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NOTES ON THE LIFE HISTORIES OF THE SILVERSIDES, *MENIDIA BERYLLINA* (COPE) AND *MEMBRAS MARTINICA* (VALENCIENNES) IN MISSISSIPPI SOUND AND ADJACENT WATER[1]

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ABSTRACT

During the process of a biological sampling program for Mississippi's Estuarine Inventory, data on the spawning season and influx of young were compiled for the two species of silversides found in Mississippi estuarine waters, *Menidia beryllina* (Cope) and *Membras martinica* (Valenciennes). Silversides taken from collections made with seines, beam trawls, plankton nets and dip nets were measured and the condition of the gonads noted. These data, when combined with associated field observations, first revealed ripe male and female *Menidia beryllina* (68 mm to 98 mm) in late March (water temperature 23.9°C) and *Membras martinica* (66 mm to 79 mm) in early April. *M. beryllina* in spawning condition were collected in salinities ranging from 3.6°/oo to 31.5°/oo and water temperatures ranging from 23.9°C to 32.7°C throughout the spring and summer months. Spawning *M. martinica* were collected in salinities from 9.4°/oo to 31.1°oo and in water temperatures from 21.2°C to 30.7°C.

Postlarval atherinids (4.5 mm to 9 mm) were taken in plankton tows in late March and early April. Juvenile *Menidia beryllina* (14 mm) first appeared in early April. Juvenile *Membras martinica* (26-31 mm) were first collected in early May.

These observations from the Mississippi coast parallel those of other workers reporting on atherinid spawning elsewhere along the Gulf and Atlantic coasts of the United States.

INTRODUCTION

Since January, 1966, a research project has been underway at the Gulf Coast Research Laboratory to gather as much information as time, personnel, funds and all other variable factors will permit, concerning the ecology of the estuaries of the Mississippi Gulf Coast. This project is

[1] Conducted in cooperation with the United States Department of Interior, Bureau of Commercial Fisheries, under Public Law 88-309. (Project 2-25-R)

entitled the "Cooperative Gulf of Mexico Estuarine Inventory and Study, Mississippi" and is that state's contribution to the comprehensive "Gulf of Mexico Estuarine Inventory" now being carried out on the Gulf Coast of the United States.

It was during an extensive sampling program undertaken for this project on the barrier islands, in Mississippi Sound and up three of the river systems of the coast of Mississippi, that field observations were made, which led to work incorporated in this paper.

The importance of *Menidia beryllina* and *Membras martinica* to the ecology of Gulf coast estuaries is reflected in their abundance and their value as food for larger fishes. In Florida their abundance in the Cedar Key and Bayport areas is related by Kilby (1955) and in the Caloosahatchee Estuary by Gunter and Hall (1965). On the Texas coast Gunter's (1945) work in the Aransas Bay — Copano Bay area, Renfro's (1958) study in the Aransas River and Baldauf's (1954) survey of the Neches River, all list *Menidia beryllina* as the most numerous species of fish collected in their shallow water seine stations.

The fact that the silversides are utilized as food by some of the important game and commercial fishes of the Gulf Coast, such as the spotted seatrout *(Cynoscion nebulosus)* and red drum *(Sciaenops ocellata)*, was documented by Pearson (1929), Guest and Gunter (1958) and Simmons and Breuer (1962), to name a few. Bayliff (1950) listed seventeen species of fishes which reportedly have fed upon silversides on the United States Atlantic Coast.

Observations of the spawning season and growth of *Menidia beryllina* and *Membras martinica* have been discussed in papers by Reid (1954) about Cedar Key on the west coast of Florida, by Springer and Woodburn (1960) in the Tampa area, by Gunter and Hall (1963), in St. Lucie Estuary, and by Gunter and Hall (1965) in the Caloosahatchee Estuary. Similar work has been done by Gunter (1945) and Renfro (1958) on the Texas Coast. Hildebrand (1922) noted the spawning and described the development of *M. beryllina* near Beaufort, North Carolina. Hildebrand and Schroeder (1928) reported the spawning of both of these species in the Chesapeake Bay region of the Atlantic Coast. All of these papers suggested that these species exhibit protracted spawning periods. More than one spawning peak may occur during a season.

No previous work has been published on the spawning and growth of *Menidia beryllina* and *Membras martinica* collected from Mississippi Sound and its associated waters. This paper is a preliminary report of their spawning seasons and growth in this area in relation to data from Texas, Florida, and the U. S. Atlantic Coast. This report covers the data obtained from the first field observations of ripe adults in early March, 1967 to the end of July, 1967.

METHODS AND MATERIALS

Samples of the various sizes of silversides were collected with five different types of nets. The juveniles and adults were taken with a fifty-foot bag seine, six feet deep, made of 3/16 inch bar nylon webbing, and a similar 100-foot net with 1/4-inch bar mesh. Because of the larger mesh size, small juveniles were able to escape from the larger seine.

Smaller juveniles and postlarval silversides were collected with a fine-mesh beam trawl as described in detail by Christmas, Gunter and Musgrave (1966). Early postlarval forms were collected with a Gulf V high speed plankton sampler. On one occasion a fine-mesh dip net was used off a pier at the Gulf Coast Research Laboratory to catch postlarval atherinids.

The seines were set out parallel to the beach and hauled into the shoreline with the ropes tied to each end. The beam trawl was used to take standard samples covering about 1,958 square feet of bottom as described by Christmas, Gunter and Musgrave (*op. cit.*).

The Gulf V plankton sampler was pulled from a boat for ten minutes in a circle at each station. This net was pulled at stations providing a transect from the high salinity water near the barrier islands, through

progressively lower salinities to the station approaching fresh water near the confluence of the Biloxi and Tchouticabouffa Rivers.

At all stations temperatures were taken with a thermometer reading in increments of 0.1°C. Salinities were obtained from the refractive index of each water sample.

Samples of fishes collected and preserved with formalin in the field were sorted, identified and measured to the nearest mm in the laboratory. Adult silversides were examined and "milked" to determine spawning condition immediately after capture and before they were preserved.

STATIONS

All stations where atherinids were taken by the various gear used are shown in Figure 1. An abbreviated location of each station follows:

Station XD—Pier in front of Gulf Coast Research Laboratory.

Station 1—East Beach of Ocean Springs on Davis Bay.

Station 4—South Side of Little Deer Island.

Station 11—Belle Fontaine Beach near Belle Fontaine Point.

Station 13—North side of Horn Island at "the Horseshoe."

Station 14—Southwest side of Round Island.

Station 18—Henderson Point west of Pass Christian.

Station 22—East end of Horn Island.

Station 31—Lopez Point at confluence of Biloxi River and Tchouticabuffa River

Station 37—Beacon "14" in Harrison County Seaway.

Station 44—East Pascagoula River at Griffin Point.

Station 50—West of Cameron Island in Jourdan River.

Station 61—St. Joseph Point.

Station 64—Kiln Bridge on Jourdan River.

Station 68—Point Aux Chennes, East of Pascagoula, Mississippi.

Station 69—North side of Deer Island near Grand Bayou.

Station 70—West end of Deer Island on North side.

Station XS—Bayou behind Fort Massachusetts on Ship Island.

Stations 1, 4, 11, 13, 31 and 35 were sampled twice a month with the 50-foot seine. Stations 18, 44, 50, 61, 64 and 68 were sampled once a month with the 50-foot seine. The 100-foot seine was used once a month at stations 13, 14, 22, 69 and 70.

Twice a month sampling was carried out at stations 1, 4, 11 and 13 with the beam trawl. The Gulf V plankton sampler was operated once a month and atherinids were caught only at stations 31 and 37 of the six stations on the transect.

Station "XD" was sampled with a long-handled, fine-mesh dip net on one occasion. Station "XS" was sampled with the 50-foot seine only one time.

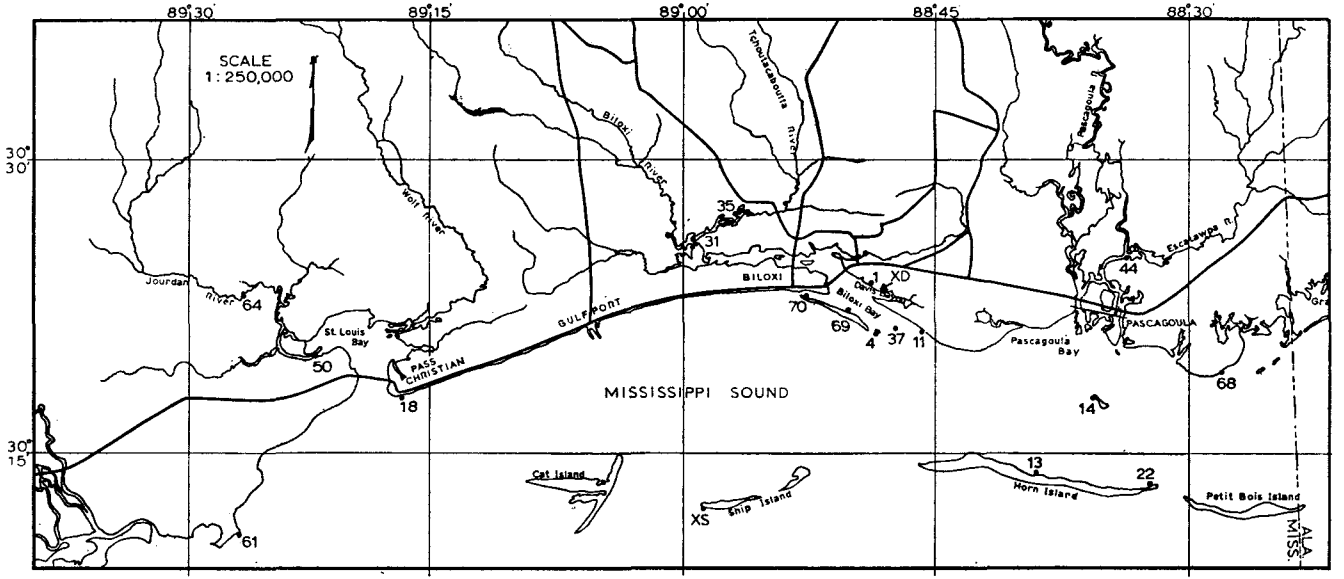

Figure 1. Mississippi Sound and adjacent waters showing stations at which silversides were collected.

RESULTS AND OBSERVATIONS

The data on the catches of silversides made with the various gear types and the associated water conditions were compiled to be presented in the following manner. First, all observations of ripe adults were listed in chronological order, along with the station at which captured, the number collected, the size range, the salinity, temperature and the gear type used. (Table 1). The same form was followed with postlarval silversides (Table 2), juveniles (Table 3) and spent or sexually mature (but not ripe) adults (Table 4). It is important to note that in many instances the size ranges presented under a category such as "juveniles," showed overlapping so that "adults" were obviously present. When this was the case, the collection exhibiting this overlapping size range was repeated in the other category (i.e. "adults" also. The deliniation of the various categories ("postlarval," "juvenile" etc.) followed the criteria described by Hubbs (1943). The exact borders between any two categories were rather arbitrarily set on the basis of microscopic exami-

TABLE 1 — RIPE ADULTS

This table lists only the stations (by date) at which at least some of the individuals caught were ripe adults (over 50 mm). The columns indicating the number of individuals and the size ranges of each species included *all* specimens collected.

Note that in some cases juveniles (not ripe) were taken along with ripe adults.

				Menidia beryllina		*Membras martinica*		
					Size Range*		Size Range*	
Date (1967)	Sta. No.	Temp. in °C	Sal. in °/oo	No. Indv.	Total length (mm)	No. Indv.	Total length (mm)	Grear** Type(s)
March 22	1	23.9	19.4	6	68-98	..	..	6
April 5	1	28.4	19.4	11	60-101	1	71-71	6
April 5	4	27.7	22.5	2	96-114	3	66-79	6
April 6	31	26.4	9.2	5	45-55	..	..	6
April 6	35	27.3	3.6	21	71-91	..	..	6
April 10	XS	24.0	31.5	9	51-105	..	..	6
April 19	1	27.8	16.1	..	....	1	77-77	6
May 5	11	21.2	21.1	..	....	4	82-84	6
May 11	44	24.1	2.2	61	29-101	..	..	6
May 17	1	26.8	16.4	4	67-99	..	..	6
May 17	4	26.1	16.9	1	85-85	..	..	6
May 17	11	28.2	17.2	..	....	7	69-81	6
May 17	13	26.2	22.2	..	....	2	86-100	6
May 24	50	24.0	9.4	..	....	1	86-86	6
May 25	61	25.0	8.1	33	40-98	..	..	6
May 31	1	28.2	21.9	1	72-72	..	..	6
May 31	11	27.8	24.1	5	64-87	..	..	6
June 12	1	31.6	20.0	31	43-73	..	..	1&6
June 12	11	30.7	17.8	..	....	56	33-103	6
June 13	4	32.7	22.2	2	91-96	..	..	6
June 13	13	28.3	28.3	20	29-96	..	..	6
June 14	31	31.3	10.0	26	35-82	..	..	6
June 14	35	28.2	6.1	24	45-87	..	..	6
June 28	13	30.0	28.0	32	57-103	..	..	6
July 6	69	29.4	24.4	13	50-65	..	..	9
July 11	11	27.7	25.3	..	....	24	47-68	6
July 11	13	30.0	31.1	..	....	12	63-72	6
July 14	13	27.9	30.3	..	....	18	61-101	9
July 14	14	28.2	22.5	..	....	10	51-79	9
July 18	18	24.2	21.1	..	....	1055	26-72	6
July 18	61	26.5	19.2	..	....	9	63-70	6
July 25	4	28.6	24.9	..	....	10	59-95	6
July 25	11	29.2	24.7	..	....	18	53-71	6

*Includes all specimens collected whether all were spawning or not.
**"1"—BPL; "6"—50-ft. seine; "7"—Gulf V, "9"—100-ft. seine.

TABLE 2 — POSTLARVAE

This table lists only the stations (by date) at which at least some of the individuals caught were postlarvae. These postlarvae (4 mm to 11 mm) were identifiable only to family Atherinidae.

Note that in one case * the number of individuals (total number collected) and size range included: 7 postlarvae (8 mm-11 mm), 13 juveniles (12 mm-23 mm) and 2 spent adults (76 mm and 80 mm).

Date (1967)	Sta. No.	Temp. in°C	Sal. in. °/oo	No. Indiv.	Size Range Total length (mm)	Gear** Type(s) used
March 22	1	23.9	19.4	13	6.0-9.0	1
April 7	31	25.7	10.0	4	4.5-6.0	7
April 7	37	24.7	21.9	1	9.0-9.0	7
April 19	1	27.8	16.1	22	8.0-80.0*	1

*Includes postlarvae, juveniles and spent or mature adults (but not ripe).
**"1"—"BPL"; "7"—Gulf V.

TABLE 3 — JUVENILES

This table lists only those stations (by date) at which at least some of the individuals collected were in the category of juveniles (12 mm-49 mm). The columns indicating the number of individuals and the size ranges included *all* specimens collected.

Note that in some cases postlarvae, adults or postlarvae and adults were taken along with juveniles.

				Menidia beryllina		*Membras martinica*		
					Size Range*		Size Range*	
Date (1967)	Sta. No.	Temp. in °C	Sal. in °/oo	No. Indv.	Total length (mm)	No. Indv.	Total length (mm)	Grear** Type(s)
April 5	1	28.4	19.4	1	14-14	..	..	1
April 6	31	26.4	9.2	5	45-55	..	..	6
April 19	1	27.8	16.1	22	8-80	..	..	1
April 21	XD	28.1	12.8	1	15-15	..	..	D
April 26	31	27.5	6.7	13	29-62	..	..	6
April 26	35	26.9	3.3	46	22-95	..	..	6
May 5	1	21.0	18.6	7	34-99	2	26-31	6
May 5	4	22.8	19.4	..	....	421	19-34	1
May 11	44	24.1	2.2	61	29-101	..	..	6
May 17	1	26.8	16.4	..	....	42	30-44	6
May 17	4	26.1	16.9	1	31-31	..	..	6
May 18	31	28.2	7.8	70	31-44	..	..	6
May 24	18	22.7	13.3	..	....	60	26-101	6
May 24	50	24.0	9.4	138	33-88	..	..	6
May 24	61	25.0	8.1	33	40-98	..	..	6
May 31	1	28.2	21.9	..	....	12	35-45	6
May 31	11	27.8	24.1	1	32-32	7	29-43	1&6
June 12	1	31.6	20.0	29	43-73	17	37-50	6
June 12	11	30.7	17.8	..	....	56	33-103	6
June 13	4	32.7	22.2	..	....	7	36-49	6
June 13	13	28.3	28.3	20	29-96	..	..	6
June 14	31	31.3	10.0	26	35-82	..	..	6
June 14	35	30.0	6.1	24	45-87	..	..	6
June 26	68	31.8	22.8	15	36-56	1	48-48	6
June 28	11	32.5	20.8	1	47-47	..	..	6
June 28	13	30.0	28.0	..	....	243	45-67	6
July 6	69	29.4	24.4	..	....	155	47-84	9
July 11	11	27.7	25.3	..	....	24	47-68	6
July 18	18	25.2	21.1	..	....	1055	26-72	6
July 19	50	27.0	12.8	10	44-50	..	..	6
July 25	1	27.0	22.2	..	....	13	49-69	6

*Includes all individuals collected at each station, postlarval, adult, as well as juveniles.
**"1"—BPL; "6"—50-ft. seine; "9"—100-ft. seine; "D"—dipnet.

TABLE 4 — SPENT AND MATURE ADULTS (NOT YET RIPE)***
This table lists only those stations (by date) at which at least some of the individuals collected were either spent or mature adults (not yet ripe). The columns indicating the number of individuals and the size ranges included all specimens collected.

Note that in some cases postlarvae or juveniles were taken along with the spent and mature adults.

Date (1967)	Sta. No.	Temp. in °C	Sal. in °/oo	*Menidia beryllina* No. Indv.	*Menidia beryllina* Size Range* Total length (mm)	*Membras martinica* No. Indv.	*Membras martinica* Size Range* Total length (mm)	Grear** Type(s)
March 8	1	17.8	16.1	6	64-91	..	..	6
March 9	31	19.5	4.2	19	53-88	..	..	6
March 22	4	20.9	21.9	..	....	9	53-76	6
March 22	13	18.5	27.8	1	93-93	..	..	6
March 23	31	19.9	8.9	9	50-78	..	..	6
April 19	1	27.8	16.1	24	8-90	..	..	1&6
April 26	31	27.5	6.7	13	29-62	..	..	6
April 26	35	26.9	3.3	46	22-95	..	..	6
May 5	1	21.0	18.6	7	34-99	..	..	6
May 24	18	22.7	13.3	..	....	60	26-101	6
May 24	50	24.0	9.4	138	33-88	..	..	6
May 24	64	25.1	2.2	1	73-73	..	..	6
June 12	1	31.6	20.0	..	....	17	37-50	6
June 26	68	31.8	22.8	15	36-56	..	..	6
June 28	13	30.0	28.0	..	....	243	45-67	6
July 6	69	29.4	24.4	..	....	155	47-84	9
July 10	70	29.0	26.6	..	....	292	55-92	9
July 11	1	31.5	24.1	2	57-62	1	54-54	6
July 11	4	32.0	27.8	1	72-72	3	60-62	6
July 14	13	27.9	30.3	1	104-104	..	..	9
July 14	22	28.7	29.4	3	65-106	..	..	9
July 19	50	27.0	12.8	10	44-50	..	..	6
July 25	1	27.0	22.2	7	55-65	13	49-69	6
July 26	31	30.7	12.2	4	57-72	..	..	6

*Including some juveniles and postlarvae collected with certain samples.
**"1"—BPL; "6"—50-ft. seine; "9"—100-ft. seine.
***Adults which were either spent or had fully developed gonads but were not in spawning condition.

nation of the gonads of a variety of sizes, correlated with manual measurement of their total lengths. The limits for postlarval forms were arbitrarily set at 4.0 mm (approximately the smallest size collected) and 11 mm. Those specimens from 12 mm to 49 mm resembled the adult form but generally were found to have only developing gonads, so they were classed as juveniles. Those specimens grouped as adults were from 50 mm to the largest one collected, 114 mm. These arbitrary limits were found to be useable for both *Menidia beryllina* and *Membras martinica*, although it is recognized by the author that the relationship between size and sexual development may vary from one population to another and may depend on locality, temperature variations, salinity variations or other factors.

DISCUSSION

Ripe Adults

Menidia beryllina with mature (but not ripe) or spent gonads were first collected March 8 (Table 4). Ripe adults were obtained first on March 22 at a temperature of 23.9°C and a salinity of 19.4/oo (Table 1). The catch of ripe adults tapered off about April 10, but after a short period of cooler weather around May 5 (water temperature dropped to 21.2°C), the catch of spawning adults resumed on May 11, as the water temperature rose to 24.1°C. This spawning activity was evident in most samples from May 11, to July 6 and then dropped off to inactivity throughout the rest of July. Spawning was evident at temperatures from 23.9°C to 32.7°C and at salinities from 3.6°/oo to 31.5°/oo. During

the lulls in spawning (April 10 to May 11, and July 6 to July 25 or later) many adults either spent or not yet ripe were collected.

Results obtained in this five-month study generally concur with those of Gunter (1945) in Texas, who took developing and ripe *M. beryllina* from February 17 to August 18 in two peaks. Reid's (1954) study near Cedar Key, Florida showed breeding fish being collected in March and July, but observations indicated an extended breeding season. The obvious difference here was the lack of ripe *M. beryllina* in July in Mississippi Sound (Table 1). In southern Florida, Gunter and Hall (1963, 1965), and Springer and Woodburn (1960) all noted that the chief spawning period involves two or three peaks in the spring and early summer. This is generally what is documented in the data presented in Tables 1 through 4. Hildebrand (1922) found about the same spawning period (March to September) in Beaufort, North Carolina. Hildebrand and Schroeder (1928) captured ripe adults from April 10 to September 19, 1921 in Chesapeake Bay, and Rubinoff and Shaw (1960) noted ripe specimens in June and July in the Cape Cod area.

All of these Atlantic Coast studies show generally comparable spawning seasons to those in this study. Further work must be done to determine the extent of *M. beryllina* spawning in the late summer, throughout the autumn, and winter and into the early spring in Mississippi Sound before more detailed comparisons to other areas can be made.

Membras martinica with fully developed gonads, which were either not ripe or spent, were obtained in the 50-foot seine on March 22 (Table 4). Ripe males and females were first observed and collected April 5 (Table 1). Adults were collected in spawning condition from that date (April 5) generally through May 24. With only one exception (June 12), there was a lull in spawning activity from May 25 to July 11. This lull was accompanied by the collection of a large number of spent and mature (but not ripe) adults (Table 4). Beginning July 11 and continuing through the last samples on July 25, ripe individuals were examined from six of seven stations (eight of a total of nine seine hauls) at which *M. martinica* were caught. Spawning was evident in water with a temperature range of 21.2°C to 30.7°C and a salinity range of 9.4°/oo to 31.1°/oo.

Gunter (1945) in Texas noted ripe males and females *M. martinica* in March and April, 1942. In Florida, Reid (1954) took ripe females only in March. The results of this Mississippi Sound study show spawning adults from April through the end of May and a second "peak" throughout all of July. Data on later months was not available at this time (as previously explained). In Chesapeake Bay, Hildebrand and Schroeder (1928) also noted a protracted spawning season lasting from May through August.

Postlarvae

Identification of specimens in this category was certain only to family level (Atherinidae). Postlarvae from 4.5 mm to 9 mm were collected by beam trawl and Gulf V plankton sampler from March 22 to April 19 (Table 2). Temperatures at collection sites ranged from 23.9°C to 27.8°C, while salinities varied from 10.0°/oo to 21.9°/oo. None of the papers discussed previously mentioned silversides of postlarval size. The possibility of some of the postlarvae taken at station 1 on March 22 being *Menidia beryllina* is discussed in the section entitled "Juveniles."

Juveniles

The first juvenile *Menidia beryllina* (14 mm) collected appeared in a sample taken April 5 (Table 3). This catch at station 1 followed a March 22 catch of postlarval atherinids (6 mm to 9 mm) at the same station (Table 2). These data, when combined with the fact that juvenile *Membras martinica* were not taken until May 5 at station 1, led to the probability that at least some of the postlarvae collected on March 22 were

Menidia beryllina.

The smallest juvenile *Menidia beryllina* (14 mm to 22 mm) were taken from April 5 to April 26 in temperatures of 26.4°C to 28.4°C and salinities of 3.3°/oo to 19.4°/oo. Juveniles up to 36 mm were taken until

June 26 in water temperatures of 21.0°C to 31.8°C and salinities of 2.2°/oo to 23.8°/oo. Those forms (40 mm to 47 mm) approaching the arbitrary upper limit (49 mm) of juveniles, were collected from April 6 through July 29 in temperatures of 21.0°C to 32.5°C and salinities of 2.2°/oo to 28.3°/oo.

These data generally agree with the previously discussed papers (Gunter 1945, Reid 1954, Gunter and Hall 1963 and 1965) in showing juveniles appearing in samples throughout the spring and summer.

Juvenile *Membras martinica* ranging from 19 mm to 34 mm in total length were first collected May 5. From this date through July 25 there was no actual lull in the collection of juveniles. As seen in Table 3, the minimum size of the ranges listed was progressively increasing with each passing month. The minimum range from 19 mm to 30 mm in early May, from 29 mm to 37 mm in late May and early June and from 45 mm to 49 mm (with only one as low as 26 mm) from late June throughout July. The spawning peak apparent throughout July (see Table 1) would probably show itself by an influx of juveniles about August and September. Juveniles were collected in water with temperatures of 21.0°C to 32.7°C and salinities of 13.3°/oo to 28.0°/oo.

These data agree well with Gunter and Hall (1965) who reported juveniles (23 mm) in the Caloosahatchee Estuary, Florida, in May 1957 and May 1958. Further agreement is found in Gunter (1945), who found the sizes corresponding to the arbitrary limits chosen for juveniles from May throughout the summer and fall. Reid (1954) showed evidence of juveniles in March which does not correspond with these data (Table 3).

CONCLUSIONS

1. It is evident, even from this limited study, that the spawning, postlarval presence and juvenile presence agrees in general terms with the observations made by other authors on the Gulf and Atlantic Coasts. Only slight differences are noted for both *Menidia beryllina* and *Membras martinica* from the observations of other authors.

2. The results tend to indicate that salinity does not have much influence on the spawning or entry of postlarvae and juveniles into Mississippi Sound and adjacent waters.

3. Temperature may have some effect on the time when spawning begins in both species. Possibly, rising water temperatures trigger the spawning mechanism.

4. Further work should definitely be done in order to study variations over a full year (or two years) and to try to determine what effect such extrinsic factors as vegetation, bottom type, turbidity, photoperiodicity, current and especially moon phase and tide (as evidenced in the related grunion) have on spawning seasons of both species.

5. Above all, it is a foregone conclusion that this five-month study is only a preliminary one.

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LIFE HISTORY STUDY OF THE RIVER REDHORSE, *MOXOSTOMA CARINATUM* (COPE), IN THE CAHABA RIVER, ALABAMA, WITH NOTES ON THE MANAGEMENT OF THE SPECIES AS A SPORT FISH

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ABSTRACT

Severe reduction in number of river redhorse, *Moxostoma carinatum* (Cope), has occurred in Alabama and the southeast during recent years. The Cahaba River is one of the last strongholds for this species in Alabama. Electrical shocking equipment was utilized during this study. Two hundred eighty-six adult river redhorse were captured, tagged, and returned to the Cahaba River.

Redhorse were observed spawning on gravel shoals during April, 1966 and April, 1967 with water temperatures ranging from 71°F. to 76° F. Egg counts made on river redhorse ranging in size from 17.9 inches to 22.1 inches total length revealed a range from 6,078 to 23,085 eggs per individual, respectively. Pond-reared river redhorse exhibited slower growth than those in natural habitats. River redhorse fed heavily on the Asiatic clam, *Corbicula spp.* Present utilization of the river redhorse as a sport fish is light.

INTRODUCTION

From a review of the literature it is apparent that relatively little is known about the river redhorse, *Moxostoma carinatum* (Cope). Most of the work conducted with this species is concerned with its identification and occurrence.

Severe reduction in number or extirpation of the river redhorse from areas of former abundance has been noted by several authors (Harlan and Speaker, 1951; Hubbs and Lagler, 1957; Trautman, 1957). This trend is also occurring in Alabama. The species has constituted as high as 24.3 percent of the total weight of fish collected in rotenone samples of Alabama streams.[1] They have not been recorded in similar studies of these same areas following impoundment and inundation of the river habitat.[2,3] Although reliable records of earlier abundance are generally lacking for many areas of Alabama, it is apparent that the river redhorse has suffered severe reduction in number and possible extirpation over much of its former range within the state. One exception is the Cahaba River where the species is still found in abundance.

The river redhorse has fine potential as a sport fish because of its relatively large size, palatability, and stamina. It was felt that there was need for more knowledge of this disappearing redhorse before initiating any greatly increased exploitation. The Cahaba River offered an excellent opportunity for study of this fish.

DESCRIPTION OF STUDY AREA

The study area for this project was the Cahaba River in the central portion of Alabama. The headwaters of the Cahaba River are located in the northeastern portion of Jefferson County near Birmingham, Alabama. The river flows in a southwesterly direction and joins the Alabama River near Selma, Alabama (Figure 1). The Cahaba River Basin com-

[1] Alabama Department of Conservation, Report for Fiscal Year October 1, 1957-September 30, 1958. p. 134.
[2] Ibid. October 1, 1962-September 30, 1963. pp. 110-111.
[3] Ibid. October 1, 1963-September 30, 1964. pp. 119-120.