

Collections of Planktonic and Interstitial Marine Rotifers from Puerto Rico

JAMES R. LITTON, JR.
Department of Biology, Saint Mary's College
Notre Dame, Indiana 46556

Introduction

Investigations of the fauna of coral reefs have never carefully examined the microfauna, and specifically the rotifer fauna, in a detailed manner. While a few reports of planktonic marine rotifers exist (reviewed in 2) only a few have been oriented to the interstitial (= psammon) rotifers (reviewed in 2). Part of the reason for this lack of information on marine rotifers stems from the impression that they are, with rare exception, a group of exclusively freshwater invertebrates. Also, they are difficult to isolate from planktonic and interstitial samples. This investigation reports on collections made off the coast of Puerto Rico in 1977 aimed specifically at collecting marine rotifers.

Study Site and Methods

Five marine sites off the coast of Puerto Rico were selected for study (Figure 1). These included a southern shore coral reef, a northern shore coral reef, Phosphorescent Bay, a mangrove cay, and northern shore coral sand beach. Sampling was completed during the daylight hours at all of the sites, with the exception of Phosphorescent Bay, which was sampled at night.



FIGURE 1. *Location of Marine Sampling Sites off the Coast of Puerto Rico*

Continuous trawls were made at each site using a 125 mesh (No. 25) nylon plankton net. Concentrated plankton were preserved in 10% formalin solution after having been anesthetized with benzamine hydrochloride.

Quantitative sediment samples were taken at four sites: southern shore coral reef, northern shore coral reef, mangrove cay and northern shore coral sand beach. A pvc tube with a cross section of 1 cm² was forced into the substrate to a depth of about 10 cm. Four replicate samples at each site, consisting of 5-10cm³ of coral sand each, were collected in stoppered glass tubes. Samples were extracted using the magnesium

TABLE 1. *Planktonic Rotifers Identified at Marine Sites in Puerto Rico*

Species	Site				
	Southern Reef	Northern Reef	Phosphorescent Bay	Mangrove Bay	Coral Sand Beach
<i>Argonotholca foliacea</i>		x		x	
<i>Brachionus plicatilis</i>	x	x	x	x	x
<i>Keratella cochlearis</i>	x	x			x
<i>Lecane cornuta</i>	x	x			
<i>Notholca striata</i>			x	x	

chloride anesthetization technique (1). No interstitial samples were taken at or beneath the black sulphite layer of sediments at each of these sites.

Water samples (both open water and interstitial water) were collected for salinity determination. Salinity was estimated using an American Optical Goldberg Salinity Refractometer. For study and taxonomic identification of individual rotifers the mastax was mounted in polyvinyl-lactophenol (4) and examined microscopically.

Results and Discussion

Table 1 indicates the planktonic rotifers found at each site. Since these were qualitative plankton tows it is uncertain how abundant each of these species were. The euryhaline *Brachionus plicatilis* was the only species found at all of the sites. The other four species were collected at two or three of the five sites. Table 3 indicates the salinity of the open-water collecting sites at the time of collection. The values range from 22-32 ‰ salinity and are probably the highest reported salinities noted with the occurrence of several of these species. Given the limited nature of the sampling it is uncertain whether these salinities represent extremes for these sites or whether they are relatively constant. Phosphorescent Bay, with a low value of 22 ‰ must certainly experience considerable fluctuation due to freshwater inflowing to the bay.

TABLE 2. *Interstitial Rotifers Identified at Marine Sites in Puerto Rico*

Species	Site			
	Southern Reef	Northern Reef	Mangrove Cay	Coral Sand Beach
	Organisms/cm ³ substrate; mean value of four replicate samples			
<i>Aspelta clydona</i>	3.0	1.3	0	11.5
<i>Aspelta reibischi</i>	0	1.3	0	11.0
<i>Colurella adriatica</i>	5.3	0	1.3	0
<i>Colurella colurus</i>	0	0	0	1.6
<i>Encentrum cruenatum</i>	4.0	2.5	3.0	2.5
<i>Encentrum marimum</i>	10.5	8.5	3.3	15.5
<i>Encentrum rousseleti</i>	2.0	0	0	8.0
<i>Encentrum simillimum</i>	0	0	0	2.6
<i>Encentrum striatum</i>	3.3	0	0	0
<i>Encentrum villosum</i>	0	6.6	1.5	0
<i>Euchlanis dilatata</i>	0	1.5	0	0
<i>Paradicranophorus hudsoni</i>	0	2.5	0	3.6
<i>Proales reinhardti</i>	3.3	1.0	3.0	6.3
<i>Proales halophila</i>	5.5	3.6	1.5	2.5
<i>Rotaria citrina</i>	1.3	5.0	7.6	0

TABLE 3. *Salinity of Marine Sites in Puerto Rico*

Site	Salinity ‰	
	Openwater	Interstitial
Southern reef	29	32
Northern reef	32	30
Phosphorescent Bay	22	—
Mangrove Cay	26	28
Coral sand beach	30	30

The quantitative analysis of interstitial rotifers at four sites is shown in Table 2. These samples showed a much greater species diversity than those from the associated open water areas (plankton samples). All of these rotifers have been reported by Thane-Fenchel (5,6) or Tzschaschel (7,8) from northern European marine waters. A major difference, however, is the salinity of the interstitial or surrounding water in the areas in which they collected. The Puerto Rican samples were collected from sites that were at or approach full-strength seawater (greater than 30 ‰ S). Furthermore the rotifers appeared somewhat more abundant than those found by Thane-Fenchel (5). No particular pattern of occurrence was apparent at each of the sites that allowed them to be clearly distinguished from each other. There were, however, some differences in abundance between sites that are worth noting; comments on food habits are also included.

Members of the genus *Aspelta* were relatively abundant in the loose coral sand (32 ‰ S) and could be seen feeding on other rotifers. Abundant mastax trophi from other interstitial rotifers were noted in their guts. *Colurella* species were found irregularly in low concentrations and showed guts full of diatoms and bacteria. The genus *Encentrum* was well represented in the interstitial samples. *E. cruenatum* and *E. marinum* were ubiquitous. All *Encentrum* showed a mixed stomach contents consisting of diatoms, ciliates and nematodes. *Paradicranophoris hudsoni* was found at two sites. In both cases the animals' guts were filled with the pennate diatoms that were noticeably abundant in the interstitial samples. The two *Proales* species were ubiquitous. Their guts were filled with mixed diatoms and a few dinoflagellates. *Rotaria citrina* represents the only bdelloid rotifer collected during this study. Occurring in some abundance at these sites, its gut contents could not be distinguished.

This localized study demonstrates the existence of marine rotifers, in at least modest diversity, in marine planktonic and interstitial habitats that approach full-strength seawater. Previous work in these habitats has undoubtedly failed to isolate these rotifers owing to the special care needed (e.g., fine net size, special extraction procedures) for delicate organisms present in small numbers. While the concentration of interstitial rotifers reported for freshwater is in the range 10-100 rotifers per cm³ sand (3) some of my samples did exceed this lower limit at a site or two. A future seasonal observation at each of these sites might show populations that increase into the range usually thought only to occur in freshwater. While Tzschaschel (7) notes the dorsaventral flattening, existence of tubular toes, complicated joints of the toes, and enlargement or doubling of the foot glands as rotifer adaptations to the interstitial environment, Thane-Fenchel (5) notes that the degree of rotifer adaptation is slight compared to other marine interstitial microfauna. This is a possible reason for the low abundance of rotifers noted in marine interstitial samples.

Thane-Fenchel (5) has shown, in laboratory experiments, that rotifers maintained at 20 ‰ S had high reproductive potentials. Whether or not this high reproductive potential is maintained at higher salinities is not known. She did, however, show that

many species were able to tolerate the salinity range 0-32 ‰ in the lab, while field collections showed a decrease in number of species with increasing salinity. All of the rotifers collected in this study would be considered by many zoologists as euryhaline freshwater species. Since the rotifers are considered a limnic element in the marine fauna it is still unclear whether their limited abundance in the marine environment may have a morphological or physiological (e.g., osmoregulatory capacity) basis.

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