river courses, and of the slug-

gish, grassy creeks of the prairie region. Wherever we found a small pond or slowly flowing stream with plenty of aquatic vegetation and a more or less muddy bottom, there we found this little darter in large numbers. Similar ponds or streams in Texas yield *Boleichthys fusiformis*, while in such places in the lower Wabash Basin we find *Etheostoma chlorosoma*.

The following description is based primarily upon the specimens from Creighton: Head 3⅓; depth 5⅓; eye 5; snout 4⅔. D. VIII to X–9 to 11; A. II, 7; scales 6–53–7, the lateral line arched anteriorly, incomplete, developed on about 30 scales. Body rather long and slender, resembling *E. fusiforme*, anterior part of back elevated, the caudal peduncle long; head moderate, snout rather short, blunt and decurved; mouth small, nearly horizontal, the lower jaw included; maxillary reaching pupil; premaxillaries not protractile; gill membranes scarcely connected. Vertical fins high in male, lower in female; pectoral about as long as head; dorsals usually well separated; anal smaller than soft dorsal, the first spine the stronger. Scales strongly ctenoid; opercle usually pretty well scaled and some scales on cheek; there is, however, much variation in these characters; ventral line with ordinary scales; nape scaled, breast naked. Colors in life: male with 10 or 11 brick-red vertical bars, the first under the pectoral; these bars are somewhat irregular in position and extent, but they do not meet under the belly nor do they usually reach above the lateral line; interspaces between the red bars two or three times as wide and pale greenish; head and back rusty or grayish; a dark line downward from the eye and another forward to tip of snout; opercle and region in front of pectoral silvery; basal half or two-fifths of spinous dorsal dark green, above this a broad, bright-red band, then a narrow, pale-blue line, narrowly bordered above by paler; soft dorsal mottled with light rusty; caudal with about five ashy crossbars; pectorals and anal nearly plain; ventrals plain; female without any bright colors, the general color rusty greenish, the dorsals and caudal mottled or barred with olivaceous.

In alcohol these specimens show the following colors: Body light coffee-color, small brown spots arranged in somewhat obscure longitudinal series, plainest on back and caudal peduncle; side with about 10 or 11 irregular, dark cross blotches; back with 6 or 7 dark cross blotches; under parts pale; head dusted with dark; a dark line downward from the eye, another forward on upper jaw, meeting its fellow on snout. In the male, the spinous dorsal has at the base a broad brown band two-fifths height of fin, this followed by a pale strip of equal width, then a narrow dark strip, and the fin finally pale along the margin; in the female these stripes are broken up into dots; soft dorsal, caudal, anal, and pectorals barred or vermiculated with light brown; ventrals pale. The variations in the squamation and in the fin formulas are very great, and must be carefully considered in determining the relationships of this and kindred species.

First, as to the squamation. Twenty-one examples were carefully examined, and the number of scales in the lateral line varied from 50 to 58, there being 50 scales in 1, 51 in 2, 52 in 2, 53 in 5, 54 in 3, 55 in 3, and 58 in 5. The number of developed pores in the lateral line ranges from 17 to 31. The number of scales in a transverse series varies from 10 to 15, counting from front of soft dorsal to middle line of belly. Usually the cheeks and opercles are fairly well scaled; in some cases they are densely scaled, while in others there are but few scales on the opercle, and still fewer or even none on the cheek. These specimens, with imperfect squamation of cheeks and opercles, are the form described under the name *Etheostoma quappelle*, by Eigenmann & Eigenmann.

The formula for the dorsal fins was found to be VIII–9 in 5; VIII–10 in 1, IX–9 in 1, IX–10 in 3, IX–11 in 2, IX–12 in 1, X–10 in 4, X–11 in 2, and XI–11 in 1. In 25 specimens which we collected at South Bend and which we examined for Professor Meek, the formula was IX–10 in 9, X–11 in 5, X–10 in 4, IX–11 in 4, IX–9 in 2, and XI–10 in 1. In the single specimen upon which *E. quappelle* was based it is IX–9. The anal fin is usually II, 7, though occasionally it is II, 6, or II, 8. The specimens from Crow Creek near Chamberlain, 39 in number, differ somewhat from Creighton specimens in having the scales smaller, usually 55 to 58 in lateral line, fewer pores developed, and the cheeks and opercles more nearly naked. The largest specimens in our collections are from Creighton, Mitchell, and Niobrara and are 2¾ inches long.

131. **Etheostoma cœruleum spectabile** (Agassiz). Ellis, Ellis County, Kans. (as *Pœcilichthys cœruleus*, Gilbert, 1884); Kansas River (as *E. variatum*, Graham, 1885); Ellis, Kans. (as *E. variatum*, Gilbert, 1885 and Cragin, 1885*a*); Blackwater Creek, Brownsville, Saline County, Mo.; Flat Creek, Sedalia, Mo.; Grand River, Clinton, Mo.; Tabo Creek, Calhoun, Mo. (as *Etheostoma variatum spectabile*, Jordan & Meek, 1885); Bigler, Texas County, Mo. (Call, 1887); Little Piney River at Newburg and Arlington, Mo.; Big Piney River, Cabool, Mo.; Gasconade River, Arlington, Mo.; Lock Fork, Mansfield, Mo.; Osage Fork, Marshfield, Mo.; Jones Creek and Marais River, Dixon, Mo.; Niangua River, Marshfield, Mo.; Sac River, Springfield, Mo. (Meek, 1891). Whether all these references belong properly to the variety *spectabile* is doubtful; some of them may have been based upon typical *cœruleum* specimens. In the Ozark region of Missouri it is probable that only *spectabile* occurs.

132. **Etheostoma lepidum** (Baird & Girard). Shunganunga Creek, Topeka; spring near Maple Hill, Wabaunsee County, Kans.; Ellis, Kans. (Gilbert, 1886); north fork of Solomon River, Lenora, Kans.; Saline River, Wakeeney, Kans.; Smoky Hill River, Wallace, Kans. (Hay, 1887).

133. **Etheostoma punctulatum** (Agassiz). Jones Creek, Dixon, Mo.; Big Piney River, Cabool, Mo.; Osage Fork, Marshfield, Mo.; Lock Fork and Niangua River, Mansfield, Mo. (Meek, 1891).

134. **Etheostoma flabellare** Rafinesque. *Fan-tailed Darter.* Jones Creek and Marais River, Dixon, Mo.; Little Piney River, Mo.; Osage Fork, Marshfield, Mo.; Niangua River, Marshfield, Mo. (Meek, 1891).

135. **Boleichthys fusiformis** (Girard). Marais des Cygnes (as *Ethcostoma fusiforme*, Graham, 1885).

136. **Boleichthys exilis** Girard. Little Muddy River (as *Boleichthys exilis* type, Girard, 1859); Cannon Ball River (as *B. warreni* type, Girard, 1859).

137. **Microperca punctulata** Putnam. Jones Creek, Dixon, Mo. (Meek, 1891).

138. **Roccus chrysops** (Rafinesque). *White Perch.* Kansas River and Mill Creek, Kans. (Graham, 1885); Big Sioux River and Silver Lake, Iowa (Meek, 1892).

139. **Morone interrupta** Gill. *Yellow Bass.* The only record of the occurrence of this fish in the Missouri Basin is that given by Cragin (1885*a*), who reports it from the Kansas River (presumably at Lawrence) on the authority of Prof. Frank H. Snow, of the Kansas State University.

140. **Aplodinotus grunniens** Rafinesque. *Fresh-water Drum.* Milk River (as *Amblodon grunniens*, Suckley, 1860); Missouri River, St. Joseph, Mo.; Grand River, Clinton, Mo.; Tabo Creek, Calhoun, Mo. (Jordan & Meek, 1885); Kansas River (Graham, 1885, and Cragin, 1885*a*); Big Sioux River at Sioux City (Meek, 1892); Elkhorn River at Fremont (Meek, 1894).

141. **Cottus bairdi** Girard. *Blob*; *Molly-crawl-abottom.* "All streams of the Ozark region" (as *Uranidea richardsoni*, Call, 1887); Big Piney River, Cabool, Mo.; Little Piney River at Newburg and Arlington, Mo.; Osage Fork, Marshfield, Mo.; Lock Fork, Mansfield, Mo.; Jones Creek and Marais River, Dixon, Mo.; Niangua River, Marshfield, Mo.; Sac River, Springfield, Mo. (Meek, 1891).

**142. Cottus bairdi punctulatus** (Gill). *Rocky Mountain Blob.* Between Bridger Pass and Fort Bridger (as *Potamocottus punctulatus* type, Gill, 1862); Gallatin Fork of the Missouri River (as *Uranidea punctulata*, Cope, 1872); Gibbon and Madison rivers and Canyon Creek, Yellowstone National Park (Jordan, 1891*a*); Beaverhead River, Dillon, Mont.; Red Rock River, Red Rock, Mont.; Canyon Creek, Yellowstone Park; junction of Firehole and Gibbon rivers (Evermann, 1892); Missouri River, Craig, Mont. (Eigenmann, 1894).

**143. Lota lota maculosa** (Le Sueur). *Ling*; *Lawyer.* Battle Creek, S. Dak. (as *L. maculosa*, Cope, 1879); Missouri River at Wyandotte, Kans. (Cragin, 1885*a*); Missouri River at Leavenworth (Gilbert, 1887); Red Rock River, Red Rock, Mont. (Evermann, 1892); Cheyenne River at Cheyenne Falls, S. Dak. (Evermann, 1893); Missouri River, Craig, Mont. (Eigenmann, 1894). One specimen of the ling, 13 inches long, was taken in the south fork of the Cheyenne at Cheyenne Falls, S. Dak. Like all the fishes found in Cheyenne River this is greatly bleached and is much paler than specimens from the Great Lakes.

## NOMINAL SPECIES DESCRIBED FROM MISSOURI BASIN LOCALITIES.

The total number of nominal species and subspecies which have been described from Missouri Basin localities is 74, representing 52 species as now recognized, and all but 28 of these 52 species had been previously described from localities not in the Missouri Basin.

| Nominal species | Date. | Identification. | Type locality. |
|---|---|---|---|
| Acipenser copei Duméril | 1870 | Acipenser rubicundus | Upper Missouri. |
| Acipenser rauchi Duméril | 1870 | do | Osage River, Missouri. |
| Acipenser anasimus Duméril | 1870 | do | Missouri River. |
| Lepidosteus otarius Cope | 1865 | Lepisosteus osseus | Kansas River near Fort Riley, Kans. |
| Pimelodus olivaceus Girard | 1858 | Ictalurus punctatus | Fort Pierre, Milk and Yellowstone rivers, and Nebraska. |
| Pimelodus hammondii Abbott | 1860 | do | Fort Riley, Kans. |
| Pimelodus notatus Abbott | 1860 | do | Do. |
| Ictalurus simpsonii Gill | 1862 | do | Big Sandy River of Kansas (Platte River). |
| Amiurus obesus Gill | 1862 | Ameiurus melas | Nebraska. |
| Noturus occidentalis Gill | 1862 | Noturus flavus | Platte River. |
| Carpiodes bison Agassiz | 1855 | Carpiodes carpio | Osage River, Missouri. |
| Carpiodes damalis Girard | 1856 | Carpiodes velifer | Milk River. |
| Carpiodes grayi Cope | 1870 | do | "Probably from one of the Western States." |
| Pantosteus jordani Evermann | 1893 | Pantosteus jordani | Red Rock and Beaverhead rivers, Montana. |
| Catostomus (Acomus) griseus Girard. | 1856 | Catostomus griseus | Milk River. |
| Catostomus (Acomus) lactarius Girard. | 1856 | do | Do. |
| Catostomus retropinnis Jordan | 1878 | do | Milk River, Montana. |
| Catostomus sucklii Girard | 1856 | Catostomus commersonii | Upper Missouri River and tributaries. |
| Catostomus chloropteron Abbott | 1860 | do | Kansas. |
| Ptychostomus hayden Girard | 1856 | Minytrema melanops | Missouri River at Fort Pierre and Yellowstone River. |
| Ptychostomus bucco Cope | 1871 | Moxostoma bucco | St. Joseph, Mo. |
| Campostoma hippops Cope | 1864 | Carupostoma anomalum | Platte River at Fort Kearney. |
| Chrosomus dakotensis Evermann & Cox. | 1896 | Chrosomus dakotensis | Crow Creek, Chamberlain, S. Dak. |
| Hybognathus evansi Girard | 1856 | Hybognathus nuchale evansi. | Missouri River at Fort Pierre. |
| Hybognathus argyritus Girard | 1856 | Hybognathus argyrite | Milk River. |
| Pimephales fasciatus Girard | 1856 | Pimephales promelas | Yellowstone River. |
| Coliscus parietalis Cope | 1871 | do | Missouri River at St. Joseph, Mo. |
| Semotilus macrocephalus Girard | 1836 | Semotilus atromaculatus | Fort Pierre. |
| Semotilus speciosus Girard | 1856 | do | Sweetwater River. |
| Semotilus hammondii Abbott | 1856 | do | Kansas River near Fort Riley. |
| Phoxinus milnerianus Cope | 1879 | Leuciscus milnerianus | Probably Battle Creek, S. Dak. |
| Cliola smithii Evermann & Cox. | 1896 | Cliola smithii | Prairie Creek, Scotland, S. Dak. |

| Nominal species. | Date. | Identification. | Type locality. |
|---|---|---|---|
| Notropis germanus Hay | 1887 | Notropis heterodon | Smoky Hill River, Wallace, Kans. |
| Hybopsis missuriensis Cope | 1874 | Notropis blennius | Missouri River at St. Joseph. |
| Alburnus lineolatus Agassiz | 1863 | Not identifiable; may be Notropis scylla. | Osage River, Missouri. |
| Hybopsis scylla Cope | 1871 | Notropis scylla | Red Cloud Creek, a tributary of North Platte River. |
| Cliola chlora Jordan | 1878 | do | Upper Missouri region. |
| Cliola (Hybopsis) topeka Gilbert. | 1884 | Notropis topeka | Shunganunga Creek, Topeka, Kans. |
| Notropis æneolus Hay | 1887 | do | Saline River, Wakeeney, Kans. |
| Photogenis piptolepis Cope | 1871 | Notropis piptolepis | Red Cloud Creek, a tributary of North Platte River. |
| Cyprinella billingsiana Cope | 1871 | Notropis lutrensis | St. Joseph, Mo. |
| Moniana jugalis Cope | 1871 | do | Do. |
| Notropis umbrifer Hay | 1887 | Notropis macrostomus | Solomon River, Beloit, Kans. |
| Alburnus notatus Agassiz | 1863 | Notropis notatus | Osage River, Missouri. |
| Plargyrus bowmani Girard | 1856 | Notropis cornutus | Sweetwater River. |
| Alburnus oligaspis Cope | 1864 | Notropis dilectus | Kansas. |
| Alburnellus percobromus Cope | 1871 | Notropis rubrifrons | St. Joseph, Mo. |
| Minnilus (Lythrurus) nigripinnis Gilbert. | 1884 | Notropis umbratilis umbratilis. | Shunganunga Creek, Topeka. |
| Sarcidium scopifer Cope | 1871 | Phenacobius scopifer | Missouri River, St. Joseph, Mo. |
| Argyreus dulcis Girard | 1856 | Rhinichthys cataractæ dulcis. | Sweetwater River. |
| Rhinichthys maxillosus Cope | 1864 | do | Kansas. |
| Rhinichthys ocella Garman | 1881 | do | Northeastern Wyoming and Montana. |
| Gobio gelidus Girard | 1856 | Hybopsis gelidus | Milk River. |
| Hybopsis meeki Jordan & Evermann. | 1890 | Hybopsis meeki | Missouri River at St. Joseph. |
| Hybopsis *montanus* Meek | 1884 | Hybopsis montanus | Upper Missouri region. |
| Nocomis nebraccnsis Girard | 1856 | Hybopsis kentuckiensis | Sweetwater River. |
| Leucosomus dissimilis Girard | 1856 | Couesius dissimilis | Milk and Little Muddy rivers. |
| Pogonichthys communis Girard. | 1856 | Platygobio gracilis | Fort Pierre; Fort Union; above Fort Union; Milk River; Yellowstone River; Sweetwater River. |
| Pogonichthys (Platygobio) gulonellus Cope. | 1865 | do | Near Bridger Pass. |
| Coregonus williamsoni cismontanus Jordan. | 1891 | Coregonus williamsoni cismontanus. | Madison, Yellowstone, and Gardiner rivers, and Horsethief Springs, Montana. |
| Salar lewisi Girard | 1858 | Salmo mykiss lewisi | Falls of Missouri River. |
| Salmo pleuriticus Cope | 1872 | do | Yellowstone River; Yellowstone Creek, Gallatin Fork, and Yellowstone Lake. |
| Salmo (Salar) stomias Cope | 1871 | Salmo mykiss stomias | Kansas River near Fort Riley. |
| Thymallus *montanus* Milner | 1874 | Thymallus ontariensis montanus. | Tributary of Missouri River at Camp Baker, Montana. |
| Zygonectes lineatus Garman | 1881 | Fundulus lineatus | Northeastern Wyoming. |
| Zygonectes macdonaldi Meek | 1891 | Fundulus macdonaldi | Jones Creek, Dixon, Mo.; Osage River, Mansfield, Mo. |
| Fundulus floripinnis Cope | 1874 | Fundulus floripinnis | South Platte River at Denver. |
| Fundulus sciadicus Cope | 1865 | Fundulus sciadicus | "Nebraska or Platte River." |
| Percopsis hammondii Gill | 1864 | Percopsis guttatus | Kansas. |
| Pœcilichthys mosæus Cope | 1864 | Boleosoma nigrum | Platte River near Fort Kearney, Nebr. |
| Pœcilichthys beani Jordan | 1884 | do | Tabo Creek, Lafayette County, Mo. |
| Boleichthys exilis Girard | 1859 | Boleichthys exilis | Little Muddy River. |
| Boleichthys warreni Girard | 1859 | do | Cannon Ball River. |
| Potamocottus punctulatus Gill. | 1862 | Cottus bairdi punctulatus. | Between Bridger Pass and Fort Bridger. |

## DISTRIBUTION OF SPECIES BY STATES.

The following table shows the distribution by States of the fishes of the Missouri Basin:

| No. | Families and species. | Missouri. | Iowa. | Kansas. | Nebraska. | South Dakota. | North Dakota. | Montana. | Wyoming. | Colorado. |
|---|---|---|---|---|---|---|---|---|---|---|
| | PETROMYZONIDÆ. | | | | | | | | | |
| 1 | Ichthyomyzon concolor | | | × | | × | | | | |
| 2 | Ichthyomyzon castaneus | | | × | | | | | | |
| 3 | Lampetra wilderi | | | | | | | | | |
| | POLYODONTIDÆ. | | | | | | | | | |
| 4 | Polyodon spathula | | × | × | × | | | × | | |
| | ACIPENSERIDÆ. | | | | | | | | | |
| 5 | Acipenser rubicundus | × | × | × | × | × | | | | |
| 6 | Scaphirhynchus platorynchus | × | × | × | × | | × | × | × | |
| | LEPISOSTEIDÆ. | | | | | | | | | |
| 7 | Lepisosteus osseus | × | × | × | | × | | | | |
| 8 | Lepisosteus platostomus | | | × | | × | | | | |
| | AMIIDÆ. | | | | | | | | | |
| 9 | Amia calva | | | × | | | | | | |
| | SILURIDÆ. | | | | | | | | | |
| 10 | Ictalurus furcatus | × | | × | | | | | | |
| 11 | Ictalurus punctatus | × | × | × | × | × | | × | × | |
| 12 | Ameiurus natalis | × | | × | | | × | | | |
| 13 | Ameiurus nebulosus | × | | × | | | × | | | |
| 14 | Ameiurus melas | × | × | × | × | × | × | | | |
| 15 | Leptops olivaris | × | | × | | × | | | | |
| 16 | Noturus flavus | × | × | × | × | × | | × | × | |
| 17 | Schilbeodes gyrinus | | × | | × | × | | | | |
| 18 | Schilbeodes exilis | × | | × | | | | | | |
| 19 | Schilbeodes miurus | | | × | | | | | | |
| | CATOSTOMIDÆ. | | | | | | | | | |
| 20 | Ictiobus cyprinella | × | | × | × | | | | | |
| 21 | Ictiobus urus | × | | × | | | | | | |
| 22 | Ictiobus bubalus | × | × | × | | × | | | | |
| 23 | Carpiodes carpio | × | | × | × | × | | | | |
| 24 | Carpiodes velifer | × | × | × | × | | | × | | |
| 25 | Cycleptus elongatus | | | × | | | | | | |
| 26 | Pantosteus jordani | | | | × | × | | × | × | |
| 27 | Catostomus griseus | | | | × | | | × | × | × |
| 28 | Catostomus catostomus | | | | | | | | × | |
| 29 | Catostomus commersonii | × | × | × | × | × | × | × | × | |
| 30 | Catostomus nigricans | × | | × | | | | | | |
| 31 | Erimyzon sucetta oblongus | | | × | | | | | | |
| 32 | Minytrema melanops | | | × | × | | | × | | |
| 33 | Moxostoma bucco | × | | | | | | | | |
| 34 | Moxostoma aureolum | × | × | × | × | × | × | × | × | |
| 35 | Placopharynx duquesnii | | × | | | | | | | |
| | CYPRINIDÆ. | | | | | | | | | |
| 36 | Campostoma anomalum | × | × | × | × | × | × | | × | |
| 37 | Chrosomus erythrogaster | × | | × | | | | | | |
| 38 | Chrosomus dakotensis | | | | × | × | | | | |
| 39 | Hybognathus nuchale | × | × | × | × | | × | | | |
| 40 | Hybognathus nuchale evansi | | | × | × | × | | × | × | |
| 41 | Hybognathus argyrite | | | | | | | × | | |
| 42 | Hybognathus nubilum | × | × | | × | × | | | × | |
| 43 | Pimephales promelas | × | × | × | × | × | × | × | | |
| 44 | Pimephales notatus | × | × | × | × | | × | | | |
| 45 | Semotilus atromaculatus | × | × | × | × | × | × | | × | |
| 46 | Leuciscus elongatus | | | × | | | | | | |
| 47 | Leuciscus neogæus | | | | | × | | | | |
| 48 | Leuciscus milnerianus | | | | | × | | | | |

*Distribution of the Fishes of the Missouri Basin*—Continued.

| No. | Families and species. | Missouri. | Iowa. | Kansas. | Nebraska. | South Dakota. | North Dakota. | Montana. | Wyoming. | Colorado. |
|---|---|---|---|---|---|---|---|---|---|---|
| | CYPRINIDÆ—continued. | | | | | | | | | |
| 49 | Abramis crysoleucas | × | × | × | × | | | | | |
| 50 | Cliola vigilax | × | × | | × | | | | | |
| 51 | Cliola smithi | | | | × | × | | | | |
| 52 | Notropis cayuga | × | × | | × | × | × | | | |
| 53 | Notropis heterodon | | × | × | | | | | | |
| 54 | Notropis blennius | × | × | × | × | × | × | | × | |
| 55 | Notropis scylla | × | | × | × | | | × | | |
| 56 | Notropis topeka | | × | × | × | × | | | | |
| 57 | Notropis gilberti | × | × | | × | | | | | × |
| 58 | Notropis piptolepis | | | | × | | | | | |
| 59 | Notropis shumardi | × | | | | | | | | |
| 60 | Notropis hudsonius | | × | × | | × | | | | |
| 61 | Notropis lutrensis | × | × | × | × | × | | | × | × |
| 62 | Notropis macrostomus | | | × | | | | | | |
| 63 | Notropis notatus | × | | | | | | | | |
| 64 | Notropis whipplii | × | × | | | | | | | |
| 65 | Notropis cornutus | × | × | × | × | × | × | | × | × |
| 66 | Notropis zonatus | × | | | | | | | | |
| 67 | Notropis jejunus | | | × | × | | | | × | |
| 68 | Notropis atherinoides | | × | | | | | × | | |
| 69 | Notropis dilectus | × | × | × | × | × | | | | |
| 70 | Notropis rubrifrons | × | | × | | | | | | |
| 71 | Notropis umbratilis umbratilis | × | × | × | | | | | | |
| 72 | Phenacobius mirabilis | × | × | × | × | × | | | | |
| 73 | Phenacobius scopifer | × | | | | | | | | |
| 74 | Rhinichthys cataractæ dulcis | | | × | × | × | × | × | × | × |
| 75 | Rhinichthys atronasus | | | | | × | | | | |
| 76 | Hybopsis æstivalis | | | | × | | | | | |
| 77 | Hybopsis hyostomus | | | | × | | | | | |
| 78 | Hybopsis gelidus | | | | × | × | | × | × | |
| 79 | Hybopsis meeki | × | × | | | | | | | |
| 80 | Hybopsis montanus | | | | | | | × | | |
| 81 | Hybopsis dissimilis | × | | | | | | | | |
| 82 | Hybopsis storerianus | × | | × | × | | | | | |
| 83 | Hybopsis kentuckiensis | × | × | × | × | | × | | × | |
| 84 | Couesius dissimilis | | | | × | × | | × | × | |
| 85 | Platygobio gracilis | × | | × | × | × | × | × | × | |
| | ANGUILLIDÆ. | | | | | | | | | |
| 86 | Anguilla chrysypa | | | × | | | | | | |
| | HIODONTIDÆ. | | | | | | | | | |
| 87 | Hiodon alosoides | × | × | × | × | × | | × | × | |
| 88 | Hiodon tergisus | | | × | | × | | | | |
| | CLUPEIDÆ. | | | | | | | | | |
| 89 | Dorosoma cepedianum | × | × | × | × | | | | | |
| 90 | Pomolobus chrysochloris | | | × | | | | | | |
| | SALMONIDÆ. | | | | | | | | | |
| 91 | Coregonus williamsoni cismontanus | | | | | | | × | × | |
| 92 | Salmo mykiss lewisi | | | | | | | × | × | |
| 93 | Salmo mykiss stomias | | | ×? | | | | | | × |
| | THYMALLIDÆ. | | | | | | | | | |
| 94 | Thymallus ontariensis montanus | | | | | | | × | | |
| | LUCIDÆ. | | | | | | | | | |
| 95 | Lucius lucius | | × | | × | | × | × | | |
| | PŒCILIIDÆ. | | | | | | | | | |
| 96 | Fundulus diaphanus | | | × | | | | | | |
| 97 | Fundulus zebrinus | | × | × | | | | | | |
| 98 | Fundulus catenatus | × | | | | | | | | |
| 99 | Fundulus lineatus | | | | | | | | × | |
| 100 | Fundulus macdonaldi | × | | | | | | | | |
| 101 | Fundulus floripinnis | | | | | | | | | × |
| 102 | Fundulus soladicus | | × | | × | × | | | | |

*Distribution of the Fishes of the Missouri Basin*—Continued.

| No. | Families and species. | Missouri. | Iowa. | Kansas. | Nebraska. | South Dakota. | North Dakota. | Montana. | Wyoming. | Colorado. |
|---|---|---|---|---|---|---|---|---|---|---|
| | GASTEROSTEIDÆ. | | | | | | | | | |
| 103 | Eucalia inconstans | | | | × | × | | × | | |
| | PERCOPSIDÆ. | | | | | | | | | |
| 104 | Percopsis guttatus | | × | × | | | | | | |
| | ATHERINIDÆ. | | | | | | | | | |
| 105 | Labidesthes sicculus | × | | | | | | | | |
| | CENTRARCHIDÆ. | | | | | | | | | |
| 106 | Pomoxis annularis | × | | × | | | | | | |
| 107 | Pomoxis sparoides | | × | × | | | | | | |
| 108 | Ambloplites rupestris | | × | × | | × | | | | |
| 109 | Chænobryttus gulosus | | | × | | | | | | |
| 110 | Apomotis cyanellus | × | × | × | × | × | | | | |
| 111 | Lepomis megalotis | × | × | | | | | | | |
| 112 | Lepomis humilis | × | × | × | × | × | | | | |
| 113 | Lepomis macrochirus | × | | | | | | | | |
| 114 | Lepomis pallidus | × | × | | | | | | | |
| 115 | Eupomotis gibbosus | | × | | | | | | | |
| 116 | Micropterus dolomieu | × | × | × | | | | | | |
| 117 | Micropterus salmoides | × | × | × | × | | | | | |
| | PERCIDÆ. | | | | | | | | | |
| 118 | Stizostedion vitreum | | × | × | × | × | | | | |
| 119 | Stizostedion canadense boreum | × | × | × | × | × | | × | | |
| 120 | Perca flavescens | | × | | | × | × | | | |
| 121 | Percina caprodes | × | | × | | | | | | |
| 122 | Hadropterus phoxocephalus | × | | × | | | | | | |
| 123 | Hadropterus aspro | × | × | × | × | | × | | | |
| 124 | Hypohomus cymatotænia | × | | | | | | | | |
| 125 | Hypohomus nianguæ | × | | | | | | | | |
| 126 | Cottogaster uranidea | × | | | | | | | | |
| 127 | Diplesion blennioides | × | | × | | | | | | |
| 128 | Boleosoma nigrum | × | × | × | × | × | × | | | × |
| 129 | Etheostoma zonale | | × | | | | | | | |
| 130 | Etheostoma iowæ | | | | × | × | × | | | |
| 131 | Etheostoma cœruleum spectabile | × | | × | | | | | | |
| 132 | Etheostoma lepidum | | | × | | | | | | |
| 133 | Etheostoma punctulatum | × | | | | | | | | |
| 134 | Etheostoma flabellare | × | | | | | | | | |
| 135 | Boleichthys fusiformis | | | × | | | | | | |
| 136 | Boleichthys exilis | | | | | | × | | | |
| 137 | Microperca punctulata | × | | | | | | | | |
| | SERRANIDÆ. | | | | | | | | | |
| 138 | Roccus chrysops | | × | × | | | | | | |
| 139 | Morone interrupta | | | × | | | | | | |
| | SCIÆNIDÆ. | | | | | | | | | |
| 140 | Aplodinotus grunniens | × | × | × | × | | | × | | |
| | COTTIDÆ. | | | | | | | | | |
| 141 | Cottus bairdi | × | | | | | | | | |
| 142 | Cottus bairdi punctulatus | | | | | | | × | × | |
| | GADIDÆ. | | | | | | | | | |
| 143 | Lota lota maculosa | | | × | | × | | × | | |
| | Total | 77 | 59 | 86 | 50 | 49 | 23 | 30 | 26 | 8 |

## RECOMMENDATIONS REGARDING THE FOOD-FISHES OF THE MISSOURI BASIN.

Of the 143 species of fishes known from the Missouri Basin at least 42 may be regarded as food-fishes of more or less importance. They are the following:

| | | |
|---|---|---|
| Common Sturgeon. | Common Redhorse. | Warmouth Bass. |
| Chuckle-head Cat. | Big-jawed Sucker. | Green Sunfish. |
| Channel Cat. | Creek Chub. | Long-eared Sunfish. |
| Common Bullhead. | River Chub. | Red-spotted Sunfish. |
| Black Bullhead. | Toothed Herring. | Blue-gill. |
| Mud Cat. | Moon-eye. | Common Sunfish. |
| Yellow Cat. | Rocky Mountain Whitefish. | Large-mouth Black Bass. |
| Common Buffalo-fish. | Yellowstone Trout. | Small-mouth Black Bass. |
| Small-mouth Buffalo. | Platte River Trout. | Wall-eyed Pike. |
| Carp Sucker. | Montana Grayling. | Sauger. |
| Gourd-seed Sucker. | Northern Pickerel. | Yellow Perch. |
| Milk River Sucker. | Crappie. | White Perch. |
| Long-nosed Sucker. | Calico Bass. | Freshwater Drum. |
| Common White Sucker. | Rock Bass | Ling. |

To these may be added the following species which have been introduced into the waters of the Yellowstone National Park by the United States Fish Commission:

| | | |
|---|---|---|
| Rainbow Trout. | Von Behr Trout. | Eastern Brook Trout. |

These three species and perhaps others, including the carp, have been introduced by several of the State fish commissions and by the United States Fish Commission in various places in these States.

The trout, whitefish, and grayling are, of course, primarily game fishes, and are of interest chiefly to the angler. Their abundance in the upper waters of this basin attracts annually a large number of anglers to that region. The supply, though yet large, is diminishing. There is no reason, however, why the supply of these species can not be greatly increased in the waters in which they are already found and plants may very properly be made in a number of suitable streams in which they are not indigenous; but the pond and river fishes are the species whose cultivation will result in the greatest good to the Missouri River States.

The six species of catfishes named above are all well suited to the lower and middle portions of the Missouri Basin. The same is true of the suckers and the spiny-rayed fishes. Nearly all of these species are found in abundance in the ponds and bayous along the Mississippi in Illinois, where the Commission has for several years been collecting them for distribution to various suitable waters.

No better work can be done than to make liberal shipments of buffalo, suckers, catfish, bullheads, black bass, sunfish, crappies, etc., to the suitable waters in western Iowa, Kansas, Nebraska, South Dakota, and Wyoming. The suckers, buffalo, and large catfish should be put in the streams; the bullheads, sunfishes, bass, crappies, etc., will do well in the numerous ponds and small lakes.