

1955

Food of the Freshwater Drum, *Aplodinotis grunniens* Rafinesque, in Four Dickinson County, Iowa, Lakes

Tom Moen

Iowa State Conservation Commission

Copyright © Copyright 1955 by the Iowa Academy of Science, Inc.

Follow this and additional works at: <https://scholarworks.uni.edu/pias>

Recommended Citation

Moen, Tom (1955) "Food of the Freshwater Drum, *Aplodinotis grunniens* Rafinesque, in Four Dickinson County, Iowa, Lakes," *Proceedings of the Iowa Academy of Science*: Vol. 62: No. 1, Article 73.

Available at: <https://scholarworks.uni.edu/pias/vol62/iss1/73>

This Research is brought to you for free and open access by UNI ScholarWorks. It has been accepted for inclusion in Proceedings of the Iowa Academy of Science by an authorized editor of UNI ScholarWorks. For more information, please contact scholarworks@uni.edu.

Food of the Freshwater Drum, *Aplodinotus grunniens* Rafinesque, in Four Dickinson County, Iowa, Lakes

By TOM MOEN

The freshwater drum, *Aplodinotus grunniens* Rafinesque, better known throughout most of the midwest as sheepshead, is the only member of the family Sciaenidae in the midwest. This species has been the object of many arguments among fishermen as to whether it should be classed as a game fish or relegated to the rough fish group (carp, buffalo, gar and etc.). Although sheepshead often take both artificial and live bait, it is the present policy of the fisheries management section of the Iowa Conservation Commission that the competitive aspects of this species outweigh any gain in food or sport that might accrue to the hook and line fisherman. Therefore, these fish are seined from the inland waters of the state by rough-fish-removal crews.

The data presented here form a portion of general study of rough fish and concern an analyses of the stomach contents of 533 sheepshead from four Dickinson County lakes.

DESCRIPTION OF THE LAKES

The four lakes from which sheepshead were collected are a part of a chain of lakes in Dickinson County: Spirit, East Okoboji, West Okoboji, and Lower Gar. These are shallow (maximum depth 26 feet, except West Okoboji which exceeds 130 feet), glacial eutrophic lakes. The surface area varies from 260 acres for Lower Gar to 5,682 acres for Spirit Lake.

METHODS AND PROCEDURE

Collections were made with a wide variety of gear, including gill nets, traps, and various lengths of large and small mesh drag seines. Most of the fish used in this study were collected by drag seines operated by the rough-fish-removal crews. All fish were taken to the laboratory where routine data were recorded. The stomachs were either examined the day of capture or preserved in formalin for later examination.

The food organisms found in each stomach were identified to genera and species where this could be readily accomplished, however, for this report they are grouped into orders and larger divisions. The volume of each species or higher unit of food was measured by displacement to the nearest tenth of a cubic centimeter.

The results of each analysis was recorded by volume and/or occurrence. No volumes were determined for the food of young-of-the-year sheepshead.

The analyses of the 533 sheepshead stomachs can be placed in three groups. The analyses of 352 stomachs taken from the four lakes during the period of 1946-49 are separated by lakes, season and young and adult fish. The food items are expressed as percentages of total volume (where volumes were determined) and as percentages of frequencies of occurrence in tables 1, 2, 3, and 4 in the appendix. Twenty-six stomachs collected during the winter and found to be empty are not included in the tables. The analyses of 155 adult sheepshead stomachs collected in 1940 are discussed in a special section of this paper.

FOOD TAKEN BY 352 SHEEPSHEAD

There are few specific references involving a study of the food taken by sheepshead. Daiber (1952) pointed this out and stated that Forbes (1880) had made the only seasonal analyses of the feeding habits of this species. The results of Forbes' (*op. cit.*) analyses of 29 fish apparently formed the basis of the general statements made by several authors that adult sheepshead feed largely on mollusks, and only occasionally take crustaceans, insects and small fish (Bean, 1903; Baker, 1916; Forbes and Richardson, 1920; Jordon and Everman, 1934; Eddy and Surber, 1943).

The disappearance of an extensive population of clams (*Lamp-silis siliquoides*) from Spirit Lake during the period of 1930-40, has been blamed upon the feeding of sheepshead. While the pharyngeal teeth are well adapted for a diet of mollusks, the bulk of the food taken by the sheepshead examined in this study consisted of insect larvae, fish, and crustaceans, in that order of importance.

Insect larvae were important in the food of sheepshead of all sizes throughout the period of open water, making up 46 per cent of the total food consumed by all adults examined. Insect larvae occurred more frequently in the stomachs of young fish than any other item. Sibley (1928) found insect larvae comprising nearly 100 per cent of the food of eleven sheepshead from one to four inches long. Daiber (*op. cit.*) noted that insects were important in the food of young sheepshead and were used to a large extent beyond the first year. Among the seven orders of insect larvae identified from the stomachs, the larvae of Diptera, largely Tendi-pedidae, and Trichoptera contributed nearly 75 percent of the total insect volume. Nymphs of the orders Neuroptera, Ephemeroptera, and Hemiptera were less important; their combined volume exceeded ten per cent of the insect volume in only three collections.

Fish comprised 32 per cent of the combined volume of food of the adult sheepshead. During mid-summer there was an increase in the volume and occurrence of fish taken as food and they constituted the most important item of food for adults in July and August. This feeding trend coincides with the peak of abundance of young fishes each summer. Fish were found only occasionally in the food of young sheepshead. Young of the pan fish species supplied the bulk of the piscivorous diet, with the following species identified: yellow perch, *Perca flavescens* (Mitchell); bluegill, *Lepomis macrochirus macrochirus* Rafinesque; black crappie, *Pomoxis nigromaculatus* (LeSueur); and black bullhead, *Ameiurus melas melas* (Rafinesque). Forage fish taken were unidentified darters and minnows. No young of the rough fish species were noted. Dendy (1946) observed that fish were important in the food of the Norris Reservoir sheepshead, with larger individuals showing an accelerated growth rate as they reached a size where young fish could be handled as a food item. Only 7.8 per cent of the adult sheepshead from western Lake Erie had taken fish (*Daiber, op. cit.*).

Crustaceans ranked third in overall importance, contributing 12 per cent of the total volume of food. Small crustaceans (Entomostraca) were not important in the food of adults but occurred frequently in the stomachs of the young. Ewers (1933) in a study of the food of young sheepshead from Lake Erie, found that small crustaceans made up 100 per cent of the diet of fish less than 25 millimeters in length but occurred less frequently as they increased in length. In this study large crustaceans found in the stomachs consisted of the amphipod, *Hyalella azteca*, and crayfish (*Cambarus sp.*). Amphipods occurred frequently but did not exceed seven per cent of the food taken by the fish of any one collection. Crayfish were not frequently taken as items of food but due to their size made up a large portion of the total volume in certain collections, and reached a maximum of 55 per cent of the food of ten fish from Spirit Lake in June of 1947.

Mollusks, commonly thought of as the most important food of the sheepshead (Forbes and others, *op. cit.*), occurred frequently but contributed only slightly more than three per cent of the total volume of food when all collections were combined. Mollusks were more important in the food of carp (Moen, 1953) from the same lakes at the same time. Snails (Gastropoda) were the only mollusks noted in the sheepshead stomachs in spite of the fact that the diet of carp from the same lakes at the same time consisted of one to two per cent fingernail clams (Pelecypoda). There was no evidence of clams or snails being taken by the sheepshead in Lake Erie even though a supply of clams existed that could be utilized as food (*Daiber, op. cit.*). The lack of mollusks in the food of sheepshead in Norris Reservoir was caused by the reduction or near

elimination of mollusks by fluctuations of surface elevation (Dendy, *op. cit.*)

Annelids, mostly leeches, appeared frequently but did not contribute heavily to the diet except in the case of individual fish. For instance, one fish from an East Okoboji collection made in May, 1947, contributed one-third of the food and nearly 100 per cent of the annelids recorded for that collection. This individual had apparently gorged on earthworms, perhaps from some fisherman's discarded bait can.

Free living flatworms (Turbellaria) and water mites (Hydracarina) occurred occasionally but furnished very little in volume.

Plant material in the stomachs of sheepshead was limited to the occasional ingestion of green fragments, filamentous algae, and debris, probably taken in the normal course of feeding. Plant material did not exceed three per cent of the total volume of food in any one collection. The scarcity of plant material in the stomachs would tend to indicate that sheepshead do not seriously disturb normal stands of vegetation while feeding.

WINTER SAMPLES

Twenty-six sheepshead (3 collections) were collected from Spirit Lake during the winter period. The stomachs and intestines were empty. From this limited number of stomachs it appears that there is little or no feeding during the period of ice cover.

FOOD OF 155 ADULTS TAKEN IN 1940

During the summer of 1940 the writer examined 155 adult sheepshead from Spirit Lake, East Okoboji, and West Okoboji Lakes. In the examination of these stomachs the food items were identified and recorded in numbers of organisms per stomach but no volumes were determined. The per cent of volume of each item was estimated, therefore the data were not included in the appendix tables or foregoing discussion.

These fish were collected during the months of July, August and September. The bulk of the diet of 58 sheepshead from Spirit Lake and 26 fish from West Okoboji consisted of young pan fish, amounting to 75 and 95 per cent respectively. Insect larvae, crustaceans, and mollusks contributed the remaining portion. Seventy-one stomachs of sheepshead from East Okoboji contained 95 per cent insect larvae and five per cent crustaceans. Lake surveys indicated that fishes of all kinds, particularly young, were scarce in East Okoboji and abundant in West Okoboji and Spirit in 1940; young fishes were abundant in all three lakes in 1946 and 1947 (table 1). There is no immediate explanation for the poor showing of fish in the diet of East Okoboji sheepshead in 1946.

Table 1

Comparison of the average number of young fish per survey haul (500 feet of $\frac{1}{4}$ inch drag seine) and the per cent of fish in the diet of adult sheepshead taken from East Okoboji, West Okoboji, and Spirit Lakes, summer months of 1940, 1946, and 1947

Year	East Okoboji		West Okoboji		Spirit Lake	
	No. young per haul	Per cent in diet	No. young per haul	Per cent in diet	No. young per haul	Per cent in diet
1940	480	0	2,175	95	7,144	75
1946	6,030	8	5,552	28
1947	5,645	60	3,742	69	14,401	66

SUMMARY

The food habits of 352 sheepshead from four Dickinson County lakes were investigated during the years 1946-49. The results were tabulated by lake, season and for young and adult fish. The food of sheepshead during the period of open water consisted of insect larvae, fish and crustaceans, amounting to 46, 32, and 12 per cent of the total diet respectively.

Insect larvae, mostly Diptera and Trichoptera, were important food items at all times. Young pan fish were the most important food during late summer months, corresponding to their peak of abundance each year. Small crustaceans were more important in the food of young sheepshead, while amphipods and crayfish were the important crustaceans in the food of adults. Mollusks contributed only three per cent of the total diet. Plant material was considered incidental to regular feeding.

Twenty-six stomachs taken during the winter months were empty. Apparently there is little or no food taken during the ice covered period.

The food of 155 sheepshead taken from the same lakes during the late summer months of 1940 indicated that young pan fish were the most important item in the diet of sheepshead from Spirit and West Okoboji. Young pan fish were scarce in East Okoboji in 1940 and as a result 95 per cent of the food of the sheepshead from this lake was insect larvae.

ACKNOWLEDGEMENT

The author wishes to thank the members of the Biology Section Editorial Board and Dr. Kenneth D. Carlander of Iowa State College for their help and suggestions in preparation of the manuscript. The writer also appreciates the help and encouragement given by his associates.

Appendix

Table 1

Early summer food of adult sheepshead from East Okoboji in 1946, 1947, and 1948, expressed as percentages of total volume of food organisms and as percentages of frequencies of occurrence.

Date of Collection	April-May 1946		May 1947		April 1948	
Number of stomachs taken	18		27		26	
Number of stomachs containing food	11		25		24	
Per cent of stomachs containing food	61		93		92	
Total volume of food. (c.c.)	13.4		60.3		36.1	
Weight (lbs) mean range	2.2 1.2-3.7		1.7 1.0-3.4		1.8 1.0-3.7	
	Per cent		Per cent		Per cent	
	Vol.	Occ.	Vol.	Occ.	Vol.	Occ.
ANIMAL	100	100	99	100	100	100
Fish	10	9	4	8	28	4
Game					28	4
Forage			4	8		
Unidentified	10	9	T	8		
Insects	81	100	36	96	66	88
Neuroptera	3	18	2	8	2	4
Ephemeroptera	33	54	4	20	T	12
Odonata			2	4		
Hemiptera	1	18				
Trichoptera	35	36	12	40	T	8
Diptera	9	64	16	76	64	88
Crustacea	9	45	25	92	6	20
Entomostraca	7	9	T	4	T	12
Cladocera	7	9	T	4	T	12
Malacostraca	2	36	25	84	6	8
Amphipods	2	36	3	76		
Decapoda			22	12	6	8
Mollusca			T	8		
Gastropoda			T	8		
Annelida	T	9	32	20	T	8
Hydracarnina			T	4		
Turbellaria			2	4		
PLANT			1	28		
Green fragments			T	4		
Algae (filamentous)			T	8		
Debris			T	16		

Table 2

Mid-summer and late summer food of adult sheepshead from East Okoboji and West Okoboji Lakes in 1946 and 1947, expressed as percentages of total volume of food organisms and as percentages of frequencies of occurrence.

Lake	East Okoboji				West Okoboji			
	June-July 1946		July 1947		Aug.-Oct. 1947		July-August 1947	
Date of Collection								
Number of stomachs taken	32		29		20		17	
Number of stomachs containing food	23		27		18		15	
Per cent of stomachs containing food	75		93		90		88	
Total volume of food (c.c.)	8.5		19.5		27.0		41.1	
Weight (lbs) mean range	0.8 0.4-3.0		1.1 0.1-1.4		1.2 0.9-1.7		1.8 0.8-5.0	
	Per cent		Per cent		Per cent		Per cent	
	Vol. Occ.		Vol. Occ.		Vol. Occ.		Vol. Occ.	
ANIMAL	100	100	98	100	99	100	100	100
Fish	8	13	42	48	72	67	69	27
Game	8	13	12	7	31	39	61	14
Forage					1	6	7	7
Unidentified			30	44	40	39	1	7
Insecta	82	95	49	93	20	72	11	80
Neuroptera	1	9			T	11		
Ephemeroptera	12	22	T	6	1	11	8	53
Odonata	1	4						
Hemiptera	22	52	8	26	T	6	T	7
Coleoptera					6	6		
Trichoptera	25	35	9	59	11	55	5	47
Diptera	21	61	32	70	1	11	1	40
Crustacea	2	18	7	48	7	61	5	27
Malacostraca	2	18	7	48	7	61	5	20
Amphipoda	2	18	7	48	7	61	T	7
Decapoda							5	14
Mollusca	8	13					14	33
Gastropoda	8	13					14	33
Annelida	T	13						
PLANT	T	13	2	37	1	6	T	14
Green fragments			T	3	T	6	T	7
Algae (filamentous)					T	6		
Debris	T	13	2	37			T	7

Table 3

Food of adult sheepshead from Spirit Lake in 1946, 1947, and 1948, expressed as percentages of total volume of food organisms and as percentages of frequencies of occurrence.

Date of Collection	April 1948	May 1946	June 1947	July 1946	July-Aug. 1947
Number of stomachs taken	5	10	10	13	12
Number of stomachs containing food	3	9	9	13	10
Per cent of stomachs containing food	60	90	90	100	83
Total volume of food (c.c.)	3.7	52.2	5.4	56.1	50.3
Weight (lbs) mean	4.7	4.1	2.3	5.0	4.2
range	2.7-5.7	1.4-5.9	0.6-6.5	1.5-8.0	1.4-7.3
	Per Cent Vol. Occ.	Per Cent Vol. Occ.	Per Cent Vol. Occ.	Per Cent Vol. Occ.	Per Cent Vol. Occ.
ANIMAL	100 100	100 100	96 100	97 100	100 100
Fish				28 54	66 100
Game				20 38	57 80
Forage				7 8	1 10
Unidentified				1 8	8 30
Insecta	97 100	59 77	18 100	69 100	20 70
Neuroptera		1 22			
Ephemeroptera		T 22	6 44	11 38	
Odonata		T 11			
Trichoptera	97 100	23 55	12 33	58 85	20 70
Diptera		34 55	T 66	T 15	
Unidentified				T 8	
Crustacea		38 44	61 66	T 23	
Amphipoda		T 22	6 66	T 15	
Decapoda		38 22	55 11	T 8	
Mollusca	3 33		2 22	T 8	14 40
Gastropoda	3 33		2 22	T 8	14 40
Annelida	T 33	3 22	15 11	T 15	T 10
PLANT		T 11	4 11	3 8	T 20
Green fragments		T 11	4 11	3 8	
Algae (filamentous)					T 20

Table 4

Food of young sheepshead from several lakes, expressed as percentages of frequencies of occurrence of food organisms.

Lake	East Okoboji	Spirit Lake	Lower Gar
Date of collection	Oct. 1947	Aug. 1948	Sept. 1949
			June 1948
Number of stomachs taken	23	69	24
Number of stomachs containing food	22	69	23
Total volume of food	Not taken	Not taken	Not taken
Weight (gr.) mean	18	5.2	15.7
range	10-34	2.8-8.2	8.4-18
	Per cent occ.	Per cent occ.	Per cent occ.
ANIMAL	100	94	100
Fish		15	12
Insecta	73	93	100
Neuroptera	9		
Ephemeroptera	9		47
Odonata			4
Hemiptera	9		
Trichoptera		5	57
Coleoptera	4		
Diptera	64	93	100
Unidentified		6	
Crustacea	82	54	52
Entomostraca	82	6	52
Cladocera	82	6	17
Copepoda	9	1	18
Malacostraca	50	49	8
Amphipoda	50	49	8
Annelida	4		
Turbellaria	4		4
PLANT	4		4
Debris	4		4

Literature Cited

- Bean, T. H. 1903. Catalogue of the fishes of New York. Bull. N.Y. State Museum 60. Albany, Univ. of the State of N. Y. 774 pp.
- Baker, F. C. 1916. The relation of mollusks to fish in Oneida Lake. N.Y. St. Coll. Forestry, Tech. Publ. No. 4. 366 pp.
- Daiber, Franklin C. 1952. The food and feeding relationships of the freshwater drum, *Aplodinotus grunniens* Rafinesque in western Lake Erie. Ohio Jr. Sci. 52 (1):35-46.

- Dendy, Jack S. 1946. Food of several species of fish, Norris Reservoir, Tennessee. *Jr. Tenn. Acad. Sci.*, 21 (1) :105-127.
- Eddy, Samuel and Thaddeus Surber. 1943. *Northern Fishes*, (Second edition), University of Minnesota Press. 276 pp.
- Ewers, Lela A. 1933. Summary report of crustaceans used as food by the fishes of the western end of Lake Erie. *Trans. Am. Fish. Soc.*, 63:379-390.
- Forbes, S. A. 1880. The food of fishes. *Bull. Ill. State Lab. Nat. Hist.* 1 (3):18-65.
- and R. E. Richardson. 1920. The fishes of Illinois (Second Edition), *Nat. Hist. Surv.*, Ill. 357 pp.
- Jordan, David Starr and Barton Warren Evermann. 1934. *American Food and Game Fishes*. Doubleday, Doran and Company. 574. pp.
- Moen, Tom. 1953. Food habits of the carp in northwestern Iowa lakes. *Iowa Acad. Sci.*, 60:665-686.
- Sibley, C. K. 1929. Food of certain fishes of the Lake Erie drainage basin. *New York Conservation Dept. Suppl. to 18th ann. Rept.* pp 180-188.

STATE CONSERVATION COMMISSION

OKOBOJI, IOWA