

THE FISHES OF THE MISSOURI RIVER BASIN. BY BARTON W. EVERMANN AND J. T. SCOVELL.

In 1892 and again in 1893 Dr. Evermann made extended investigations in Iowa, South Dakota, Nebraska and Wyoming for the purpose of selecting a site for a fish-cultural station somewhere in that region. In 1891 he had made similar investigations in Montana and Wyoming and primarily for the same purpose.

While engaged in this work we examined a great many streams and made large collections of fishes representing a great many localities.

Studying these collections very naturally led to a consideration of the entire fish-fauna of the Missouri basin, and it is with some of the interesting features of this fauna that the present paper deals. That we may understand more clearly the distribution of the fishes a few words concerning the characteristic features of the basin may not be out of place.

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, Montana, where the Jefferson, Madison and Gallatin rivers unite to form the Missouri proper is 4,132 feet altitude, the sources of Madison River are over 8,300 feet above the sea, while Two-Ocean Pass is about 8,200 feet.

* For a full description of this phenomenon and its bearing upon the distribution of fishes see Evermann, in *Popular Science Monthly*, for June, 1895.

The mouth of the Missouri River is about 400 feet above sea level; the total fall of this river is 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.

The Missouri basin may very properly be divided into three parts, viz., the western or mountainous, the middle or plains portion, and the eastern or region of deciduous trees.

The mountainous belt includes western Montana, northwestern and central Wyoming, and a small portion of central Colorado. This includes the portion with an altitude of about 4,000 feet or over, and is the region of coniferous forests and swift, clear and cold mountain streams.

The middle belt includes most of northern and eastern Montana, a part of eastern Wyoming and Colorado, and, excepting a narrow strip along their eastern edge, all of the Dakotas, Nebraska and Kansas. This is, in its general features, a broad, level plain, with slight irregularities here and there. It is a region without forests, and over much of its surface not much vegetation of any kind is found. The only timber of any importance is the narrow strip of cottonwoods and willows covering the bottom lands along the streams. The western and central portions of this belt are very barren, in places even desolate, particularly in the Bad Lands, or Mauvais Terre of South Dakota, and parts of North Dakota, Wyoming, Montana and Nebraska. These tertiary beds are of great thickness, usually full of alkali, and very easily eroded.

The Black Hills constitute a mountainous island of evergreen forests and beautiful, clear, cold streams in this desert plain, but need not concern us in the consideration of the basin as a whole. The eastern part of this belt receives more moisture and is a typical prairie region, but its streams are slow, shallow and shifting, still carrying much solid matter in suspension from the region to the westward.

The third or eastern belt embraces a narrow strip along the eastern border of South Dakota, Nebraska and Kansas, and the portions of Iowa and Missouri lying

within the Missouri basin. This is essentially a region covered with forests of deciduous trees. It is true that some parts of it are prairie, but the soil contains little or no alkali, and the small streams having their rise in it are fairly clear and pure.

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 originally 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 the broad treeless plain of the middle belt. Here the alkali soil erodes easily, the current becomes slower, the bed broadens, the channel shifts from year to year, and the water becomes warmer and often of the consistency of thin soup. This is the character of all the larger streams as they pass through this middle belt, and the character of the water is the same in all the smaller streams which start in this belt.

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 plain, few of the streams are ever really clear. The Missouri River is always carrying 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.

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All this, of course, has its effects upon the fish fauna of this river system. Each of the three belts possesses a fish fauna differing very materially in the aggregate from that of each of the other belts.

The total number of species and subspecies of fishes now recognized from the entire Missouri basin is 143. These are distributed among 24 families and 68 genera. The families with large numbers of species are:

The Cyprinidae, with 50 species.

The Percidae, with 20 species.

The Catostomidae, with 16 species.

The Centrarchidae, with 12 species.

The Siluridae, with 10 species.

Only 10 species are characteristic of the western belt, the most characteristic ones being the cut-throat trout, Williamson's whitefish, the blob, the grayling, the long-nosed sucker, Jordan's sucker, and the western dace.

Only 45 species are known from North Dakota, Montana, Wyoming and Colorado. On the other hand, Missouri and the small part of Iowa drained by the Missouri, furnishes 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 has such characteristic species as *Platyobio gracilis*, *Hybopsis gelidus*, *Hybognathus nuchalis eransi*, 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.

In the lower portion of the middle belt is found the limit in the western extension of spiny-rayed fishes. West of the 96th 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 thirty-five species of spiny-rayed fishes, and from the streams of Indiana alone we know at least fifty-one 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 98th meridian.

In the Missouri itself and in its larger tributaries are found such large river species as *Polyodon spathula*, *Scaphirhynchus platyrhynchus*, *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 yet been found west of Mitchell, S. D., 98° west; *Micropterus* has not been found west of Ravenna, Neb., 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 Mitchell, S. D., *Hadropterus aspro* to Ewing, Neb., 98° 20' W., *Etheostoma tuciae* extends still further west, having been found by us at Valentine, Neb., 100° 30' W., while *Boleichthys exilis*, a somewhat doubtful species, was found even a little farther west in North Dakota.

The Flat-headed Chub is pre-eminently the characteristic fish of the shallow, alkali streams of the middle Missouri basin, and shows better than any other the

* Eigenmann and Fordice, Proc. Phil. Acad. Sci. 1885.

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 seem to be almost wholly without pigment cells of any kind. Perhaps the most extreme case of bleaching is that of *Platygobio gracilis*, which, of all American fishes, seems to be the one most perfectly adapted to life in these alkaline streams.

An examination of the literature shows that seventy four nominal species have been described as new from Missouri basin localities. These seventy-four names represent fifty-one species as now understood, but all but twenty-eight of the seventy-four nominal species had already been described, so only twenty-eight of them were really new. Indeed, we are inclined to think that a little closer investigation will show at least eleven of these twenty-eight to have been not new, so that of the seventy-four fishes which have been described as new from the Missouri basin only seventeen, or about 23 per cent., were really so.

TABLE GIVING NAMES OF DESCRIBERS OF MISSOURI BASIN FISHES, THE NUMBER DESCRIBED BY EACH, AND THE NUMBER OF EACH WHICH STILL HOLD.

AUTHORS.	No. of Species Described.	No. Which Still Hold.
Agassiz.....	3	1
Abbot.....	4	0
Cope.....	21	8
Duméril.....	3	0
Evermann.....	1	1
Evermann and Cox.....	2	2
Gilbert.....	2	1
Garman.....	2	1
Gill.....	5	1
Girard.....	20	8
Hay.....	3	0
Jordan.....	4	1
Jordan and Evermann.....	1	1
Meek.....	2	2
Milner.....	1	1
Total.....	74	28