FEEDING BEHAVIOR OF THE PRIMITIVE SHRIMP, *PROCARIS*  
(DECAPODA, PROCARIDIDAE)

BY

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One of the more exciting carcinological finds of recent years has been the discovery of a new family of decapod crustaceans, represented by two species which may be the most primitive decapod shrimps living (Chace & Manning, 1972; Holthuis, 1973). Some morphological features of *Procaris* resemble those of stenopodideans and penaeids while other characters resemble those of caridean shrimps, but only *Procaris* lacks chelae. Maciolek (in Holthuis, 1973) and Manning both observed *Procaris* in the field. Their observations and ecological notes of the habitats from which the species were obtained, constitute all that is known of the behavior or ecology of these interesting shrimps. The present work records feeding behavior both in the laboratory and in the field.

MATERIAL.

Live specimens of *Procaris ascensionis* Chace & Manning, 1972, were obtained in two shipments from Ascension Island. One *Procaris* and approximately 100 specimens of the atyid shrimp *Typhlatya rogersi* Chace & Manning, 1972, had been placed in sea water of 36 ppt in plastic bags inside a styrofoam box on 23 May 1975 and chilled to well below ambient temperature (instructions had been given to chill to 19-20°C or until the shrimp became inactive, but actual shipping temperature is unknown). They were then sent by military aircraft to Charleston, South Carolina, where they were chilled from 23 to 19°C, oxygenated and repacked by colleagues there, and sent to Norfolk via commercial airline arriving on 25 May 1975. Twelve specimens (and seven *Typhlatya*) were shipped 16-18 June 1975. This group, delayed in transit, arrived in Charleston at a temperature of 27.5°C and was not rechilled before repacking for Norfolk. Though all arrived alive, some were damaged physically and five did not survive the next 48 hours.

Two specimens of *Procaris hawaiiana* Holthuis, 1973, with several specimens of the atyid, *Halocaridina rubra* Holthuis, 1963, sealed in plastic bags and not chilled, were carried by hand from Hawaii to Norfolk, a travel time of about 36 hours, arriving on 21 June 1975.

All the above specimens were placed in a single 56-liter aquarium equipped with a subsand filter utilizing crushed oyster shell overlain with fine granitic gravel.
Sea water in the aquarium had been prepared with Instant Ocean Brand sea salts (Aquarium Systems, Inc., Eastlake, Ohio, U.S.A.) to a salinity of 31°/00. This was adjusted to 33°/00 and then to 38°/00 over the next two weeks. Within three or four days after arrival, water temperature had fluctuated from 26 to 20° C and changes from 21.5 to 26° C in a three-hour period were tolerated. Over the next few months, aquarium temperatures ranged from a high of 27.5 to a low of 15.5° C without apparent harm.

In July 1976, the author accompanied a team of Invertebrate Zoologists from Smithsonian Institution to Ascension Island for the purpose of observing Procaris in its natural habitat and to attempt to secure additional live material. Field observations were made at the type locality of Procaris ascensionis to supplement previous laboratory observations. Unfortunately, an attempt to return additional live material to Norfolk failed on this occasion.

RESULTS

At the time the first Procaris ascensionis was placed with 82 of the smaller shrimps into the aquarium, there was essentially no natural food present, including detritus. The atyids were extremely active immediately, and in following weeks and months those remaining in the tank continued to be active, keeping the Procaris agitated by frequent collisions. Within 48 hours, the Procaris had been offered, had picked up and had dropped the following potential food items: Tetramin Brand aquarium food flakes, clumps of sludge (primarily fecal material of blackfin mollies (Mollinesia) from a freshwater fish tank, upon which the atyids fed avidly), pieces of oligochaetes, tissue fragments of the brackish water mussel Modiolus, muscle fibers from the cyprinodontid fish, Fundulus, and pieces of a nereid polychaete. The specimen had only eight functional pereiopods and during an attempt to remove the Procaris for close examination under a binocular dissecting microscope, two pereiopods broke off, leaving only three on each side.

Lack of full complement of pereiopods did not seem to interfere with locomotion, the pleopods being the major, if not only means of swimming, but feeding was obviously handicapped. On the third day after arrival, small clusters of eggs removed from a Palaemonetes were provided. Upon encountering these during movements over the bottom, the Procaris had great difficulty in picking them up, but appeared to consume some of them. By the fifth day, Artemia nauplii hatched in the aquarium were available in abundance and some of these increased in size over the next few days. Capture and consumption of Artemia could not be verified at that time. At no time did this or any other observed specimen actively pursue any prey object. Rather, chance encounter in which one or more pereiopods contacted the object, seemed to be essential to capture of prey.

On 5 June 1975, 11 days after arrival of the specimen, a shell of the gastropod Polynices sp. was placed in the tank. On the following day, the Procaris was using it as a shelter, and it continued to do so from time to time.

By 14 June, many Artemia were fully grown but the Procaris was not observed