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Contributions to the Ecology of the Mysid Crustaceans in the Shallow Waters of Dauphin Island, Alabama

Richard F. Modlin
University of Alabama, Huntsville

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Short Papers and Notes:

CONTRIBUTIONS TO THE ECOLOGY OF THE MYSID CRUSTACEANS IN THE SHALLOW WATERS OF DAUPHIN ISLAND, ALABAMA

Recent publications by Stuck *et al.* (1979a,b) enriched the systematic knowledge of the shallow-water Mysidacea in the northern Gulf of Mexico. However, ecological information on this group is limited to a single synoptic study done by Price (1976). Therefore, the objectives of this research were to examine species composition, spatial distribution and ecology of the shallow-water mysids in the vicinity of Dauphin Island, Alabama.

MATERIALS AND METHODS

Specimens were obtained by pushing a 0.3 m wide D-ring dip net with a 1.0 mm^2 mesh over the sediments from the shoreline to a depth of 1.3 m. To insure that most burrowing species were collected,the upper 1.0 cm of the substrate was disturbed while the net was pushed. Collecting sites were visited during the months of May through September at irregular intervals for a period of three years. Samples were fixed in a 10% sea-water-Formalin solution and stained with Rose Bengal to facilitate sorting.

Species were identified from the description of Stuck *et al.* (1979b). All specimens were sexed and their total length was measured with an ocular micrometer. Total length was the distance from the tip of the rostrum to the tip of the telson. Only those gravid females with full brood pouches were used for counts of eggs and larvae. Brood size was determined from counts of eggs and larvae scraped from the brood pouches. Characteristics specified by Modlin (1979) were used to designate the stage of larval development: Stage I, embryonic cuticle present, eye pigment absent; Stage II, embryonic cuticle and eye pigment present; Stage III, embryonic cuticle absent, but with large dorsal yolk mass; Stage IV, dorsal yolk mass greatly reduced.

Salinity and water temperature were measured with a Yellow Springs Instrument SCT meter. The condition of the sea surface at various times during the period of study was compared to the Beaufort Scale to estimate the magnitude of wave action in the collection areas (Von Arx 1962). Plant species and sediment composition at each collecting site were recorded.

DESCRIPTION OF COLLECTING AREAS

Qualitative samples of mysids were collected at 21 sites selected to examine a variety of microhabitats in the shallow waters around Dauphin Island. Collection sites are shown in Figure 1. Only those salinities and temperatures measured during the period of study are reported.

A 1. Mobile Bay. Beach habitat; substrate, sandy; wave action, 0.3-1.5 m; salinity, 10-17 ‰; water temperature, 25-28° C.

B 1-4. Dauphin Bay, collecting sites were situated offshore of *Spartina alterniflora* and *Juncus roemerianus* beds. Semi-protected bay; substrate, sand, silt and oyster shells; wave action, 0.0-0.3 m; salinity, 8-15 ‰; water temperature, 27-32° C.

C 1-6. Mississippi Sound. C 1-4, beach habitat; substrate, sandy; wave action, 0.3-1.0 m. Site C 5, offshore of *S. alterniflora* marsh; substrate, sand-silt; wave action, 0.0-0.3 m. Site C 6, substrate, shell-gravel; wave action, 0.3-1.0 m. Salinity and temperature at all sites were 15-17 ‰ and 25-27° C, respectively.

D 1-4. Pelican Bay. Beach habitat;

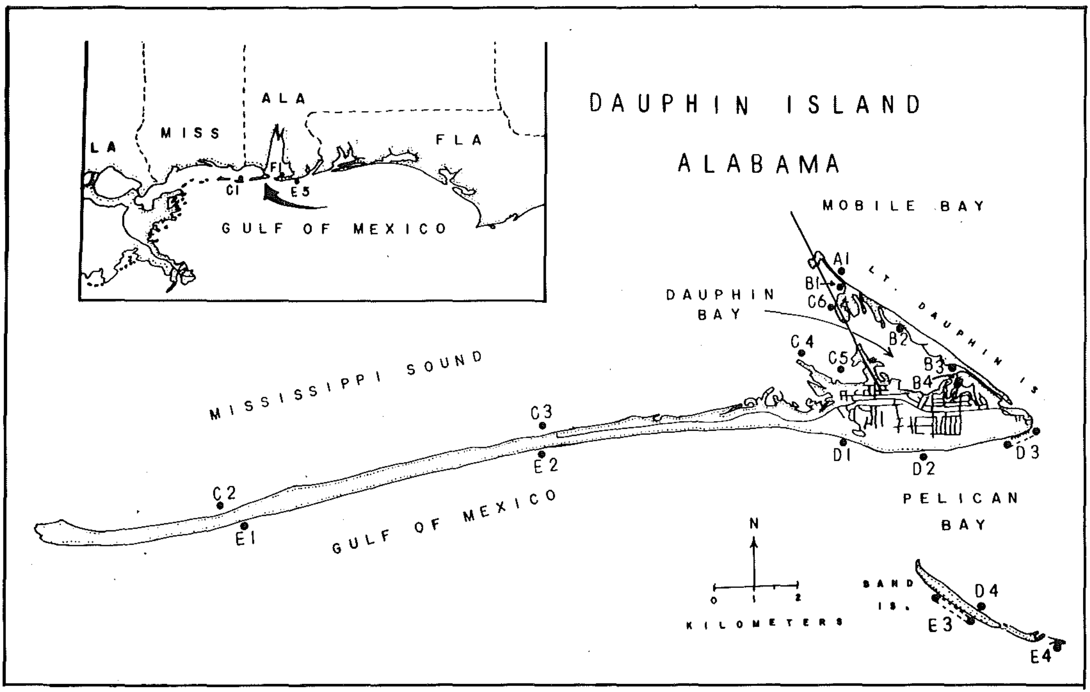

Figure 1. Locations of the mysid collecting sites in the waters of Dauphin Island, Alabama, and vicinity.

substrate, sandy; wave action, 0.3-1.0 m; salinity, 17-21°/oo; water temperature, 25-27° C.

E 1-5. Gulf of Mexico. Beach habitats; substrate, fine to coarse sand; wave action, 1.0-2.0 m; salinity, 22-29°/oo; water temperature, 25-27° C.

F 1. Bon Secour Bay. Clay beach; substrate, clay overlaid with suspended leaf litter; wave action, 0.3-1.0 m; salinity, 5°/oo; water temperature, 30° C.

RESULTS

Five species of mysids, totaling 2190 individuals, were collected. *Mysidopsis almyra* accounted for 44.5% of the specimens collected, *Bowmaniella brasiliensis* and *B. floridana* together accounted for 41.4%; *Metamysisdopsis swifti*, 11.3% and *Mysidopsis bigelowi*, 2.8%.

Mysidopsis almyra inhabited semi-protected areas in Mississippi Sound, Mobile Bay and Dauphin Bay. They were collected at Sites A 1 (64 males-55 gravid females-142 non-gravid females-109 juveniles), B 1 (7-1-18-4), B 2 (3-9-5-22), B 3 (0-0-0-5), B 4 (40-5-27-16), C 2 (30-0-18-11), C 3 (36-0-41-26), C 4 (1-0-4-8), C 5 (56-15-44-50), C 6 (14-2-25-22), D 3 (2-0-2-0), D 4 (23-0-11-0), E 1 (0-1-0-1) and F 1 (1-0-3-0).

In July 31.4% of the brood pouches of gravid *M. almyra* females contained eggs, 45.7% had Stage I larvae; 6.1%, Stage II larvae and 16.8%, Stage III larvae. Gravid females were most abundant at sites A 1, 69%, and C 5, 19%. An average of seven eggs or larvae were carried per female (range 3-15).

Average total length and range, respectively, for males was 4.2 mm and 3.4 to 5.3 mm; for gravid females, 4.9 mm and 3.8 to 6.2 mm; and for juveniles, 2.7 mm and 2.3 to 2.9 mm.

Identification of the two *Bowmaniella* spp. could only be made on mature males (Stuck *et al.* 1979b). This was unfortunate because the majority of individuals collected were juveniles and females, 67.5% and 26.8%, respectively. A second frustration was that mature males of both species usually occurred in the same collections. Therefore, individuals of the two populations intermixed. Because of this, partitioning of the specimens in the genus *Bowmaniella* into species was not possible.

Bowmaniella spp. were most abundant in Pelican Bay and at locations along the Gulf of Mexico. They were obtained at collecting sites A 1 (0 males-4 gravid females-2 non-gravid females-5 juveniles), B 2 (0-1-0-2), B 3 (2-0-2-0), B 4 (5-1-4-2), C 1 (0-0-2-3), C 2 (4-2-6-8), C 3 (2-3-3-23), C 4 (1-4-1-7), C 5 (0-1-0-0), C 6 (0-0-0-11), D 1 (0-0-0-19), D 2 (2-1-2-14), D 3 (24-75-44-163), D 4 (0-11-78-55), E 1 (3-23-7-141), E 2 (0-0-42-32), E 3 (1-36-12-113), E 4 (1-2-0-9) and E 5 (0-3-0-0). Mature males of *B. brasiliensis* were collected at sites B 3 (2 males), B 4 (5), C 3 (2), C 4 (1), D 2 (1), D 3 (11), E 1 (3), E 3 (1) and E 4 (1). *Bowmanelliella floridana* males were collected at sites C 2 (4), D 2 (1) and D 3 (13).

Gravid females were 38.4% of the *Bowmaniella* spp. These were most numerous in June and July of each study year. Eighty-five percent of the brood pouches contained either eggs, Stage I or Stage II larvae. Stage III and Stage IV larvae were carried by the remaining 15%. Brood pouches contained an average of 27 eggs or larvae and their range was 23 to 34.

Total lengths of mature males of both species differed. *Bowmaniella brasiliensis* averaged 6.1 mm with a range from 5.9 to 6.4 mm and *B. floridana* was 5.7 mm, range 5.0 to 7.0 mm. Gravid females of both species averaged 8.0 mm and ranged from 7.2 to 9.2 mm.

Metamysidopsis swifti were collected at sites E 1 (83 males-68 gravid females-47 non-gravid females-0 juveniles), E 2 (17-3-9-5), C 1 (1-0-0-0), D 3 (1-0-0-2), E 3 (0-1-2-0), E 4 (4-3-1-0) and E 5 (0-0-1-0). Gravid females were collected only in the July samples. Eggs were carried by 24.6% of these females, Stage I larvae by 42.0%, Stage II larvae by 27.5% and Stage IV by 5.9%. Females averaged four (2-6) eggs or larvae per brood pouch. Total lengths of both the mature male and gravid female were the same, 3.5 mm and range from 3.3 to 3.8 mm.

All the *Mysidopsis bigelowi* collected were immature. The largest concentration of individual was at site C 3 (24 males-20 females-15 juveniles). One male was collected at site C 1 and a male and female were in the collection from site D 3. Total length was not measured because the specimans were immature.

DISCUSSION

Taxonomic characteristics described by Stuck *et al.* (1979b) are useful in the identification of Mysidacea from the waters around Dauphin Island. However, the 972 adult and juvenile *M. almyra* examined had four to six long apex spines on the telson rather than the six to eight indicated by Stuck *et al.* (1979b). Likewise, Price and Vodopich (1979) reported four to five such spines on specimens from St. Johns River, Florida. It appears that numbers of spines may vary with population, season or age. Therefore, care should be taken in the identification of *M. almyra*. This single characteristic can cause the confusion of *M. almyra* with *M. bahia*, a species commonly collected in the northern Gulf of Mexico (Stuck *et al.* 1979a). Close attention must then be paid to the number of spines located posterior and medial to the statocyst on the dorsum of the uropod endopodia.

Price (1976) showed that the total length of gravid *M. almyra* and *M. swifti* females varied with season; smallest in summer and largest in winter. Gravid females of these species from the Dauphin Island area were, on the average, smaller in the summer than those specimens collected in locations farther south. Summer-collected *M. almyra* from the St. Johns River averaged 5.0 mm (Price & Vodopich 1979). They were 5.3 mm off Galveston Island, Texas (Price 1976). Females of *M. swifti* were 4.8 mm around Galveston Island (Price 1976) and 5.3 mm along Ft. Meyers Beach, Florida (Modlin, unpublished data).

The input of freshwater is great in northern Gulf of Mexico because of the influence of the Mississippi River and the rivers that flow into Mobile Bay. Thus the northern gulf waters experience a greater effect of dilute salinities than do the southern gulf waters. Duration of colder water is also longer around Dauphin Island because it is located at the northern most latitude on the Gulf of Mexico. Prolonged exposures to reduced salinities and lower water temperatures may significantly affect mysid growth. Salinity and temperature are known to act synergistically on crustacean growth (Waterman 1960).

Stuck *et al.* (1979a) cited one previous collection of mysids made in the vicinity of Dauphin Island. *Mysidopsis almyra*, *B. brasiliensis* and *M. swifti* were reported in this collection, but *B. floridana* and *M. bigelowi* were not. This was a single sample from a single collecting site and provided few specimens. Therefore, local distribution was not established. However, in the present study distributional patterns are evident and suggest that shallow-water mysids segregate into particular habitats. *Mysidopsis almyra* prefers open but protected habitats, while *M. swifti* was collected only off exposed beaches that receive strong and continuous wave action. These observed patterns are consistent with the reports of Price (1976) and the collections of Modlin (unpublished data). The *Bowmaniella* spp. favored exposed habitats that received only a moderate amount of wave action. Price (1976) suggested these species burrow into the sediments because he collected few specimens. His sampling technique did not disturb the sediments. *Mysidopsis bigelowi* is more commonly collected in offshore waters (Price 1976).

Mysid species in the Gulf of Mexico have two peak periods of recruitment, spring and autumn (Williams 1972, Price 1976). This is consistent with the observations made at Dauphin Island. Eggs, Stage I and Stage II larvae comprised 85% of the brood pouches examined during the summer. Development from egg to a Stage III larva requires two to three months, whereas Stage III larvae to postlarva takes approximately a week (Modlin 1979). Therefore, a significant number of individuals are added to the Dauphin Island populations in autumn. A period of recruitment must also occur in the spring because 41% of all the mysids collected were juveniles. Since Stage IV larvae were observed in only four *M. swifti* and 12 *Bowmeniella* spp. brood pouches, few individuals of these species are added during the summer.

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Richard F. Modlin. *The University of Alabama in Huntsville, Department of Biological Sciences, Huntsville, AL 35899.*