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INTRODUCTION

During a 1973-89 biological, water-quality study of the Perdido Bay drainage in Alabama and Florida, the senior author (RDS) collected large numbers of silversides which were initially identified as *Menidia beryllina.* However in April 1985, he collected many *Menidia* that exhibited two distinctive patterns of nuptial coloration. Closer examination of these individuals in the laboratory revealed that the samples contained two *Menidia* species. *Menidia beryllina* was consistently collected from lower salinity waters at two sample sites in upper Perdido Bay; *M. peninsulae* was consistently collected from higher salinity water at two sites in lower Perdido Bay. The goals of this paper are to: present morphological and meristic features used to distinguish *M. beryllina* from *M. peninsulae* in Perdido Bay; discuss population structure and apparent habitat preferences of each species; and finally, to compare and contrast results of this study with two other studies of *Menidia* (Middaugh and Hemmer, 1987, 1992) completed in the Pensacola Bay drainage, which lies a short distance eastward of the Perdido Bay drainage in northwest Florida.

The systematics, ecology, and habitats of *Menidia* have been studied in great detail by numerous workers, including Kendall (1902), Jordan and Hubbs (1919), Hubbs and Raney (1946), Gosline (1948), Schultz (1948), Rubinoff and Shaw (1960), Robbins (1969), Johnson (1973), Johnson (1975), Chernoff et al. (1981), Lucas (1982), and Duggins et al. (1986). Although these resources provide a wealth of information for a comprehensive summary, we only extracted limited material to support our findings in Perdido Bay.

In our perusal of the literature, we noted that Kendall (1902) and Chernoff et al. (1981) stated that Goode and Bean's (1879) original description was based on specimens from Pensacola, Florida (= *peninsulae*) and Lake Monroe, Florida (= *beryllina*). Although Goode and Bean mentioned they had numerous specimens, [USNM] No. 21,870, from Lake Monroe, FL (page 148) a comparison of the Diagnosis, which immediately followed, matches very closely the data presented in tabular form on page 150, where only two specimens from Pensacola Bay were cited. Therefore, we conclude that the original description was based primarily, if not exclusively, on the two type specimens that Goode and Bean designated as [USNM] Nos. 21, 481a and 21,481b.

METHODS

In July 1973, RDS initiated a sampling program to examine the effects of discharge from the Perdido River, Elevenmile Creek, Bayou Marcos, an unnamed bayou, and Herrion Bayou (Bridge Creek) on water quality and aquatic life in upper and lower sections of Perdido Bay. Two sampling sites were established in upper Perdido Bay in Escambia County, Florida. One site was located at the mouth of an unnamed bayou (sec. 14, T. 2 S., R. 31 W.) where Florida Hwy 298 closely parallels the shore line, and the other at the boat ramp on Herrion Bayou (sec. 25, T. 2 S., R. 31 W.) at U.S. Hwy 98 crossing (Fig. 1). Two additional sites were established in lower Perdido Bay area. The first site was located on the south side of Du Pont Point (sec. 3, T. 3 S., R. 32 W) in Escambia County, Florida. The other site located in Baldwin County, Alabama, approximately 800 m north of Red Bluff (sec. 16, T. 8 S., R. 6 E.)

A total of 31 samples was collected at each of the four (two upper and two lower) study sites from July 1973 through July 1988. Eleven samples of each 31-sample set were collected in January; 14 were collected in July; and lesser numbers were taken in April (3), August (1), and October (2). Five additional fish samples were obtained in January 1989. Three were obtained from upper Perdido Bay area: near the mouth of Elevenmile Creek, from Grassy Point, and from Double Point. Two samples were obtained from near the mouth of Perdido Bay: one at Bear Point and the other at Inerarity Point. One additional sample was used that had been collected from along the Alabama side of lower Perdido Bay on 7 May 1965.

Samples were collected with a 16-ft (4.87 m) shrimp trawl at two stations in upper Perdido Bay. One station was located approximately 800 m north of the mouth of Herrion Bayou; the other was midway between Grassy and Double Point. One trawl station was located in lower Perdido Bay, midway in the bay west of Du Pont Point. No further details of trawling stations is pertinent to the discussion in this paper.

Most samples at seine stations were collected with a nylon seine that was 10 ft (3.05 m) long, 6 ft (1.82 m) high (or deep), and had 3/16 in (0.48 cm) ace mesh. A few samples were collected with bag seines. One bag seine was 40 ft (12.19 m) long and had 1/4 inch (0.64 cm) mesh in the bag and 3/8 inch (0.95 cm) mesh in the wings. The other was 100 ft (30.48 m)

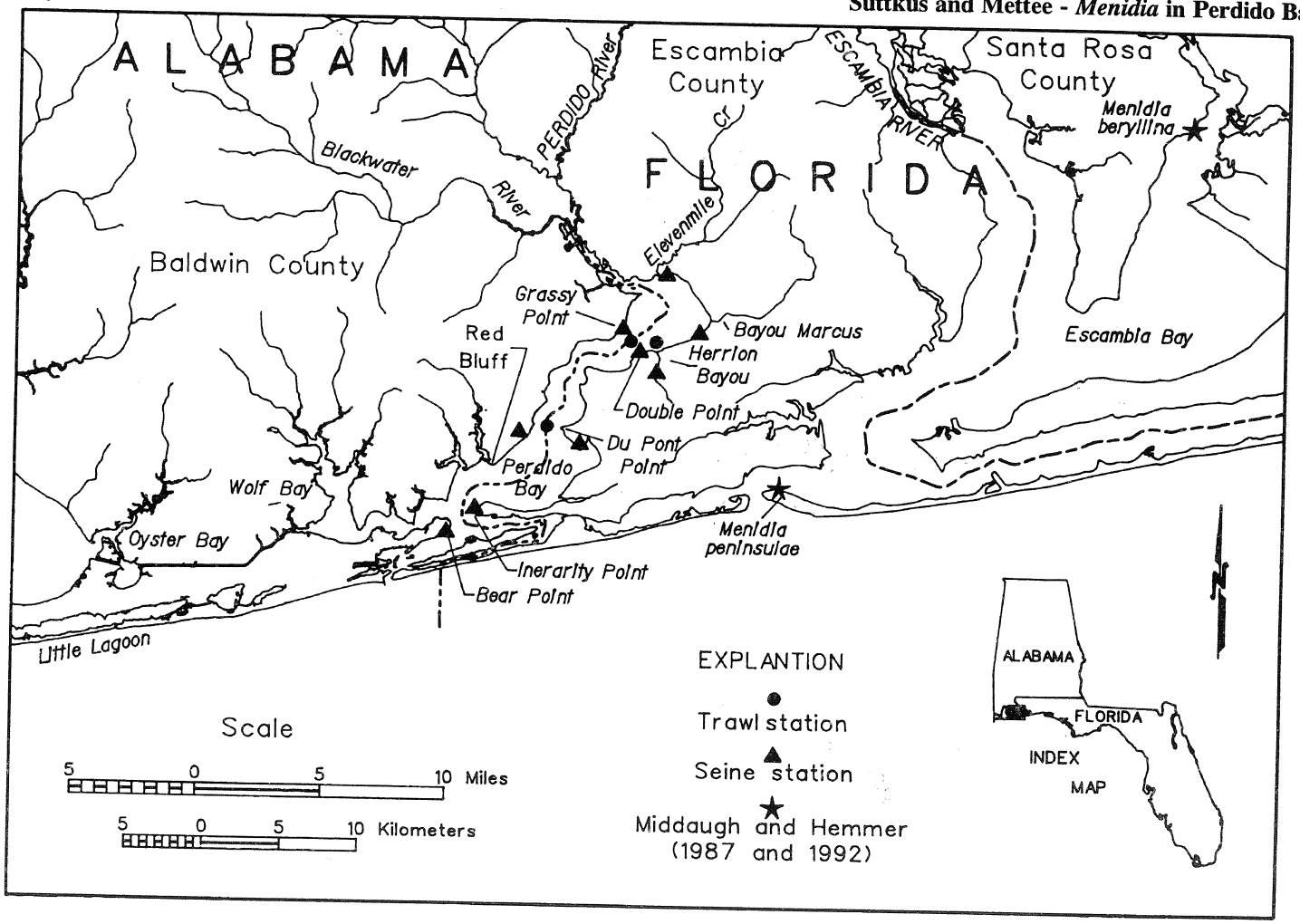

Figure 1. *Menidia* collecting localities used in this study.

long and had 3/8 inch (0.95 cm) mesh in bag and 1/2 inch (1.27 cm) mesh in the wings. The latter seine was used only at DuPont Point and Red Bluff.

With few exceptions, entire samples were preserved in the field and transported to Tulane University Museum of Natural History for processing. A few extremely large samples taken by seine or trawl had to be subsampled in the field, but all species and specimens were recorded and tabulated before any specimens were discarded. A few larger individuals of Atlantic stingrays, *Dasyatis sabina*, and longnose gar, *Lepisosteus osseus*, were identified and subsequently released unharmed because they were too large for preservation. Some trawl samples containing many small specimens of a few species were subsampled in the laboratory; however, all species and specimens were recorded before they were discarded.

Of the 130 seine samples from Perdido Bay, 102 contained specimens of either *M. beryllina* or *M. peninsulae*. All specimens of *Menidia* used for this report were preserved and accessioned into the Tulane University Museum of Natural History (TU). Accession numbers and inclusive numbers of specimens used for the present paper are as follows: *Menidia beryllina*, TU 82865 (452), TU 88990 (2), TU 89028 (400), TU 92118 (53), TU 94829 (323), TU 96879 (22), TU 98660 (99), TU 100809 (1), TU 102998 (15), TU 103006 (364), TU 105486 (17), TU 108613 (176), TU 111472 (106), TU 113906 (1962), TU 116055 (74), TU 117533 (167), TU 117631 (631), TU 120092 (8), TU 122285 (22), TU 122292 (30), TU 124341 (146), TU 124362 (9), TU 131506 (18), TU 133765 (135), TU 136060 (238), TU 136071 (78), TU 140173 (3), TU 140180 (4), TU 141899 (1), TU 141907 (679), TU 145947 (310), TU 145952 (181), TU 146990 (135), TU 147352 (100), TU 148357 (17), TU 149188 (351), TU 150272 (202), TU 151908 (2), TU 151917 (53), TU 152756 (173), TU 152765 (242), TU 154237 (84), TU 154256 (25), and TU 154266 (47) (total = 8,157 specimens). *Menidia peninsulae*: TU 71826 (89), TU 82880 (16), TU 82888 (287), TU 89002 (27), TU 89014 (842), TU 92141 (14), TU 92150 (114), TU 94982 (39), TU 94996 (323), TU 96886 (17), TU 98687 (222), TU 98698 (9), TU 100826 (33), TU 100829 (103), TU 102974 (41), TU 102989 (235), TU 105501, TU 105507 (11), TU 108682 (6), TU 108692 (139), TU 111498 (12), TU 111501 (18), TU 113934 (2), TU 113948 (3121), TU 116092 (151), TU 116094 (77), TU 117623 (1), TU 122331 (179), TU 122341 (137), TU 124365 (499), TU 131484 (31), TU 131493 (2), TU 133205 (2), TU 136137

(20), TU 136146 (16), TU 140229 (1), TU 140237 (20), TU 141935 (13), TU 141948 (81), TU 145999 (3), TU 147030 (169), TU 147038 (35), TU 147689 (275), TU 147694 (141), TU 148384 (53), TU 148388 (44), TU 149218 (187), TU 149229 (26), TU 150313 (23), TU 150331 (107), TU 151328 (77), TU 151335 (23), TU 151983 (6), TU 151989 (2), TU 152804 (16), TU 152811 (30), TU 154216 (243) and TU 154227 (129) (total = 8,682).

Eleven proportional measurements were taken to the nearest 0.1 mm with dial calipers and were expressed in thousandths of standard length (SL). Morphometrics were taken on 100 specimens each of *M. beryllina* and *M. peninsulae;* each species set included specimens in nuptial condition. Pectoral and anal fin ray counts and predorsal scale counts were made on 200 specimens of *M. beryllina* and 400 specimens of *M. peninsulae* following methods in Hubbs and Lagler (1958). Gill raker counts were made on the first, left gill arch (total count) of 250 specimens each of *M. beryllina* and *M. peninsulae*.

Standard analytical equipment was used to determine several different water-quality parameters. A hand-held Taylor Instrument Company Centigrade pocket thermometer was used to measure water temperature (C). Chlorides were determined to the nearest mg/l in freshwater using the standard Hach Chemical Company procedure which involved premeasured chemicals in powder pillows in titration with standard mercuric nitrate solution. Salinity as parts per thousand (ppt) was determined in brackish water using a Yellow Springs Instrument (YSI) Company Model 33S-C-T salinometer.

RESULTS AND DISCUSSION

All *Menidia* collected during the early years of this survey were initially identified as *M. beryllina*. However In April 1985, several series of *Menidia* were collected that exhibited two distinctly different patterns of nuptial coloration. On 5 April 1985, ripe males and females were collected at both upper Perdido Bay sites that were heavily pigmented on the fins and body with a rather uniform overlay of brassy-olive and had no bright yellow or orange anywhere on the fins or body. These were determined to be *Menidia beryllina*. The water temperature was 22 C and the salinity 2.29 ppt at the unnamed bayou and the water temperature was 21 C at Herrion Bayou.

On 6 April 1985, ripe males and females were collected at Du Pont Point in lower Perdido Bay. *Menidia* collected at these sites had a lighter and more silvery appearance than individuals from the upper bay sites and they had bright orange coloration at the base of the pectoral fins and in the axil of the same fin. Also, the caudal fin was a bright lemon yellow, especially the base. These were determined to be *Menidia peninsulae*. A review of our field notes revealed that in some cases the coloration of the pectoral fin base was noted but not of the caudal fin and so we do not know the consistency of the dual coloration of both fins. The water temperature at DuPont Point was 20 C and salinity was 7.0 ppt.

Similarly, on 16 April 1987, ripe males and females of *M. beryllina* were taken at the unnamed bayou and Herrion Bayou in upper Perdido Bay. Water temperature was 23 C at both sites; salinity was 2.0 ppt at the unnamed bayou site. On 17 April 1987, nuptial (squeeze ripe) individuals of *M. peninsulae* were obtained at the two lower bay sites. Water temperature was 22 C at both Du Pont Point and Red Bluff, but salinity varied from 7.2 ppt at Du Pont Point to 8.0 ppt at Red Bluff. Nuptial coloration patterns on *Menidia* collected in upper and lower Perdido Bay in mid-April were consistent with those collected at the upper and lower sites in early April.

All individuals of *Menidia* collected from Perdido Bay during the survey were reexamined to determine if the distinctive color patterns noted in April collections were habitat influenced or they actually reflected discrete, previously observed, differences in species identity. Although laboratory work produced moderate (depth of body and caudal peduncle) to slight differences in morphometrics (Table 1), pectoral and anal fin ray counts and predorsal scale counts (Table 2), considerable overlap of these parameters provided little information for reliable separation of these two *Menidia* species in our samples. The same was not true, however, with regard to gill raker counts (Table 3). Although some overlap was observed, modal gill raker counts ranged from 22-23 (mean = 22.2) for *M. beryllina* and from 25-26 (mean = 25.6) for *M. peninsulae* and no single sample exhibited bimodality in gill raker counts.

Thus, the distinctive color pattern and salinity relationships of *Menidia* in the April collections, did indeed, coincide with the identification of two species. All 102 Perdido Bay (upper and lower) samples were checked for gill raker counts. All samples from upper Perdido Bay contained only individuals of *M. beryllina*, whereas those samples, with two exceptions, from lower Perdido Bay contained only *M. peninsulae*. The aforementioned two exceptions were as follows: On 17 July 1980, 631 *M. beryllina* were taken at Du Pont Point. No *M. peninsulae* were identifiable in the samples. The water temperature was 32.5 C at the time of collection and the surface salinity a short distance out in the bay was 3.6 ppt which was the lowest salinity of the 31 corresponding measurements recorded between July 1973 and July 1988 at the DuPont Point site. On 9 January 1982 when the water temperature was 13.5 C, nine specimens of *M. beryllina* were taken at the Red Bluff site. No other atherinids were taken with the *M. beryllina* at the site on that date. On that date, the surface salinity a short distance out in the bay was 3.9 ppt. These data, although few, indicate that the two species, *M. beryllina* and *M. peninsulae*, in Perdido Bay area, do segregate on the basis of salinity.

Table 1. Measurements in thousandths of standard length for *Menidia beryllina* and *M. peninsulae*.

Measurements	*Menidia beryllina* (N= 100) Range	Mean	S.D.	*Menidia peninsulae* (N= 100) Range	Mean	S.D.
Standard length (mm)	52.9 - 83.0	66.2	7.6	48.5 - 110.2	72.7	15.7
First dorsal origin to snout tip	484 - 544	515	11.4	485 - 554	519	13.7
Second dorsal origin to snout tip	639 - 683	660	9.5	640 - 702	675	11.8
Anal origin to snout tip	541 - 600	573	12.3	582 - 630	604	10.5
Pelvic insertion to snout tip	369 - 417	392	9.1	389 - 454	409	11.7
Anal origin to caudal base	399 - 463	439	12.5	390 - 437	416	10.4
Head length	227 - 258	240	6.0	225 - 274	248	13.3
Head depth	114 - 134	125	3.9	125 - 156	138	8.7
Orbit length	63 - 81	72	3.7	58 - 89	72	7.6
Snout length	69 - 96	77	4.0	71 - 90	80	4.0
Body depth	141 - 175	160	8.1	162 - 209	192	8.8
Caudal peduncle depth	67 - 84	76	3.7	76 - 101	87	5.8

Table 2. Frequency distributions for pectoral and anal fin ray and predorsal scale counts in *Menidia beryllina* and *M. peninsulae* from Perdido Bay, Florida and Alabama.

Species	Meristic Character						N	Mean	S.D.
		Pectoral Fin Rays							
	12	13	14	15	16				
M. beryllina	1	50	126	23			200	13.8	1.02
M. peninsulae		62	213	115	10		400	14.2	0.71
		Anal Fin Rays							
	14	15	16	17	18	19			
M. beryllina	1	27	65	78	23	6	200	16.5	1.31
M. peninsulae	19	115	176	73	15	2	400	15.9	1.09
		Predorsal Scales							
	14	15	16	17	18				
M. beryllina	1	44	110	42	3		200	16.0	0.71
M. peninsulae	28	135	181	49	7		400	15.6	1.02

Table 3. Frequency distribution for gill rakers in *Menidia beryllina* and *M. peninsulae* from Perdido Bay, Florida and Alabama.

Species	Gill Rakers										N	Mean	S.D.
	20	21	22	23	24	25	26	27	28	29			
M. beryllina	9	62	82	72	23	2					250	22.2	1.04
M. peninsulae				8	40	65	76	42	17	2	250	25.6	1.25

Repeated sampling at the two upper (unnamed and Herrion) and two lower (DuPont Point and Red Bluff) sites in Perdido Bay revealed some interesting species associations and habitat relationships. A total of 68 *Membras martinica* was taken in five of 31 collections at the unnamed bayou site while a total of 6,654 *Menidia beryllina* was taken in 28 of 31 collections. Both species were taken in four of the 31 collections. Four collections containing *Membras martinica* were obtained during July surveys and the remainder (a single specimen) was taken on 21 April. A total of 601 brook silverside, *Labidesthes sicculus*, was taken in eight of the 31 collections at Herrion Bayou while a total of 707 *Menidia beryllina* was taken in ten of the 31 collections. Both species were taken together only once (11 July 1984) when the water temperature was 31 C. This sample contained 29 *L. sicculus* and 78 *M. beryllina*.

Three species of atherinids were obtained in 31 collections from the Du Pont Point site in lower Perdido Bay. A total of 250 *Membras martinica* was taken in 13 of the 31 samples while 6,594 *Menidia peninsulae* was taken in 28 of the 31 collections. On 17 July 1980, 631 *Menidia beryllina* were taken at Du Pont Point.

Three species of atherinids were obtained in the 31 collections from the Red Bluff site. A total of 110 *Membras martinica* was taken in seven collections and 1,608 *Menidia peninsulae* was taken in 27 collections. On 9 January 1982, nine specimens of *M. beryllina* were taken at the Red Bluff site as stated above when the water temperature was 13.5 C and the surface salinity a short distance out in Perdido Bay was 3.9 ppt.

The separate January 1989 survey resulted in the collection of 156 *Menidia beryllina* from three sites along the shore of upper Perdido Bay and 372 *Menidia peninsulae* from two sites near the outlet of lower Perdido Bay.

Allopatric distributions of *M. beryllina* in upper Perdido Bay and *M. peninsulae* in lower Perdido Bay appear strongly influenced by a north to south salinity gradient which may, in turn, be affected by the unique shape of Perdido Bay itself. In January, salinities in the upper bay area ranged from 0.3 to 10.5 ppt while in the lower bay area, they ranged from 3.5 to 17.0 ppt. Correspondingly in July, salinities ranged from 0.1 to 9.8 ppt in the upper bay and from 2.0 to 21.5 ppt in the lower bay. April, August and October salinities varied from station to station, but in general, they were lower in the upper bay than in the lower bay. A description of surface and bottom current patterns in Perdido Bay, particularly in the constricted area of Perdido Bay near Chagrin and Cummings Points, are detailed in a 1970 study by the Federal Water Pollution Control Administration.

Results of our morphological examinations and our observation of an apparent allopatric distribution of *M. beryllina* and *M. peninsulae* along a salinity gradient in Perdido Bay are, at least in part, substantiated by reports on *Menidia* species completed by earlier workers in other areas. Kendall (1902) noted that "Although the different forms [of *Menidia*] when mixed together are readily distinguishable by the eye, it is difficult to represent their differences by measurements or figures." Johnson (1975) stated, "Differences between *M. peninsulae* and *M. beryllina* are statistically clear, but difficult to express in terms of individuals." He also said, "Although *M. beryllina* is broadly sympatric with both *M. peninsulae* and *M. menidia*, it is usually not taken with these species, due to differences in distribution with respect to salinity." The fact that we never took both *Menidia beryllina* and *M. peninsulae* in the same seine haul nor at the same sampling site during the same sampling period seems to substantiate Johnson's foregoing statement.

In referring to *Menidia menidia*, Kendall (1902) wrote, "They swim in immense schools, fish of about the same size generally being found together." We observed that most individuals in schools of *Menidia peninsulae* were also rather uniform in size. Most *Menidia beryllina* taken in our April samples were also of a uniform size. However, by 1 July 1988, we collected several schools of *Menidia beryllina* that contained juvenile individuals in addition to ripe males and females.

Our findings, that allopatric distribution of *M. beryllina* and *M. peninsulae* in our samples appeared related to north to south salinity gradients in Perdido Bay, differed considerably from two other studies completed by Middaugh and Hemmer (1987 and 1992) in the Pensacola Bay drainage, which lies immediately east of Perdido Bay. Middaugh and Hemmer (1987) reported they collected both *M. beryllina* and *M. peninsulae* at Santa Rosa Island. Ninety-nine specimens (presumably of *M. beryllina*) were eliminated from the study because the ratio of the horizontal distance from the origin of the first dorsal and anal fins in millimeters (herein called HD) to standard length in millimeters (SL) was <0.7 (Chernoff, et al. 1981). Middaugh and Hemmer (1992) also eliminated a small percentage of *Menidia* specimens (presumably *M. peninsulae)* from their study sample of *M. beryllina* in Blackwater Bay because the HD/SL was equal to or > 0.7 (Chernoff, et al. (1981). A second feature used to separate the two species concerned gas bladder structure. Echelle and Mosier (1982) found that the gas bladder in *M. beryllina* is long and translucent; in *M. peninsulae*, it is truncated and opaque.

In contrast to Chernoff, et al. (1981) and Middaugh and Hemmer (1987 and 1992), the HD/SL ratio did not appear to be a reliable character to separate *M. beryllina* and *M. peninsulae* on individuals collected from Perdido Bay. The first dorsal and second dorsal fin origins, the anal fin origin, and the pelvic fin insertion all appeared farther posterior on *M. peninsulae* than in *M. beryllina* but again as with all other proportions cited above, there was considerable overlap between the two species with respect to each proportion (Table 1). We support the view of Edwards, et al. (1978) that the position of the extension of the air bladder is not an absolute reliable feature for distinguishing between *M. beryllina* and *M. peninsulae*.

Several workers have commented on male to female ratios within various *Menidia* species, including *beryllina* and

peninsulae. Hildebrand (1922) made observations on living and fresh material in the vicinity of the biological station at Beaufort, North Carolina, from April 1914 into August 1916. With special reference to *Menidia menidia*, he stated that, "It was learned from the examination of large collections that the ratio of males to females is about equal." He followed this with a profound statement: "It so happens, however, for unknown reasons, that at times a school which consists almost wholly of females is taken, and again the reverse is true." Could Echelle and Mosier (1982) have observed this same phenomenon 60 years after Hildebrand (1922)? Kendall (1902) examined 250 specimens of a sample of 380 *M. menidia* and identified 204 females versus 146 males. Rubinoff and Shaw (1960) found only 12 males in a sample of more than 200 adult *M. beryllina*.

Conover and Heins (1987) presented data that sex determination in progeny of *Menidia menidia* is temperature-dependent and that at low temperatures (15 C), three distinct modes result: 50/50 male and female; all female; or nearly all male. Further, they went on to say that significant fluctuations in sex ratio had been observed in field populations, but they postulated that fluctuations would cancel out because the adults breed en masse. We believe that *M. peninsulae* may follow a similar behavioral and developmental pattern as described for *M. menidia*.

Middaugh and Hemmer (1987) stated that the gonado-somatic indices of *M. peninsulae* at the Santa Rosa site were highest at increasing water temperatures from 16.7 to 30.8 C, mean = 25.9 C. We observed *M. peninsulae* spawning or determined individuals to be in nuptial condition at three different times in April with water temperatures of 20 to 22 C. One additional observation of *M. peninsulae* in nuptial condition was made on 12 January 1989 at Inerarity Point, Lower Perdido Bay, when water temperature was 20 C. The observations and water temperature coincide with those stated by Middaugh and Hemmer (1987) with regards to *M. peninsulae*. Spawning of *M. beryllina* in upper Perdido Bay was observed four different times in April with water temperatures that ranged from 21 to 23 C. An additional observation on 1 July 1988, a few large *M. beryllina* in a large school were determined to be ripe. Water temperature was 29.5 C about a mile out in the bay at the time of the observation and thus spawning activity of *M. beryllina* in Perdido Bay were similar to those reported by Middaugh and Hemmer (1992) for Blackwater Bay. We have included these few data to help document some of our following statements.

Conover and Heins (1987) demonstrated that the sex ratio in *Menidia menidia* was primarily temperature dependent and little affected or unaffected by photoperiod and salinity. We believe temperature, salinity, perhaps photoperiod, and additional factors play an important role in the development and hatching success of spawned *Menidia* eggs. Both *M. beryllina* and *M. peninsulae* spawn in the intertidal zone where there are plants for attachment of the eggs. The upper tidal zone is perhaps the optimum subzone (Middaugh, 1981) because of the strength and duration of tidal currents and the lapping of wind-generated waves that continually move or agitate the vegetation with the attached eggs. Moreover, surface diffusion of oxygen is greatest in this shallow, often turbulent zone. Certainly developing embryos are subjected to numerous ebb and flood tides, on and offshore wind turbulence, and diurnal changes in temperature and salinities. All of these variables interacting with different intensities on spawned masses at different sites along the shoreline would obviously result in variation in development and hatching time. Thus, with an environmentally plastic form, the end result is a highly variable morphology.

We have a strong belief that the two species (*M. beryllina* and *M. peninsulae*) do not occur together in the same school or aggregation in Perdido Bay. One would have expected, if co-occurrence was typical, occasional, or even a rare event, that in more than 100 samples taken in a period of 16 years, we would have taken both species in a least one sample, however this was not the case. The primary factor of separation seems to be salinity.

Our conclusion with regard to identification of the two species, *beryllina and peninsulae*, is that the overall appearance (color, body depth, caudal peduncle depth, and so forth) should be sufficient to allow experienced workers to identify the species of *Menidia* when schools of individuals are sampled. Size, spawning colors, and color pattern are additional features for identification of spawning adults and gill raker counts of a sub-sample of any large sample should be sufficient to verify identification based on general appearance.

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ERRATUM

In the article "Distribution and habitat affinities of the blackmouth shiner (*Notropis melanostomus*) in Mississippi, including eight newly discovered localities in the Upper Pascagoula River Drainage" that appeared in *Southeastern Fishes Council Proceedings 36* (March, 1998), the second sentence of the abstract incorrectly referred to the species as being "federally listed as threatened". The sentence should read as follows:

"Because of its limited distribution, the species is listed as imperilled by the Mississippi Natural Heritage Program and as threatened by the American Fisheries Society (Williams et al. 1989)."

Southeastern Fishes Council
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The primary purpose of the *Proceedings* is to publish peer-reviewed research papers and critical reviews of activities; regional reports and notes; and other pertinent information pertaining to the biology and conservation of southeastern fishes. The *Proceedings* is also an outlet for range extensions, distributions, and status papers, covering ecology and conservation ichthyology. Life history studies, faunal surveys, management issues, behavior, genetics and taxonomy of southeastern fishes are appropriate topics for papers in the *Proceedings*. Review papers or information on imperiled waters or fishes are particularly appropriate.

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