Pacific Science (1978), vol. 32, no. 1

Gastropods as Predators and Prey at Easter Island[1]

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ABSTRACT: First observations are reported of predator-prey relationships among gastropod mollusks of the depauperate, Indo-West Pacific derivative, intertidal and shallow subtidal benthic fauna of Easter Island. *Conus miliaris*, which will be reported in detail in a separate paper, and *Pisania decapitata englerti* prey on polychaete annelids; *Mitra flavocingulata* preys on sipunculans; and *Neothais nesiotes* preys on barnacles intertidally and gastropods subtidally. Gastropods of at least three species are eaten by the most common Easter Island starfish, *Astrostole paschae*.

EASTER ISLAND, THE MOST ISOLATED island in the Pacific Ocean, may be viewed as a natural experiment in the assembly of biotic communities (Diamond and May 1976). For this reason, its inshore marine biota has been studied increasingly in recent years; the primarily tropical Indo-West Pacific affinity and limited number of species of the fishes and invertebrates have drawn particular attention (Devaney 1973, Fell 1974, Garth 1973, Kohn and Lloyd 1973, Randall 1976). However, the biological interactions of these animals have remained unstudied.

In the course of an ecological study of the predatory gastropod *Conus miliaris* at Easter Island, I examined individuals of three co-occurring predatory gastropod species for evidence of the nature of their prey, and I examined specimens of the starfish *Astrostole paschae* (Clark) to determine whether its diet includes gastropods. The results of the *Conus* study will be published separately; here, I report briefly on an initial effort to determine predator-prey relationships involving the other gastropods.

METHODS

All observations were made in the intertidal and shallow subtidal region of Easter Island from 15 April to 4 May 1977. Specimens of *Neothais nesiotes* and *Astrostole paschae* were carefully examined in the field for feeding activity. In the case of *N. nesiotes*, this consisted of insertion of the proboscis into a prey organism or of drilling its shell. The cardiac stomach of *A. paschae* was examined for the presence of prey organisms not visible externally. Specimens of *Pisania decapitata englerti* and *Mitra flavocingulata* were collected and retained 2 to 3 days individually in 40-ml vials containing enough seawater to cover the shells. All fecal strings produced were pipetted into 1-ml vials containing 70 percent alcohol with 5 percent glycerin, and smears of the feces were later prepared as permanent slides for examination under the compound microscope.

RESULTS

Although the results are based on small samples (Table 1), they suggest that of the four species studied, only *Pisania decapitata englerti* (mean shell length 14.1 mm, range 12–15.5 mm) preys on polychaetes and overlaps dietarily with the commonest predatory gastropod present, *Conus miliaris*. The latter preys primarily on *Onuphis* sp. (31 percent), other eunicids (47 percent), and nereids (13 percent). *Eunice (Nicidion) cariboea* and *Lysidice collaris* together constituted 30 percent of the diet of *C. miliaris* (Kohn, in press). The proportional similarity (Pielou 1977, p. 337) between the diets of the two species is 24 percent. Populations of *C. miliaris* attain

[1] This research was supported by National Science Foundation grant no. BMS 75-03303. Manuscript received 10 January 1978.

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TABLE 1

GASTROPOD MOLLUSKS AS PREDATORS AND PREY AT EASTER ISLAND

	NUMBER OF PREDATORS EXAMINED			
PREY ITEMS FOUND	*Pisania decapitata englerti* (Hertlein) 12	*Mitra (Strigatella) flavocingulata* Lamy 26	*Neothais nesiotes* Dall 28	*Astrostole paschae* (Clark) 13
Polychaeta				
Eunice (Nicidion) cariboea Grube	2			
Lysidice collaris Grube	7			
Sipuncula				
Phascolosoma sp.		11		
Gastropoda				
Dendropoma sp.			3	
Antisabia imbricata (Gould)			2	3
Nerita morio Sowerby				2*
Pisania decapitata englerti (Hertlein)				1
Crustacea				
Chthamalus belyaevi Zevina & Kurshakova			12	
Pachygrapsus transversus (Gibbes)				1
Total prey items identified	9	11	17	7

NOTE: Numbers in the body of the table are numbers of prey organisms of species at left observed eaten in nature by the predator at top.
*One of these had been captured and was firmly held by tube feet midway along an arm, but was not actually being eaten.

densities of 8 individuals/m^2 in favorable habitats at Easter Island. No individuals of *P. decapitata englerti* were encountered in 137 $\frac{1}{8}$-m^2 quadrats censused for *C. miliaris*, although the two species shared the same habitat.

Mitra (*Strigatella*) *flavocingulata* (mean shell length 23.1 mm, range 19.5–28.5 mm), which occurred at a mean density of 0.12 individual/m^2 in the quadrats sampled for *C. miliaris*, probably preys exclusively on sipunculans, as do all other mitrids studied to date (Kohn 1970, Miller 1974, West 1978).

Neothais nesiotes (mean shell length 17.8 mm, range 14.5–21 mm), which occurs higher in the intertidal region than any of the other gastropods studied, was observed eating only barnacles (*Chthamalus belyaevi*) intertidally, and only gastropods (*Antisabia imbricata*, *Dendropoma* sp.) subtidally.

Five prey organisms of *Astrostole paschae* (radius 75–90 mm) that had certainly been captured alive were gastropods; only one protopodite of the crab was present (Table 1).

Garth (1973) reported on two individuals of the crab *Trapezia areolata* Dana and three of *T. ferruginea* Latreille recovered from the stomach of another asteroid, *Leiaster leachii* (Gray) at Easter Island. With that exception, to my knowledge the observations reported here provide the first information on predatorprey relationships in the benthic invertebrate community at Easter Island, the most isolated outpost of the Indo-West Pacific marine realm. The trophic structure of this community is of particular interest because of this distance and because of the low diversity of its allopatric populations and species derived from the rich central Indo-West Pacific inshore marine biota. Although the observations reported here are limited, they present initial knowledge necessary to provide a basis for comparisons of trophic structure that will permit interpretation of the results of natural experiments in the assembly and organization of insular marine communities.

ACKNOWLEDGMENTS

I thank Benito Alarcon for assistance in the field, and Gerardo Velasco and Carlos

Pisani for aid with logistics at Easter Island. I also thank Harald A. Rehder for helpful discussion and assistance in identification of the gastropods; the names used in this paper follow the usage in his forthcoming monograph of the Mollusca of Easter Island. I thank Dennis M. Devaney and David L. Pawson for aid in identifying the asteroid, Dora P. Henry for identifying the barnacle, and John S. Garth for identifying the crab and for helpful comments.

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