

9.—A REPORT UPON THE FISHES OF SOUTHWESTERN MINNESOTA.

BY ULYSSES O. COX.

During the past five years the writer has been making collections of the fishes from the various streams and lakes in the southwestern part of Minnesota, especially from the Minnesota and Blue Earth rivers and their tributaries. In June, 1894, at the suggestion of the United States Commissioner of Fish and Fisheries, several additional lakes and streams were visited for the express purpose of learning as much as possible concerning the run of the buffaloes and suckers, about which so much has been said by various persons in this region.

All of that portion of the State where these investigations were made lies in the region of glacial drift, and, with the exception of limited areas around Mankato, where limestone and sandstone outcrop, and at Ortonville and a few other places along the Upper Minnesota River, where granite outcrops, the entire surface is covered with drift matter.

A large area near Mankato is wooded, and this wooded area extends in a greater or less degree on the east to the State line, while west from Mankato it is but a few miles to the eastern border of the Great Plains.

The fishes here listed were taken from Minnesota River and its tributaries or Des Moines River and its tributaries, but most of them are from the former. It is thought desirable to include in the list those fishes which were collected by Prof. A. J. Woolman and the writer from Upper Minnesota River and Big Stone Lake in July, 1892, and which have been listed by Mr. Woolman in the Report of the United States Fish Commission for 1893 pages 343 to 373.

The following is a classified list of the waters from which the fishes here listed were taken:

Minnesota system.

Little Minnesota River at Browns Valley.
Big Stone Lake at Browns Valley and Ortonville.
Minnesota River at Ortonville, Appleton, Montevideo, and Mankato.
Pomme de Terre River at Appleton.
Chippewa River at Montevideo.
Blue Earth River at Mankato.
Minneopa Creek near Mankato.

Minnesota system—Continued.

Lake Washington near Mankato.
Lake George near Mankato.

Des Moines system.

Des Moines River at Windom.
Wood Lake at Windom.
East and West Okabena Lake at Worthington.
Heron Lake at Heron Lake.
Round Lake near Worthington.

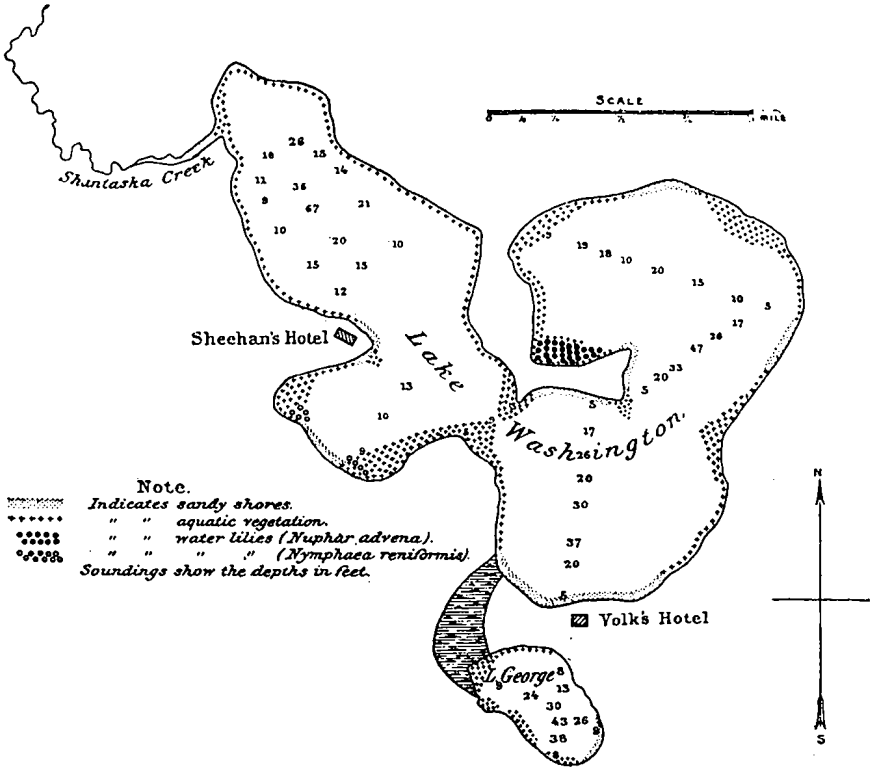
Minnesota River rises in Roberts County, S. Dak., where it is known as the Little Minnesota. It flows southeast and empties into the head of Big Stone Lake, where, at its mouth, it is nothing more than a small creek. Throughout its entire length its course is tortuous, its current sluggish, and its bottom muddy. Big Stone Lake is nothing more than the remains of an ancient glacial river bed. It varies in width from a mile to $1\frac{1}{2}$ miles and is about 40 miles in length, its greatest extent being from northwest to southeast. It is shallow everywhere, the greatest depth not supposed to exceed 20 feet, and the average less than 10. Lying in the prairie region, there is no timber except a narrow belt along its shores, and even this has been nearly all removed by the settlers in the vicinity. At the southern end of Big Stone Lake the Minnesota River again emerges, not any larger than when it entered. It still has a muddy bottom and takes a very winding course. It continues to flow southeast until it reaches Mankato, in Blue Earth County, where it changes its course to due north and finally northeast, until it empties into the Mississippi near St. Paul. At Mankato it has a bed about 525 feet wide, which it fills during high water, but during the greater part of the year the stream is not more than 40 feet wide and $1\frac{1}{2}$ feet deep on an average. The current is not swift, averaging during low water $1\frac{1}{4}$ feet per second and at high water seldom gains a velocity exceeding 3 feet per second. The river bottom at Mankato is sandy and gravelly, as might be judged from the banks, which are in many places made up of sand and gravel. Except when the water is disturbed by rains it is clear, comparatively free from aquatic vegetation, and quite pure above the city of Mankato. Below the city it is very much contaminated by sewage, where, during low water, very few of the higher forms of aquatic animals are found.

Minnesota River has but two northern tributaries of any importance, Pomme de Terre and Chippewa rivers. From the south it receives Lac qui Parle, Yellow Medicine, Redwood, Cottonwood, and Blue Earth rivers, the latter emptying into the Minnesota near where the Minnesota makes the bend in Blue Earth County. Blue Earth River, which rises in northern Iowa, is the largest tributary of the Minnesota. At Mankato it has a bed which is 200 feet in width, but the stream during the dry season narrows down to a mere brook not more than 10 feet in width on the ripples and having a depth of 6 inches or less. Notwithstanding, there are holes in which fish can live the entire year, and at the proper season bass and pike fishing is excellent at various places.

The bottom is generally sandy or gravelly, and in a few places it is covered with bowlders. The water is pure but warm.

Minneopa Creek is a very small brook which enters the Minnesota River from the south, 4 miles above Mankato. At certain seasons it becomes almost dry, but at one place there is a large hole and a waterfall, when the stream is running, and in this there are some fishes. Those referred to below were taken near the falls, known as Minneopa Falls,

Lake Washington lies in the southern part of Lesueur County, about 12 miles northeast from Mankato, and contains in the neighborhood of 1,100 acres. It has an outlet on the northwest which is known as Shantaska Creek, and which flows into Minnesota River near St. Peter. By reference to the map it will be seen that the shores of this lake are somewhat irregular and that in places the water is quite deep as compared with similar lakes of the region. In a bay on the west there are sedges and lily pads (*Nymphaea reniformis*), several species of



Map of Lakes Washington and George, LeSueur County, Minnesota.

Potamogeton, algæ, and various other aquatic plants, and these are densely populated with the lower forms of animal life commonly found in such places. In the northern part of the eastern point there is also much vegetation, but no lily pads, and at many places along the shore sedges grow. This lake has long been noted for its commercial fishing, and is at present one of the best fishing-points in this part of the State. The fishes commonly taken are the pickerel, wall-eyed pike, large-mouthed black bass, rock bass, and crappie. The pickerel and the wall-eyed pike are most abundant,

Lake George, which lies a few hundred yards to the south of Lake Washington, is not one-fourth the size of the latter, is almost circular, and does not have such deep water, the deepest sounding showing 43 feet. Along its southern, western, and northern shores there is an abundance of aquatic vegetation, water lilies being found in the southern and northwestern portions. At the northwestern shore there is a marsh, which represents the former outlet of the lake and which leads into Lake Washington. The shores of the lake are wooded. Black bass and crappies are very common in this lake.

The following is a list of the fishes which have been taken from the Minnesota River and its tributaries:

FISHES FROM THE MINNESOTA RIVER AND ITS TRIBUTARIES.

1. *Ichthyomyzon castaneus* Girard. *Lamprey*. One specimen was taken from Minnesota River at Mankato in 1892, and so far this is the only one that has been recorded.
2. *Polyodon spathula* (Walbaum). *Paddle-fish*; *Spoon-bill*; *Duck-billed Cat*. Several specimens have been taken from Minnesota River at Mankato in the springtime, generally about June 1.
3. *Scaphirhynchus platorhynchus* (Rafinesque). *Shovel-nosed Sturgeon*; *White Sturgeon*. Several specimens have been taken from Minnesota River at Mankato, generally in springtime.
4. *Lepisosteus osseus* (Linnaeus). *Common Gar-Pike*; *Long-nosed Gar*; *Billyfish*. Specimens have been taken from Lake Washington, near Mankato, where they are very numerous, but they are reported by fishermen from nearly all the lakes and streams of the region.
5. *Ameiopsis calva* Linnaeus. *Mudfish*; *Dogfish*; *Bowfin*; *Lawyer*. Two specimens were taken from LeSueur River near Mankato; it is reported common in Lake Washington.
6. *Ictalurus punctatus* (Rafinesque). *Channel Cat*; *Silver Cat*. Mr. Cram reports this fish very common in Minnesota River near Mankato in the spring.
7. *Ameiurus nebulosus* (LeSueur). *Common Bullhead*; *Horned Pout*. Three specimens were taken in Blue Earth River at Mankato in 1891. It seems to be rare.
8. *Ameiurus melas* (Rafinesque). * Big Stone Lake, common; * Chippewa River at Montevideo; ponds near Minnesota River at Mankato; Blue Earth River at Mankato, very common; Minneopa Creek near Mankato, common; Lake Washington.
9. *Noturus flavus* Rafinesque. *Stone Cat*. Blue Earth River at Mankato, not common.
10. *Schilbeodes gyrynus* (Mitchill). * Pomme de Terre River at Appleton.
11. *Schilbeodes exilis* (Nelson). Blue Earth River at Mankato, one specimen; not common.
12. *Ictiobus cyprinella* (Cuvier & Valenciennes). The large buffalo referred to further on is supposed to be this species. If correct, it is common in Big Stone Lake and Lake Washington.
13. *Ictiobus bubalus* (Rafinesque). *Sucker-mouthed Buffalo*; *Small-mouthed Buffalo*. A number of small specimens were taken from the Minnesota River at Mankato.

*All data starred were taken from Prof. A. J. Woolman's paper, Report of the United States Fish Commission for 1893 (1896), pages 343-373.

14. *Carpiodes difformis* Cope. Several specimens taken from Blue Earth River at Mankato.
15. *Carpiodes velifer* (Rafinesque). * Big Stone Lake; Minnesota and Blue Earth rivers at Mankato.
16. *Catostomus commersoni* (Lacépède). *Common Sucker; Black Sucker*. * Little Minnesota River at Browns Valley; Minnesota and Blue Earth rivers at Mankato; Lake Washington. Common at all these places.
17. *Catostomus nigricans* LeSueur. *Hog Sucker; Stone-roller; Hog Mullet*. Minnesota River at Mankato, not common; very common in Blue Earth River at the same place. In 1891 the writer saw a large school of several hundred large ones near the mouth of this river.
18. *Moxostoma aureolum* (LeSueur). *Redhorse; Mullet; Large-scaled Sucker*. Minnesota and Blue Earth Rivers at Mankato, common. Frequently taken by hook and line in springtime.
19. *Campostoma anomalum* (Rafinesque). *Stone-roller; Stone-lugger*; Minnesota and Blue Earth rivers at Mankato, very common.
20. *Hybognathus nuchale* Agassiz. *Silvery Minnow*. Ponds near Minnesota River at Mankato; Minneopa Creek; Blue Earth River at Mankato.
21. *Pimephales promelas* Rafinesque. *Flat-head; Black-headed Minnow*. * Big Stone Lake; * Chippewa River at Montevideo; Minnesota and Blue Earth rivers at Mankato; Minneopa Creek at Mankato. Very common everywhere.
22. *Pimephales notatus* (Rafinesque). *Blunt-nosed Minnow*. * Big Stone Lake; * Pomme de Terre River at Appleton; * Chippewa River at Montevideo; Minnesota and Blue Earth rivers at Mankato. Common.
23. *Semotilus atromaculatus* (Mitchill). *Horned Dace; Creek Chub*. * Big Stone Lake; * Chippewa River at Montevideo; Minnesota and Blue Earth rivers at Mankato. Very common.
24. *Abramis crysoleucas* (Mitchill). *Golden Shiner; Bream*. A few small ones taken from Blue Earth River, Mankato.
25. *Notropis cayuga* Meek. * Pomme de Terre River at Appleton; Minnesota and Blue Earth rivers and ponds near Minnesota River at Mankato. Very common.
26. *Notropis heterodon* (Cope). * Pomme de Terre River at Appleton. Not common.
27. *Notropis blennioides* (Girard). *Straw-colored Minnow*. * Chippewa River at Montevideo; ponds near the Minnesota River and the Blue Earth River at Mankato. Common.
28. *Notropis hudsonius* (De Witt Clinton). *Spawn-eater; Spot-tailed Minnow; Shiner*. * Little Minnesota River at Browns Valley; Lake Washington. Common. Specimens from Lake Washington are very much darker in color and appear at first to be a different species.
29. *Notropis whipplii* (Girard). *Silver-fin*. Ponds near Minnesota River and Blue Earth River at Mankato. Common.
30. *Notropis cornutus* (Mitchill). *Shiner; Red-fin; Dace*. * Little Minnesota River at Browns Valley; * Big Stone Lake; Minnesota River; ponds near the Minnesota River, Blue Earth River, and Minneopa Creek, Mankato. Very common everywhere.
31. *Notropis dilectus* (Girard). Minnesota and Blue Earth rivers at Mankato. Very common here, but it has not been taken in any other place in southern Minnesota so far as known.
32. *Rhinichthys cataractæ* (Cuvier & Valenciennes). *Long-nosed Dace*. Pomme de Terre River at Appleton, common.

33. *Hybopsis hyostomus* (Gilbert). Blue Earth River at Mankato. Several specimens have been taken, but it is not common.
34. *Hybopsis kentuckiensis* (Rafinesque). *Chub*; *Jerker*. * Big Stone Lake; Blue Earth River at Mankato. Not common.
35. *Anguilla chrysypa* Rafinesque. *Common Eel*. One specimen has been reported from the Minnesota River at Mankato. This was taken by hook and line.
36. *Dorosoma cepedianum* (LeSueur). *Gizzard Shad*; *Hickory Shad*. Just as the ice broke in the Minnesota River at Mankato in the spring of 1891 a number of large specimens were taken and the fishermen commented on the fact, saying that these fish had not been seen here for a number of years. A few small ones were taken in a seine in September, 1892. Since that time they have been scarce.
37. *Umbra limi* (Kirtland). *Mud Minnow*; *Dogfish*. Lake Washington, common.
38. *Lucius lucius* (Linnaeus). *Common Pike*; *Pickerel*. Very common in all of the lakes of the region and occasionally taken in the streams.
39. *Fundulus diaphanus* (LeSueur). * Big Stone Lake; * Pomme de Terre River at Appleton; Blue Earth River at Mankato; Lake Washington. Rather common.
40. *Eucalia inconstans* (Kirtland). *Brook Stickleback*. Minnesota River, Blue Earth River, and Minneopa Creek at Mankato. Not common.
41. *Percopsis guttatus* Agassiz. * Big Stone Lake.
42. *Pomoxis sparoides* (Lacépède). *Calico Bass*; *Strawberry Bass*; *Grass Bass*. Blue Earth River at Mankato and Lake Washington. Very common.
43. *Ambloplites rupestris* (Rafinesque). Blue Earth River at Mankato, common.
44. *Apomotis cyanellus* (Rafinesque). *Blue-spotted Sunfish*; *Green Sunfish*. Minnesota and Blue Earth rivers and Minneopa Creek at Mankato. Common.
45. *Lepomis megalotis* (Rafinesque). *Long-eared Sunfish*. * Chippewa River at Montevideo.
46. *Micropterus dolomieu* Lacépède. *Small-mouthed Black Bass*; *River Bass*. Common in Blue Earth River at Mankato. Many fine specimens are taken with hook and line.
47. *Micropterus salmoides* (Lacépède). *Large-mouthed Black Bass*; *Oswego Bass*; *Green Bass*; *Bayou Bass*. * Big Stone Lake; Lake Washington. Very common in nearly all the lakes of the region.
48. *Stizostedion vitreum* (Mitchill). *Wall-eyed Pike*. * Big Stone Lake; * Chippewa River at Montevideo; Minnesota River at Mankato; Lake Washington. Very common and a valuable food-fish.
49. *Perca flavescens* (Mitchill). *Yellow Perch*; *Ringed Perch*. * Little Minnesota River at Browns Valley; * Chippewa River at Montevideo; ponds near the Minnesota River and Blue Earth River at Mankato; Lake Washington. Very common.
50. *Hadropterus aspro* (Cope & Jordan). *Black-sided Darter*. * Big Stone Lake; * Pomme de Terre River at Appleton; * Chippewa River at Montevideo; Minnesota and Blue Earth rivers at Mankato. Very common.
51. *Boleosoma nigrum* (Rafinesque). *Johnny Darter*. * Big Stone Lake; * Pomme de Terre River at Appleton; * Chippewa River at Montevideo; Minnesota and Blue Earth rivers at Mankato. Very common.
52. *Ammocrypta pellucida clara* Jordan & Meek. *Sand Darter*. Minnesota and Blue Earth rivers at Mankato. Common on sand bars.
53. *Etheostoma zonale* (Cope). A few specimens have been taken in Blue Earth River at Mankato.
54. *Etheostoma iowæ* Jordan & Meek. * Little Minnesota River at Browns Valley; * Big Stone Lake; * Pomme de Terre River. Common.
55. *Etheostoma cæruleum* Storer. *Blue Darter*; *Rainbow Darter*. Ponds near Minnesota River and Blue Earth River at Mankato. Not common.
56. *Boleichthys fusiformis* (Girard). A few specimens taken from Blue Earth River at Mankato. Rare.

57. *Roccus chrysops* (Rafinesque). *Striped Bass*; *White Bass*. Rather common in Big Stone Lake. Several specimens were taken here in 1892.
58. *Aplodinotus grunniens* Rafinesque. *Sheepshead*; *Thunder-pumper*; *Drum*; *White Perch*. A large specimen was taken in Little Minnesota River at Browns Valley in 1892 and several in Big Stone Lake. A number have been taken from Minnesota River at Mankato, and it is reported very common in Lake Washington, where its grunting or croaking is often heard.

Des Moines River rises in Murray County, Minn., flows southeast across Cottonwood and Jackson counties, and thence south through Iowa. At Windom, Minn., where it was examined, it was but a small stream 40 to 50 feet wide and averaging a foot in depth, although there were many holes that were deeper. The bottom was gravelly. A dam had been built across the river here and no provision had been made for a fishway. Fish were quite abundant below the dam where we seined.

Cottonwood Lake lies a mile east of Windom and covers about a quarter section. Its shores are mostly gravelly and free from trees except on the southeast portion. A small area on the west side contained some aquatic plants. A few minnows, sunfish, and catfish were taken in the seine, and pickerel fishing was reported good in season. No suckers were taken. The lake was reported as being quite shallow, and dead fish are common along the shores after a hard winter.

Heron Lake, lying in the northwest portion of Jackson County, is 12 miles long and about 3 miles wide at its widest place. Nearly all of the northern half is grown up with sedges and other aquatic plants. On the west side, about midway between the two ends of the lake, is a projection known as Pelican Point, and here the shores are sandy and there is very little aquatic vegetation. At this point the average depth is 4 feet, the greatest depth not exceeding 5 feet. The southern end of the lake is generally open, and here the commercial fishing is good, although limited to a few species, pickerel being the fish commonly taken. Bass and pike were reported, but very few were caught. A better breeding-place for fish than the north end of Heron Lake would be hard to find, but the shallowness of the water is a serious drawback to its becoming an important fish lake. Two creeks empty into Heron Lake from the west, the one farthest north being Jack Creek. Okabena Creek, farther south, is the largest, but both are small and of little importance.

Okabena lakes lie in the southeastern part of Nobles County, at Worthington. East Okabena Lake is now about dry, but the west lake still contains some fish. It is $2\frac{1}{4}$ miles long from east to west and averages a mile in width, but the greatest depth in 1894 was 6 feet, and in 1895 the depth was considerably less than this. It is a typical prairie lake, with shores built of bowlder walls and with gravelly beaches. The water was quite well filled with aquatic vegetation the latter part of June, 1894, and at the west end of the lake there was a swampy shore at the mouth of a small creek where sedges grew and which was

an excellent breeding place for fishes, although of limited area. The commercial fishes of the lake are pike, pickerel, suckers, and buffalo.

Round Lake lies 12 miles southeast of Worthington and is known as a fishing-point, although small and shallow. It is about 2 miles broad from north to south and probably three fourths of a mile longer than broad. The soundings made at the time visited did not show a depth beyond 7 feet. There was an abundance of aquatic vegetation, which ought to furnish excellent breeding-grounds for fishes. The fishes commonly taken are pike and pickerel.

The following is a list of the fishes which have been taken by us from the Des Moines River and its tributaries:

FISHES FROM THE DES MOINES RIVER AND ITS TRIBUTARIES.

1. *Lepisosteus osseus* (Linnaeus). *Common Gar-pike*. Reported common in Okabena Lake.
2. *Ameiurus melas* (Rafinesque). *Bullhead*. Des Moines River and Cottonwood Lake at Windom; Jack Creek near Heron Lake. Common.
3. *Schilbeodes gyrinus* (Mitchill). Des Moines River at Windom; Jack Creek. Not common.
4. *Ictiobus cyprinella* (Cuvier & Valenciennes). *Common Buffalo-fish*. Reported very common in Round and Okabena lakes, if this is the species.
5. *Catostomus commersoni* (Lacépède). *Black Sucker; Common Sucker*. Reported common in Okabena Lake. Several specimens taken from Des Moines River at Windom.
6. *Moxostoma anisurum* (Rafinesque). *White-nosed Sucker*. One specimen was taken from Des Moines River at Windom.
7. *Moxostoma aureolum* (LeSueur). *Redhorse*. Des Moines River at Windom. Common.
8. *Pimephales promelas* Rafinesque. *Flathead; Black-headed Minnow*. Des Moines River at Windom; Cottonwood Lake at Windom; Heron Lake; Round Lake. Common everywhere.
9. *Pimephales notatus* (Rafinesque). *Blunt-nosed Minnow*. Des Moines River at Windom. Common.
10. *Semotilus atromaculatus* (Mitchill). *Horned Dace; Creek Chub*. Des Moines River at Windom. Common.
11. *Abramis crysoleucas* (Mitchill). *Golden Shiner; Bream*. Des Moines River and Wood Lake at Windom; West Okabena Lake at Worthington; Round Lake. Very common.
12. *Notropis cayuga* Meek. Des Moines River at Windom; Heron Lake; West Okabena Lake at Worthington; Round Lake. Common.
13. *Notropis blennioides* (Girard). *Straw-colored Minnow*. Common in Des Moines River at Windom.
14. *Notropis hudsonius* (De Witt Clinton). *Spawn-eater; Spot-tailed Minnow*. Very common in Round Lake.
15. *Notropis cornutus* (Mitchill). *Shiner; Red-fin; Dace*. Des Moines River at Windom. Common.
16. *Notropis rubifrons* (Cope). Des Moines River at Windom. Not common.
17. *Rhinichthys atronasus* (Mitchill). *Black-nosed Dace*. Des Moines River at Windom. Not common.
18. *Lucius lucius* (Linnaeus). *Common Pickerel*. Very common in Heron, Round, and Okabena lakes.
19. *Fundulus diaphanus* (LeSueur). West Okabena Lake at Worthington; Round Lake.

20. *Eucalia inconstans* (Kirtland). *Brook Stickleback*. Des Moines River at Windom. A few specimens taken.
21. *Ambloplites rupestris* (Rafinesque). *Rock Bass*. One specimen taken in Des Moines River at Windom. Rather common.
22. *Apomotis cyanellus* (Rafinesque). *Blue-spotted Sunfish; Green Sunfish*. One specimen taken in Des Moines River at Windom.
23. *Lepomis pallidus* (Mitchill). *Blue Sunfish*. Several small specimens were taken from West Okabena Lake at Worthington.
24. *Eupomotis gibbosus* (Linnaeus). *Common Sunfish; Pumpkin Seed*. One specimen taken in West Okabena Lake at Worthington. Reported to be common.
25. *Stizostedion vitreum* (Mitchill). *Wall-eyed Pike*. West Okabena Lake at Worthington; Round Lake. Common.
26. *Perca flavescens* (Mitchill). *Yellow Perch; Ring Perch*. Des Moines River at Windom; Cottonwood Lake at Windom; Heron Lake; West Okabena Lake at Worthington; Round Lake. Very common.
27. *Hadropterus aspre* (Cope & Jordan). *Black-sided Darter*. Des Moines River at Windom. Not common.
28. *Boleosoma nigrum* (Rafinesque). *Johnny Darter*. Des Moines River at Windom. Very common.
29. *Etheostoma iowæ* Jordan & Meek. Des Moines River at Windom; West Okabena Lake at Worthington. Not abundant.
30. *Etheostoma flabellare lineolatum* (Agassiz). *Fan-tailed Darter*. One specimen taken in Des Moines River at Windom.

NOTES ON THE RUN OF SUCKERS AND BUFFALO-FISH.

From the information stated below and from the many other reports given by old residents of southern Minnesota it is evident that at one time large buffalo-fish and suckers literally filled many of the lakes in this portion of the State, and were especially noticeable during the spawning season. Just what has become of these fishes is still a question, for they do not seem to be present in any of these lakes now where they were once so abundant, or, if so, only in limited numbers. Probably many of them have been killed by freezing, since the water in all the lakes is now so much more shallow than it was formerly. This is certain in some of the lakes, for the fish have been found along the shores in the spring in immense numbers dead, but it is not true of all the lakes. It is not certain just what species of buffalo is referred to in these reports, for none have been examined since the writer began to collect information concerning them. A dead one found on the shore of Big Stone Lake in 1892 was identified as *Ictiobus cyprinella*, and it is thought that possibly this is the species referred to in the other lakes of the region.

Buffaloes were reported to be very common in Big Stone Lake in 1892 and were often taken in large numbers during the spawning season, which is the latter part of May or the first of June, or, as the old settlers put it, "when the plum blossoms are out." Both the buffaloes and the suckers (*Catostomus commersonii*) are seen but a short time, generally for only a day or two, but at that time every fish seems to have come to the shore, and each scrambles to see how near he can get

out of the water and yet remain under. They are reported as often seen with their entire dorsal fins projecting above the water, and at this time men have gone into the water and thrown the fish out with their hands.

Lake Washington was at one time much higher than at present, and there was a large stream leading from it, and the buffaloes and suckers would crowd into this outlet, and at one of the mills several wagon-loads of large buffaloes were once taken. The following is a statement from Mr. Wildes, who still lives in the region, concerning Lake Washington:

When I came to Minnesota, more than 35 years ago, Lake Washington was a magnificent body of water, the largest of a number of lakes all more or less closely connected and whose outlet was Shantaska Creek, which emptied into the Minnesota River at Kasota. This section of Minnesota was then covered with an almost unbroken forest of gigantic deciduous trees, beneath whose branches, covered with dense foliage, the yearly rains sank into the soil to fill the sloughs and lakes to overflowing. The creeks and outlets of the lakes and sloughs were obstructed with fallen trees and leaves; the land surface was covered with leaves, weeds, and grass. Six flour and saw mills were located along Shantaska Creek and did a good business, and most of the time had an abundant supply of water. Now this creek is dry the greater part of the year. In 1860, and for a number of years after, the rainfall was at least three times what it is now. The water has receded greatly in all the lakes, and some have completely dried up and are now turned into cultivated fields and hay meadows. In those days the fish were very abundant and the mills along Shantaska Creek were sometimes stopped by their getting into the waterwheels.

The buffalo ran out of the large lakes into the inlets and outlets generally during the month of May, sometimes earlier or later, and only once a year, rarely staying more than two or three days. I have noticed that the run was almost always at the beginning or during a rain storm. In the spring of 1894, during a rain storm, some buffalo-fish ran out of Lake Washington into a small lake and remained there during the summer and were seen through the ice at the beginning of the following winter. The buffalo-fish attain a large size in Lake Washington, often more than 3 feet in length and 1 foot in depth. When the buffalo are running they always stir up the mud so that it is impossible to observe their doings, but I imagine that they were spawning.

Suckers are not so numerous as the other kinds of fish. Some suckers reach a weight of 6 pounds.

John Kendall, who formerly lived on Lake Washington, states that in 1850 the buffalo ran down the outlet every spring to the Minnesota River, but since the outlet became so small these fish go to the inlet, a very small creek, to spawn. He also states that but one buffalo was seen in 1894, and this was taken in the inlet. A few suckers were taken there also.

Patrick Sheehan states that there are still many buffaloes and suckers in Lake Washington, in his opinion, although he has not seen many in the last few years. Mr. Sheehan has lived on the shore of Lake Washington for a number of years.

Careful inquiry was made of the residents along Heron Lake, when it was visited in 1894, and everyone reported that the buffaloes and suckers were abundant in the lake, but were only seen for a few days

in the spring, and that in the spring of 1894 very few had been seen. None are ever taken with hook and line. Careful seining failed to capture the young of either.

A number of citizens of Worthington reported that in 1893 the buffaloes tried to pass from one Okabena Lake into the other, and that immense numbers were speared, many of them weighing 40 pounds apiece. It is reported that the farmers came there and hauled away wagonloads of these fishes and dressed and dried them for winter use. During the last few years very few have been seen. Many dead suckers were reported along the shores of West Okabena Lake in the spring of 1894, when the ice melted. Similar reports come from Round Lake, but at the time it was visited by the writer (spring of 1894) the buffalo had not been seen, and careful seining failed to secure specimens of either suckers or buffalo.

What information the writer has been able to obtain concerning these fish is very unsatisfactory. Their sudden appearance and their as sudden disappearance render it difficult to make observations on them, and the fact that they are never taken during the remainder of the year increases the difficulty of obtaining accurate information concerning them.

DESCRIPTION OF A NEW SPECIES OF LEUCISCUS FROM THE UPPER MISSISSIPPI RIVER BASIN IN MINNESOTA.

Leuciscus nachtriebi, new species.

Type locality: Mille Lacs Lake, Aitkin County, Minn., where several specimens were taken by the Minnesota Natural History Survey in 1892. Associate type localities: Man Trap, Mud, and Elbow lakes in the region of Park Rapids, Hubbard County, where several specimens were taken by the Minnesota Natural History Survey in 1893. In all about 40 specimens have been taken. (Type, No. 47688, U. S. Nat. Mus. Co-type in Leland Stanford Jr. Univ. Mus.)

Description: Head $4\frac{1}{2}$ to $4\frac{1}{4}$; depth $5(4\frac{1}{2}$ to $5\frac{1}{4})$; eye 4; snout $4\frac{1}{2}$; dorsal 8; anal 8. Body rather heavy, not greatly compressed; back slightly elevated, its curve a little greater than that of the belly; caudal peduncle rather stout, its depth one-half the length of the head. Head rather short, not any more compressed than the body, upper surface slightly flattened; snout quite blunt in mature specimens, its length $1\frac{1}{2}$ times width of eye; mouth not very large, but little oblique, lower jaw included; maxillary scarcely reaching to front of orbit; pharyngeal teeth 2, 4-5, 2. Dorsal fin inserted nearer base of caudal than tip of snout, also slightly back of ventrals; caudal fin forked; anal slightly smaller than dorsal; ventrals small, not reaching vent by one-third their length; pectorals inserted rather high, not reaching the ventrals by three-fourths their length; scales small, 12-72-9, lateral line complete on mature specimens, decurved, the pores extending on head in several lines, one passing back of eye, another down to nostril. General color dusky, darkest on back; sides above lateral line dull silvery, below lateral line light silvery; a faint dark dorsal band in some specimens, in others absent; no black lateral band, but some specimens have a very faint dusky shade along lateral line; no light stripe above lateral line; upper portion of opercles with a dusky shade, lower part bright silvery; upper part of head dark-colored; all the above colors typical in the young as well as adults. Length 4 inches.

L. nachtriebi differs from *L. neogaus* in having a well-developed lateral line, a smaller eye, fewer scales, less oblique mouth, a shorter maxillary, and in being

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a larger fish and differently colored. It differs from *L. elongatus*, a species which might occur in the State, in having a smaller mouth, the lower jaw never projecting, head less pointed, a shorter maxillary, finer scales, and the absence of the black lateral band. The accompanying tabulated measurements will give some idea of the variation in the species. The species is named for Prof. Henry F. Nachtrieb, State zoologist of Minnesota.

Tag.	Length, inches.	Head.	Depth.	Dorsal fin.	Anal fin.	Scale.	Lateral line.	
							Right.	Left.
4	3 $\frac{3}{8}$	4 $\frac{1}{2}$	5	8	8	12-75-9	Complete	Complete.
5	3 $\frac{3}{8}$	4 $\frac{1}{2}$	4 $\frac{7}{8}$	8	8	12-72-9	do	Complete, except about 6 scales.
6	3 $\frac{3}{8}$	4 $\frac{1}{2}$	5	8	8	12-73-8	do	Complete.
7	3 $\frac{3}{8}$	4 $\frac{1}{2}$	5	8	8	12-72-9	Complete, except 3 or 4 scales.	Complete, except 3 or 4 scales.
8	3 $\frac{1}{2}$	4 $\frac{1}{2}$	4 $\frac{7}{8}$	8	8	13-74-9	Complete	Complete.
9	3 $\frac{3}{8}$	4 $\frac{1}{2}$	5	8	8	11-74-9	Complete, except 3 or 4 scales.	Complete, except 3 or 4 scales.
10	3	4 $\frac{1}{2}$	5	8	8	12-76-10	Complete	Complete.
11	3 $\frac{3}{8}$	4 $\frac{1}{2}$	5	8	8	12-72-9	do	Do.
12	4	4 $\frac{1}{2}$	5 $\frac{1}{2}$	8	8	12-70-9	do	Do.
13	3 $\frac{3}{8}$	4 $\frac{1}{2}$	5	8	8	12-74-9	do	Do.
14	2 $\frac{3}{8}$	4	4 $\frac{3}{4}$	8	8	12-72-9	do	Do.
15	2 $\frac{1}{4}$	4	4 $\frac{3}{4}$	8	8	12-71-9	do	Do.
16	2 $\frac{1}{2}$ ^c	4 $\frac{1}{2}$	4 $\frac{7}{8}$	8	8	12-71-9	do	Do.
17	2 $\frac{1}{2}$	4	4 $\frac{7}{8}$	8	8	12-72-9	do	Do.
18	2 $\frac{1}{2}$ ^b	4 $\frac{1}{2}$	5	8	8	12-71-9	Complete, except 3 or 4 scales.	Complete, except 3 or 4 scales.
19	2 $\frac{1}{2}$	4	5	8	8	12-71-8	Complete, except 15 scales.	Complete, except last few scales.
20	2 $\frac{1}{2}$	4	4 $\frac{7}{8}$	8	8	12-74-9	Complete, except last 3 or 4 scales.	Complete, except last 3 or 4 scales.
21	2 $\frac{1}{2}$	4 $\frac{1}{2}$	5	8	8	12-71-8	Nearly complete.	Nearly complete.
22	2 $\frac{1}{2}$	4 $\frac{1}{2}$	5	8	8	12-72-8	Complete	Complete.
							do	Complete, except 30 scales.

* Co-type, in Leland Stanford Jr. Univ. Mus.

† Type, No. 47688, U. S. Nat. Mus.

Eight specimens, each 1 $\frac{1}{2}$ inches long, from the same locality as Nos. 14 to 22, are similar in color and other characteristics, but the lateral line is entirely absent. The pores on the head are developed in some. Nos. 4 to 11, inclusive, are from Mille Lacs Lake, Atkin County, and Nos. 12 to 22, inclusive, are from Mud and Elbow lakes, Hubbard County.