FISHES OF THE BIG SIOUX RIVER: An Annotated List*

John G. Nickum and James A. Sinning[1]
Department of Wildlife and Fisheries Sciences
South Dakota State University
Brookings, South Dakota 57006

ABSTRACT

Fish populations of the Big Sioux River represent 10 orders, 14 families, and 56 species. This paper provides a list of the fishes collected from the Big Sioux during 1966, 1967, 1969, and 1970, as well as those reported in earlier reports which included the Big Sioux. It also describes the known distribution and abundance of each species in the Big Sioux and lists other species which may be expected to occur in this river.

INTRODUCTION

The fish population of a river reflects the water quality and physical habitat of that river, and to a great extent determines the recreational use of the river. An understanding of the distribution and abundance of fishes in a river is essential to effective management of maximum, sustained benefits to the human population utilizing it.

Fishes of the Big Sioux River were first studied about 1900 by Meek and by Evermann and Cox (Bailey and Allum, 1962). A later survey by Churchill and Over (1933) apparently included some collection sites on the Big Sioux. Iowa Conservation Commission biologists have made collections from the lower reaches of the river since approximately 1945 (Cleary, 1956). Bailey and Allum (1962) included three stations on the main stream of the Big Sioux River, all located in southern Hamlin County or Brookings County.

This report combines the results of collections made in 1966 and 1967 by Sinning (1968) and those made by ichthyology classes from South Dakota State University in 1969 and 1970, with the reports of Cleary (1956), Bailey and Allum (1962) and recent collection records of Iowa Conservation Commission biologists (Don Kline, personal communication, 1970). Earlier reports (Meek, 1892, 1894; Evermann and Cox, 1896; Churchill and Over, 1933) were not included because it was felt water quality conditions in the Big Sioux have changed too drastically for distribution and occurrence of fishes in those times

1 Current address: Department of Botany, Montana State University, Bozeman, Montana 59715

* Approved for publication by the Director, Agricultural Experiment Station, South Dakota State University, Brookings, as Journal series No. 1028.

to still be meaningful. This report should serve as an instrument for future evaluations of conditions and changes in the Big Sioux River as well as provide one basis for formulating current use and management programs for the river.

STUDY AREA

The Big Sioux River lies in extreme eastern South Dakota. Its average flow is larger than any other river in South Dakota, with the exception of the Missouri River. The character of the river is strongly influenced by climatic conditions of eastern South Dakota, the glacial origins of the soils composing its watershed and human activites on its watershed.

Flow of the river is variable, both in time and along its length. Extremely high flows are often experienced during early spring, followed by periods of essentially no flow in fall and winter. Over its course of approximately 390 miles, the Big Sioux River changes from an intermittent stream less than 20 feet in width in southwestern Grant County to over 200 feet in width near its mouth in Sioux City, Iowa. Depth and bottom substrate are also highly variable, but in general, the river consists of a long series of pools and riffles over substrates of rock, gravel, sand, or mud. Except where low dams have been constructed, most pools are less than 10 feet in depth, and average depth varies from 1 to 5 feet except in the extreme lower end.

METHODS AND MATERIALS

Sampling sites in 1966, 1967, 1969, and 1970 were arbitrarily established at various access points along the Big Sioux River, so as to provide at least one sampling site in each 30-mile section of the river. The total length of the river was divided into 13 sections, approximately 30 miles in length (Figure 1). Samples were collected in June through October in 1966 and 1967, and in September and October in 1969 and 1970.

No standard sampling effort was utilized at each sampling site. Instead, methods of fish capture were employed which could function most effectively in each habitat area. To have established a standard procedure – for example, a 100 foot haul with a minnow seine – would have totally failed to sample the fish population in many sites, due to variation in the rive; habitat. Depending upon the habitat type samples were collected with 0.25 inch mesh minnow seines, experimental gill nets, 0.5 inch mesh and 0.75 inch mesh trap nets, electro-shockers, explosives, and fish poisons (sodium cyanide or rotenone).

Specimens of all species were returned to the laboratory for positive identification, following field sorting, counting, measuring, and weighing of the catch at each sampling site. All names of fishes used in this report are those

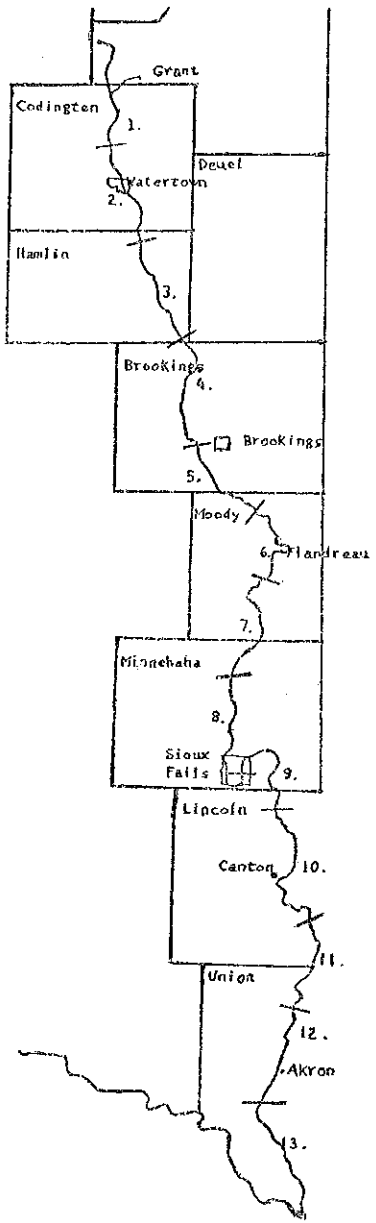

Figure 1. Course of Big Sioux River through eastern South Dakota. Numbers (1. – 13.) and line (–) across river indicate sections into which the river was divided for purposes of sampling and analyzing data.

listed in the 3rd edition of *A List of Common and Scientific Names of Fishes* (American Fisheries Society, 1970).

Data on distribution and abundance of fishes were grouped for all sampling sites within each 30-mile section of the river. It was felt that in this way any genuine differences in populations throughout the length of the river would be more obvious and would not be obscured by biases due to the nature of the habitat or the sampling means employed at each specific sampling site. The exact composition of fish populations varied sharply within specific sections of the river depending upon the nature of the sampling site; however, by pooling results from various habitat sites within each section, a view of the overall population for each section was obtained. Where Bailey and Allum (1962) or Iowa Conservation Commission biologists (Cleary, 1956, or Kline, personal communication, 1970) had reported additional species not in our samples, the presence of that species in that section of the river was added to our records.

RESULTS AND DISCUSSIONS

The data on occurrence and distribution of fishes in the Big Sioux River are presented in the following annotated list of 56 species from 14 families and 10 orders of the class Osteichthyes – the bony fishes.

Order Acipenseriformes

Polyodontidae

1) Paddlefish, *Polyodon spathula* (Walbaum)
Paddlefish were not collected in our samples, but were reported by Cleary (1956) at two locations in sections 10 and 12.

Order Semionotiformes

Lepisosteidae

2) Longnose gar, *Lepisosteus osseus* (Linnaeus)
Longnose gar were reported by Cleary (1956) at two locations in sections 12 and 13 of the river, but were not taken in our collections.

Order Cluperformes

Clupeidae

3) Gizzard shad, *Dorosoma cepedianum* (Lesueur)
Gizzard shad were present in our samples from sections 10 and 13. Cleary (1956) reported them present in sections 9 and 11 also. They were not common except in the lower few miles of section 13 where they are also extremely abundant.

Order Osteoglossiformes

Hiodontidae

4) Goldeye, *Hiodon alosoides* (Rafinesque)
Goldeye apparently occur in relatively low numbers throughout the lower reaches of the Big Sioux River. They were found in our samples from sections 10, 12, and 13.

5) Mooneye, *Hiodon tergisus* Lesueur
One specimen was taken in our collections from section 12 in 1970. It represents the first modern record of mooneye in South Dakota waters. Bailey and Allum (1962) concluded that Cope's (1879) record of the mooneye was a case of misidentification.

Order Salmoniformes

Esocidae

6) Northern pike, *Esox lucius* Linnaeus
Northern pike probably occur throughout the Big Sioux, however, they appeared in our collections only at sites in sections 1 through 10 (with the exception of section 2). They were not found in large numbers except for one shallow pool, essentially isolated from the main channel, in northern Moody County. Northern pike apparently attain sufficient size and numbers to offer a potentially important sport fishery in some parts of the river.

Order Cypriniformes

Cyprinidae

7) Stoneroller, *Campostoma anomalum* (Rafinesque)
Stonerollers were taken in our collections from sections 1, 2, 3, 5, 6, and 10. Cleary also reported them in section 9. They were found in abundance only in section 1.

8) Carp, *Cyprinus carpio* Linnaeus
Carp were collected at all stations throughout the river. They were taken in abundance in sections 2, 3, 5, 9, and 10.

9) Brassy minnow, *Hybognathus hankinsoni* Hubbs
The brassy minnow was represented in our collections from section 3 and was reported in section 5 by Bailey and Allum (1962). It apparently is not common in the Big Sioux River.

10) Silvery minnow, *Hybognathus nuchalis* Agassiz
The silvery minnow occurred in low numbers in our collections from

sections 8 and 10. Cleary (1956) reported it from sections 9 and 11 also.

11) Flathead chub, *Hybopsis gracilis* (Richardson)
This species was not represented in our collections, but was reported by Cleary (1956) from section 13.

12) Emerald shiner, *Notropis atherinoides* (Rafinesque)
Emerald shiners were found in all sections of the river except sections 11 and 13. They were present in relative abundance in sections 3 through 9. They appeared to be one of the most common minnows in the central reaches of the Big Sioux.

13) Common shiner, *Notropis cornutus* (Mitchill)
The common shiner occurred abundantly in our samples from sections 1 through 6, the relatively cleaner sections of the river. Since common shiners are often regarded as very sensitive to effects of pollution, it seems surprising that they were also found in sections 9 and 12.

14) Bigmouth shiner, *Notropis dorsalis* (Agassiz)
This species was not represented in our collections, but was reported from sections 3 and 5 by Bailey and Allum (1962), section 9 by Kline (personal communication, 1970) and section 10 by Cleary (1956).

15) Spottail shiner, *Notropis hudsonius* (Clinton)
This species was reported only by Bailey and Allum (1962) from section 5.

16) Red shiner, *Notropis lutrensis* (Baird and Girard)
Red shiners were not found above section 5, but were found in abundance at all stations below there, except sections 11 and 13.

17) Rosyface shiner, *Notropis rebellus* (Agassiz)
This species was reported only by Cleary (1956) from section 9.

18) Sand shiner, *Notropis stramineus* (Cope)
The sand shiner was taken in all sections except 11 and 13. In most sections of the river it appeared to be the most abundant minnow.

19) Topeka shiner, *Notropis topeka* Gilbert
Topeka shiners appeared in our collections from sections 6 and 11, and were reported by Bailey and Allum (1962) in section 5.

20) Suckermouth minnow, *Phenacobius mirabilis* (Girard)
Suckermouth minnows appeared in our collections from sections 6 and 10, and in our collections of the Iowa Conservation Commission (Don Kline, personal communication, 1970) for section 9.

21) Bluntnose minnow, *Pimephales notatus* (Rafinesque)
Bluntnose minnows were sparsely represented in our collections from sections 1, 5, and 8. Cleary (1956) reported them in sections 9 and 10 also.

22) Fathead minnow, *Pimephales promelas* Rafinesque
The fathead minnow was found in all sections of the Big Sioux except 6, 11, and 13. In most areas it was one of the most abundant species in our collections.

23) Blacknose dace, *Rhinichthys atratulus* (Hermann)
Blacknose dace were common in our collections from section 1 and also occurred in collections from sections 2 and 9. Bailey and Allum (1962) reported it from section 3 also.

24) Creek chub, *Semotilus atromaculatus* (Mitchill)
The creek chub was common in the upper reaches of the river being represented in our collections from sections 1 through 5. It also occurred in sections 8, 9, and 10. In some sections of the river it was present in sufficient numbers to appear to be one of the dominant fishes.

Catostomidae

25) River carpsucker, *Carpiodes carpio* (Rafinesque)
River carpsucker occurred in low numbers in our collections from sections 10, 12, and 13. Iowa Conservation Commission biologists have collected them from section 9 also (Don Kline, personal communication, 1970).

26) Quillback, *Carpiodes cyprinus* (Lesueur)
Quillback appeared to be more common in the lower sections of the river than were river carpsuckers. They were common to abundant in our collections from sections 9, 10, 12, and 13.

27) White sucker, *Catostomus commersoni* (Lacepede)
White suckers have been collected from all sections of the river except section 6. They appear to be more abundant in the portion of the river above Sioux Falls. In the upper sections they often appeared to be one of the dominant fishes.

28) Blue sucker, *Cycleptus elongatus* (Lesueur)
Blue sucker were not represented in our collections, but were reported from section 13 by Cleary (1962).

29) Northern hog sucker, *Hypentelium nigricans* (Lesueur)
The northern hogsucker occurred only in low numbers in our collections

from section 10.

30) Smallmouth buffalo, *Ictiobus bubalus* (Rafinesque)
Smallmouth buffalo occurred in low numbers in our samples from sections 9 and 10. Kline (personal communication, 1970) has collected them in section 13 also.

31) Bigmouth buffalo, *Ictiobus cyprinellus* (Valenciennes)
Bigmouth buffalo were abundant in our collections from sections 5 and 8, and were present in section 13. Cleary (1956) reported them present in sections 9, 10, and 11 also.

32) Black buffalo, *Ictiobus niger* (Rafinesque)
We did not collect any black buffalo; however Cleary (1956) reported them from sections 9, 10, and 13. The occurrence of black buffalo in Lake Mitchell, South Dakota has been verified by Moen (1970).

33) Shorthead redhorse, *Moxostroma macrolepidotum* (Lesueur)
This species was abundant to common in our collections from sections 8, 9, and 10. Kline (personal communication, 1970) collected it in section 13 also.

Order Siluriformes

Ictaluridae

34) Black bullhead, *Ictalurus melas* (Rafinesque)
Black bullheads have been collected from all sections of the Big Sioux except 2 and 7. In most collections they were abundant, often the most numerous fish in the sample.

35) Channel catfish, *Ictalurus punctatus* (Rafinesque)
Channel catfish have been collected from sections 4, 5, and 7 through 11. In general, they were more abundant in our collections from the lower sections of the river where they reach sufficient abundance to produce a desirable sport fishery.

36) Slender madtom, *Noturus exilis* Nelson
The slender madtom did not appear in our collections but has been collected in section 9 by Iowa Conservation Commission biologists (Don Kline, personal communication, 1970).

37) Stonecat, *Noturus flavus* (Rafinesque)
Stonecats appeared to be widely distributed in the Big Sioux except for the last three sections. They were scarce to common in our collections from

sections 1, 3, 5, 6, 8, 9, and 10.

38) Tadpole madtom, *Noturus gyrinus* (Mitchill)
Tadpole madtoms were collected primarily in the upper reaches of the river, appearing in our collections from section 1, 3, 4, 5, and 9.

39) Flathead catfish, *Pylodictus olivaris* (Rafinesque)
Flathead catfish have been collected only in the lower sections of the river. Cleary (1956) reported them from section 13 and they were present in our collections from section 10.

Order Percopsiformes

Percopsidae

40) Trout-perch, *Percopsis omiscomaycus* (Walbaum)
Trout-perch were scarce to abundant in our collections from sections 6 through 9 and were reported from sections 10 through 12 by Cleary (1956).

Order Gasterosteiformes

Gasterosteidae

41) Brook stickleback, *Culaea inconstans* (Kirtland)
Brook sticklebacks appeared in low numbers in our collections from section 4 and were reported by Cleary (1956) from sections 10 and 11.

Order Perciformes

Percichthydae

42) White bass, *Morone chrysops* (Rafinesque)
White bass were collected only from sections 10 and 13 and never in large numbers.

Centrarchidae

43) Green sunfish, *Lepomis cyanellus* (Rafinesque)
Green sunfish were found in low numbers in sections 3, 4, 5, and 6, and somewhat more abundantly in sections 8, 9, and 10. Kline (personal communication, 1970) and Cleary (1956) reported them from sections 11 and 12, respectively.

44) Pumpkinseed, *Lepomis gibbosus* (Linnaeus)
Pumpkinseeds were not widely distributed, appearing in low numbers in our collections only from section 9 and in those of Iowa biologists (Cleary, 1956) from section 10.

45) Orangespotted sunfish, *Lepomis humilis* (Girard)
Orangespotted sunfish have been collected from all sections of the Big Sioux except 6 and 12. They were generally the most abundant centrarchid in our samples, especially in sections 1, 3, 8, and 9.

46) Bluegill, *Lepomis macrochirus* Rafinesque
Bluegill were represented only by a few specimens in our collections from section 10.

47) Largemouth bass, *Micropterus salmoides* (Lacepede)
Largemouth bass were not present in any of our collections; however, Kline (personal communication, 1970) has collected them from section 9.

48) White crappie, *Pomoxis annularis* Rafinesque
White crappies were present in low numbers in samples from all sections except 1, 2, and 7.

49) Black crappie, *Pomoxis nigromaculatus* (Lesueur)
Black crappies were not as widely distributed as white crappies but tended to be more abundant where they were present. They appeared in our collections from sections 3, 4, 8, 9, and 10.

Percidae

50) Iowa dater, *Etheostoma exile* (Girard)
Iowa darters appeared only in our collections from sections 1 through 4, and were never abundant.

51) Johnny darter, *Etheostoma nigrum* Rafinesque
Johnny darters were the most widespread and most abundant of percid fishes in the Big Sioux. They have been collected from all sections of the river except sections 7 and 13. They were most numerous in collections from sections 1, 3, 4, 8, 9, and 10.

52) Yellow perch, *Perca flavescens* (Mitchill)
Yellow perch were collected from five sections of the Big Sioux: 2, 3, 4, 9, and 10. They were abundant only in section 3.

53) Blackside darter, *Percina maculata* (Girard)
Blackside darters were present in low numbers in collectios from section 10 only.

54) Sauger, *Stizostedion canadense* (Smith)
Sauger were not represented in our collections but were reported from section 13 by Cleary (1956).

55) Walleye, *Stizostedion vitreum* (Mitchill)
Walleye were never abundant in our samples but were present in collections from sections 3, 6, 7, 8, 9, and 10.

Sciaenidae

56) Freshwater drum, *Aplodinotus grunniens* Rafinesque
Freshwater drum were common in our collections from section 10 and were found in section 13 by Kline (personal communication, 1970).

* * * * *

In addition to the species present in our collections or reported by other workers, additional fishes may be expected to occur at least occassionally in the Big Sioux River since they have been reported from other rivers which join the Big Sioux. Such probable additions to the Big Sioux fish population include: Shovelnose sturgeon, *Scaphirhynchus platorhynchus* (Rafinesque); Shortnose gar, *Lepisosteus platostomus* Rafinesque; American eel, *Anguilla rostrata* (Lesueur); Skipjacl herring, *Alosa chrysochloris* (Rafinesque); Central mudminnow, *Umbra limi* (Kirtland); Golden shiner, *Notemigonus crysoleucas* (Mitchell); Hornyhead chub, *Nocomis biguttatus* (Kirtland); Silver chub, *Hybopsis storeiana* (Kirtland); River shiner, *Notropis blennuis* (Girard); Northern redbelly dace, *Phoxinus eos* (Cope); Golden redhorse, *Moxostoma erythrurum* (Rafinesque); Banded killifish, *Fundulus diaphanus* (Lesueur); and, Smallmouth bass, *Micropterus dolomieui* Lacepede.

SUMMARY AND CONCLUSIONS

Although the total fish population of the Big Sioux River appears to be quite diverse, it was apparent in our collections that a relatively few species were dominant in most areas. The nature of the aquatic habitat in each sample area, (i.e. gravel riffle, mud pool, rock riffle, sandy pool, etc.) strongly influenced the specific fish population of that area, with abundance of each species determined by combinations of water quality and physical habitat factors. Sand shiners or fathead minnows, followed by emerald shiners, were generally the most abundant fishes, depending upon the particular area. Gizzard shad were most abundant at the extreme lower end of the river. Among larger fishes, carp and bullheads were generally most abundant, followed closely in some areas by white suckers. Redhorse, bigmouth buffalo, and quillback were relatively numerous in particular areas. Among game fish, northern pike and channel catfish were present in sufficient numbers in some areas to provide a sport fishery. Walleye, black crappies, white crappies, and white bass were also present in some areas in sufficient numbers to interest sport fishermen.

The natural barrier of the falls of Sioux Falls combined with water quality factors (pollution) and physical habitat influenced distribution of fishes in the Big Sioux River. Of the 56 species reported in this paper, 22 were not found above Sioux Falls. Only 3 species were found exclusively above Sioux Falls.

Some year-to-year differences were noted also. A sharp difference between 1969 and 1970 collections was noted in section 9, immediately below Sioux Falls. In 1969 when river flow was high, "clean water species", such as creek chubs and common shiners were common in this section, but in 1970, when river flow was relatively low, only pollution tolerant forms such as carp and fathead minnows were found in the upper areas of this section.

Although the fish population of the Big Sioux River is quite diverse and, in most areas, numerous, it was apparent to us in our survey, that the quality of the fish population in terms of desirable game species is adversely affected by poor land use practices on the watershed and by various forms of pollution. If these factors were controlled it appears that an even more diverse fish population and certainly one offering greater recreational potential would exist in the Big Sioux River.

LITERATURE CITED

American Fisheries Society. 1970. *A List of Common and Scientific Names of Fishes,* 3rd edition. Special Publication No. 6.

Bailey, Reeve M., and Marvin O. Allum. 1962. *Fishes of South Dakota.* Misc. Publ. Museum of Zoology, Univ. of Mich., No. 119.

Churchill, Edward P. and William H. Over. 1933. *Fishes of South Dakota* South Dakota Dept. of Game and Fish.

Cleary, Robert E. 1956. The Distribution of Fishes in Iowa. Pp. 267-324, Maps 1-98. In Iowa Fish and Fishing, James R. Harlan and Everett B. Speaker. Iowa Conservation Commission.

Cope, E.D. 1879. A contribution to the zoology of Montana. Amer. Nat. 13:432-441.

Evermann, Barton W. and Ulysses O. Cox, 1896. A Report upon the Fishes of the Missouri River Basin. Rept. U.S. Comm. Fish and Game. 20(1894):325-429.

Meek, Seth Eugene. 1892. A report upon the fishes of Iowa, based upon observations and collections made during 1889, 1890 and 1891. Bull. U. S. Fish Comm. 10(1890):217-248.

Meek, Seth Eugene. 1894. Notes on the fishes of western Iowa snd eastern Nebraska. Bull. U. S. Fish Comm. 14:133-138.

Moen, Tom. 1970. The occurrence of Black Buffalo, *Ictiobus niger* (Rafinesque) in Lake Mitchell, South Dakota. Proc. S.D. Acad. Sci. 49:42-45;

Sinning, James A. 1968. Fishes of the Big Sioux River. M. S. Thesis. S. Dak. State Univ. (Unpublished)