Forage Value of Mississippi Silversides in Lake Texoma

ANTHONY A. ECHELLE[1] and JAMES B. MENSE[2]

University of Oklahoma Biological Station

Introduction

The first specimen of Mississippi silversides, *Menidia audens* Hay, from Lake Texoma was collected by Bonn in 1953; by the summer of 1954 the species was quite common, and by 1959 it was one of the most abundant species in the lake (Riggs and Bonn, 1959). Its abundance in Lake Texoma prompted the present study.

This study is an evaluation of the forage value of *Menidia* in Lake Texoma, based on food habits studies of white bass, *Roccus chrysops* (Rafinesque), (B. B. Moser, unfinished M. S. thesis, University of Oklahoma); white crappie, *Pomoxis annularis Rafinesque,* (Whiteside, 1962); gars, *Lepisosteus* sp., (Echelle and E. B. May, unfinished M. S. theses, University of Oklahoma); and young largemouth bass, *Micropterus salmoides* (Lacepede), done as part of this study.

Methods and Materials

Largemouth bass for food analyses were obtained by seining and electrofishing operations during 1965 and 1966 in the Buncombe Creek arm of Lake Texoma. Electrofishing was done with a boom shocker described by Ming (1964). Collections were made at various times of day and night during all months of the year except December.

A total of 536 young largemouth bass, ranging from 17 to 363 mm total length, were examined, most (73%) of which were collected during May and June. Each kind of food item in the stomachs was enumerated and recorded. Data on food items other than fish were not analysed.

Collections for relative abundance data for the Buncombe Creek arm of the lake were obtained by making one seine haul with a 20-ft, ⅛-inch, ace-mesh seine at each of six stations, once by day and once by night. Collections were made from February through August, 1966. In analysing the data of Table II, each seine haul was treated as one unit of effort.

Results and Discussion

In Lake Texoma, Mississippi silversides began spawning in late March and continued through the month of July (Mense, unfinished M. S. thesis, University of Oklahoma). Whiteside (1962) stated that white crappie spawned in May and June in the lake. Riggs (1955) reported that white bass spawn from April through June, depending on the locality. Largemouth bass in Lake Texoma appear to begin spawning in late April. Based on these spawning dates, *Menidia* apparently is available as food when the young of these game fishes are in their initial fish-eating stages.

Menidia are about 5 mm long at hatching and by September maximum total lengths approximate 85 mm. Adults reach maximum lengths of about 130 mm and have a maximum life span of about 16 months. Ovaries of 37 *Menidia* examined by Mense (loc. cit.) in 1965 and 1966 contained both immature and mature eggs, indicating more than one spawn by individuals. The number of mature eggs per fish ranged from 384 to 2094. Small adult size, coupled with the early and prolonged spawning period and relatively high reproduction rate, make large numbers of fish available to adults as well as young-of-year piscivorous fishes throughout the year.

[1]Supported by the United States Army Corps of Engineers through an Oklahoma Fish and Game Council assistantship.

[2]Supported by Federal Air Project F-16-R through the Oklahoma Fishery Research Laboratory.

Moser (loc. cit.) found *Menidia* to be the predominant food item in white bass 38 to 148 mm, total length. Although less important in larger specimens, silversides were a significant item in white bass of all sizes, and occurred in bass taken in all seasons of the year, with maximum numbers occurring in May and June.

Whiteside (1962) classified *Menidia* as a "miscellaneous food item" in stomachs of 719 white crappie from Lake Texoma. In Buncombe Creek the white crappie occurs primarily at depths exceeding 4 ft (Grinstead, 1965) while *Menidia* rarely reaches depths greater than 5 ft (Mense, loc. cit.). The infrequent occurrence of *Menidia* in crappie stomachs may be explained by the difference in habitat preference of the two species.

Menidia was the most important fish in the stomachs of the largemouth bass we examined, representing 78% of the 290 fish identified to family and occurring in 72% of the stomachs containing identifiable fish (Table I). *Menidia* occurred in largemouth bass as small as 24 mm, and, although insignificant compared with other food items, it represented 90% of the 146 fish identified from bass of less than 50 mm total length.

TABLE I. SEASONAL OCCURRENCE OF FISHES FOUND IN STOMACHS OF 536 LARGEMOUTH BASS TAKEN FROM LAKE TEXOMA IN 1965 AND 1966.

	Menidia	Dorosoma	Centrarchids	Cyprinids
Winter (11) 4*				
frequency	1	3	1	0
number	1	8	1	0
Spring (189) 29				
frequency	24	4	1	1
number	116	4	1	1
Summer (306) 66				
frequency	45	13	9	3
number	107	31	13	6
Fall (30) 1				
frequency	1	0	0	0
number	1	0	0	0
Total (536) 100				
frequency	71	20	11	4
% frequency	71	20	11	4
number	225	43	15	7
% of identified fishes	78	15	5	3

* Numbers in this column refer to the number of stomachs containing identifiable fish; numbers in parentheses refer to the total number of stomachs examined.

Menidia ranging from sac fry to adults were usually found singly in the stomachs of largemouth bass. Instances in which bass were found filled with *Menidia* (e.g., a 30-mm specimen contained 49 sac fry) may have resulted from the schooling behavior of young silversides. Throughout the summers of 1965 and 1966, schools of several hundred young silversides were common near shore. Such schools move through littoral areas in swarms and are relatively easy prey for predaceous fishes resting among the vegetation.

Based on relative abundance data (Table II) *Menidia* may be the most important buffer species in littoral areas of the lake. *Menidia* represented 71% of total number of fish taken and was the predominant species sampled in every month. Because of its abundance, it probably lessens the degree of inter- and intraspecific predation among game fish. Furthermore, studies indicate that the abundance of *Menidia* probably reduces predation on game fish by nongame species such as gars. May (loc. cit.) found that *Menidia* represented 54% of the fish found in adult longnose gar, *Lepisosteus osseus* (Linnaeus). *Menidia* represented 82% of 466 fish found in 386 young gars examined by Echelle (loc. cit.), while only 3% were game species. This is significant since most of these gars were taken from littoral habitats where young largemouth bass were quite common.

Based on this study, *Menidia* appears to be most important as food for those fish that feed in surface waters or in littoral areas of the lake. *Menidia* was important for the white bass, a species that feeds in littoral areas and at the surface in open waters. It was also important for gar and young largemouth bass, but was relatively unimportant for the white crappie, a species of deeper water.

TABLE II. CATCH PER UNIT EFFORT OF SEINING IN LAKE TEXOMA, 1966.

	Winter	Spring	Summer	% of Total
Menidia	7.4	34.3	713.8	71.1
Dorosoma	0.2	5.3	265.4	25.9
Lepomis	0.2	1.1	17.4	1.8
Pimephales	4.9	0.5	5.4	0.6
Notropis	0.3	1.0	2.0	0.3
Micropterus	0.0	0.4	1.0	0.1
Gambusia	0.0	0.0	1.4	0.1
All other	0.0	0.2	0.9	0.1
Units of effort	12	55	71	

LITERATURE CITED

Grinstead, Bobby G. 1965. The vertical distribution of the white crappie, *Pomoxis annularis*, in the Buncombe Creek arm of Lake Texoma. M.S. Thesis, Univ. Oklahoma, Norman.

Ming. Arvil, 1964. Boom-type electro-fishing device for sampling fish populations in Oklahoma's waters. Oklahoma Fish. Res. Lab. Semiann. Rep. (June) :22-46.

Riggs, Carl D. 1955. Reproduction of the white bass, *Morone chrysops*. Invest. Indiana Lakes and Streams 4:87-110.

Riggs, Carl D., and Edward W. Bonn. 1959. An annotated list of fishes of Lake Texoma, Oklahoma and Texas. Southwest. Nat. 4 (4):157-168.

Whiteside, Bobby G. 1962. Biology of the white crappie, *Pomoxis annularis*, in Lake Texoma, Oklahoma. M.S. Thesis, Oklahoma State Univ., Stillwater.