

A Preliminary Report on
THE FOOD OF BULLHEADS

In Certain Lakes of Eastern South Dakota

by

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Ameiurus nebulosus, the brown or spotted bullhead as it is often called, and the **Ameiurus melas**, the black bullhead, were both found in the lakes of eastern South Dakota where specimens were taken for this study. However, **Ameiurus melas** is the form most commonly found in all these lakes.

Because of the high food value and the growing economic importance of the bullhead in South Dakota, the present study was made to obtain definite information as to their food and food habits in this state.

Annual reports from the State Department of Game and Fish show that, among the rough fish seined out of South Dakota waters by licensed fishermen since 1916, the number of pounds of bullheads taken has been second only to the number of pounds of buffalo, and since 1918 has been more than three times as great as the sum total of all other fish.

In 1925, market conditions in the east were such that dressed bullheads were selling in Chicago at 15 to 20 cents per pound. At that time the state department was receiving a profit of 1 to 2 cents per pound which amounted to about \$20,000.

It has been estimated that more people in South Dakota fish for the bullhead than any other single variety of fish and that more bullheads are taken by hook and line for food purposes than are taken by the use of seine and placed on the eastern markets.

The bullhead reproduces in great numbers assuring an abundant supply. It is easily caught; a fact which increases its value to the general public.

South Dakota has recognized the value of bullheads to the extent that the Department of Game and Fish has un-

dertaken the stocking of certain of its streams, lakes and ponds with them. To make the stocking of lakes with bullheads most successful their food must be known. Propagation can not be profitable in lakes where the food supply is insufficient and the fish are in a starving condition.

The lakes from which specimens were taken for study were representative of the lakes of eastern South Dakota. They are located in widely separated parts of that section of the state; Lake Andes, Charles Mix County; Lake Madison, Lake County; Lake Poinsett, Hamlin County; Lake Kampeska, Coddington County; Cottonwood Lake, Spink County; Lake Byron, Beadle County; Sand Lake, Brown County; Clear Lake, Marshall County; North Red Iron Lake, Marshall County; Lake Tetonkaha, Brookings County and Lake Oakwood, a short distance east of Lake Tetonkaha. These eleven lakes were visited in the order in which they are given here.

The specimens were caught by Dr. E. P. Churchill while engaged with Mr. W. H. Over in making a biological survey of these same lakes during the summer of 1926. The material was placed at the disposal of the writer in September.

In the laboratory, the contents of the stomachs and intestines were examined under the binocular microscope, the compound microscope being used for the examination of very small organisms. The contents were identified as nearly as possible and the specimens of each kind present were counted and the number recorded, with other pertinent matter including date caught, length of fish, vegetation in the lake, character of the lake bottom, depth of water, freshness of water, weather conditions, method of taking fish and estimate of abundance of bullheads in the lake, wherever recorder. To obtain accurate knowledge of the food eaten by the bullheads from the lakes mentioned, the alimentary tracts of 106 specimens from these lakes were examined.

The following are examples of the food found in several specimens examined.

Poinsett.—Stomach: Chironomus eggs, trace; Chironomus larvae, 2; Chironomus pupa (in cocoon), 1; *Daphnia longispina*, 3,975; diatoms, numerous; Hydrocarina, 5; Nais,

200; *Potamogeton pectinatus*, 45 cm.; Spirogyra, 1½ cc. Intestine: Chironomus eggs, ½cc.; Chironomus larvae, 163; Chironomus pupa (without cocoon), 1; *Daphnia longispina*, 3,225; diatoms, numerous; Diptera, 1; unrecognizable fragments, 2 cc.; freshwater Oligocheta, 580; Hydrocarina, 58; *Potamogeton pectinatus* 60 cm.; snail, 4 mm., 1; snails, 2 mm., 2; Spirogyra, 8 cc.

Cottonwood—Stomach: Chaetophora, ¼ cc.; Chironomus eggs, 920; Chironomus larva, 1; Cladocera, 2; *Cyclops viridis*, 3; diatoms, a few; Hydrocarina, 1. Intestine: Chaetophora, ¼ cc.; Chironomus larvae, 127; Chironomus eggs, 1,590; Cladocera, 5; Corixidae, 1; *Cyclops viridis*, 12; diatoms, a few; Hydrocarina, 3; *Potamogeton interior* Ryd. roots and stems, partially digested so they were in short pieces, 1½ cc. packed.

North Red Iron Lake.—Stomach: Cladocera, 9; Cladocera eggs, 7; *Cyclops viridis*, 16. Intestine: Cladocera, 5; Cladocera eggs, 6; *Cyclops viridis*, 7; Gammarus, 1; colonial protozoa, 7 small colonies.

Oakwood.—Stomach: Piece of perch used as bait. Intestine: Bivalve ½ mm., 1; Chironomus larvae, 59; *Cyclops viridis*, 4; filamentous algae, trace; unrecognizable fragments, 2 cc.

TABLE I.

Showing Average per cent Volume of Principal Foods.

No. of Lake	1	2	3	4	5	6	7	8	9	10	11	Av.
Amphipoda			7.2	22.	.8		2.4	14.3	4.			4.6
Beetle larvae				3.	2.3			15.	1.	tr	1.1	2.
Bivalves		11.						8.1			tr	1.6
Chaetophora					27.8							2.4
Chironomus larvae	76.	63.	9.		23.1	24.6	1.8	25.2	6.	16.8	52.6	28.
Chironomus pupae	4.	3.			1.	26.1	10.8	2.8		6.8	28.3	7.5
Cladocera			37.6		9.2		tr	10.7	34.4	54.6	tr	13.3
Corixidae				1.	3.4	39.	7.7			tr		4.6
<i>Cyclops viridis</i>					7.		1.6		43.1	18.	tr	6.3
Damsel fly nymph	18.	13.					21.8					4.8
Hydroporus					tr			11.				1.
Mycetobia larvae	1.	1.	5.4	tr							2.	1.
Oedogonium			15.4		6.		tr					2.
Potamogeton			1.2		9.3		28.4	5.7	2.	tr	11.8	5.4
Snails		6.	5.					1.8				1.

The complete data shown that the bullheads have a decided preference for animal food in the form of crustaceans and insect larvae. Brivalve molluscs and snails are quite common in their diet. Depending on the lake, from 89 to 99 per cent of the food eaten by bullheads in the following lakes was animal; Andes, Madison, Clear, North Red Iron, Tetonkaha and Oakwood.

In only three lakes, Poinsett, Cottonwood and Sand had the fish eaten enough plant material to make it an important part of the diet. In Sand Lake, 45 per cent of the stomach content was plant.

Food Habits as Revealed by the Examination

The bullhead is in general, referred to as a bottom feeder. It does feed upon many forms at the bottom it is true, but it has also been seen to feed at the surface and at varying depths wherever food is to be had. Food found in both the stomachs and the intestines of many specimens was grouped or sorted as to kinds as though the fish had eaten of one kind for a time and then passed on to another.

There was a greater proportion of vegetable matter in the intestine than in the stomach which would show that the animal tissue is digested more rapidly, even granting that the bullheads had eaten only equal amounts of animal and plant material, though the stomach content would indicate that more animal food had been taken. Animal food is therefore of more value than plant tissue as food for bullheads.

Bullheads are shore fish. Parent bullheads are usually found in shallow, weedy water and others in deeper water though as a general rule none are far from the shore, in other words, not far from the source of their food supply.

Cladocera and Chironomus larvae and pupae were found to have been eaten by fish at all depths from which specimens were taken and in nearly all the lakes. Other forms were common in a number of lakes. Their quantity in the diet of the bullhead apparently did not depend on the depth of water.

In many places bullheads are looked upon as scavengers of unclean food habits. This is mainly because in those local-

ities unclean animal wastes were dumped into the water. Under these conditions bullheads have no choice of foods but must take what they can get. The evidence gained from this investigation would indicate that as long as our South Dakota lakes are kept clean, that is not allowed to become polluted with refuse, sewage and trade wastes, the bullheads in these lakes will continue to be of the same fine quality as we enjoy at present.

In summary, the facts learned are as follows:

1. Bullheads prefer animal food in the form of insect larvae, pupae and nymphs, crustaceans, bivalve molluscs and snails, but are able to take other foods in the absence of these.
2. Animal food is digested and assimilated more rapidly by bullheads than plant tissue.
3. Bullheads do not eat the eggs and young or other fish except occasionally and in very small quantities.
4. Juvenile bullheads eat practically the same kinds of foods as adults, very small bullheads taking only younger and much smaller animals.
5. The food supply is limited by seasonal conditions.
6. Bullheads select certain foods and reject others.
7. There is insufficient food to support the present number of bullheads both in Lake Tetonkaha and at Lake Oakwood. Fish there were below normal size, were starving and should be moved to other waters.
8. Bullheads are now scarce in Lake Andes where there is abundant food to support this species.
9. Bullheads were found to be eating only clean foods in all our lakes.