THE SPIDER CRAB *LIBINIA EMARGINATA* LEACH, 1815 (DECAPODA BRACHYURA), AND THE STARFISH, AN UNSUITABLE PREDATOR BUT A COOPERATIVE PREY

BY

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INTRODUCTION

Data are accumulating showing that echinoderms have considerable significance in the ecology of crustaceans. *Paralithodes camtschatica* (Tilesius), the Alaskan king crab, preys upon many echinoderms including asteroids (McLaughlin & Hebard, 1961). *Palinurus elephas* (Fabricius), a spiny lobster, has been characterized as a voracious predator upon ophiuroids, as well as a major predator of asteroids (Vasserot, 1965; as *P. vulgaris*). *Inachus phalangium* (Fabricius), a spider crab of the North Sea, includes echinoids in its diet (Kaestner, 1967), and the small spider crabs around the Isle of Man consume ophiuroids (Hartnoll, 1963).

Despite this widespread crustacean predation upon echinoderms, the discovery that *Libinia emarginata*, the common spider crab of the American east coast, actively preyed upon the common starfish * Asterias forbesi* (Desor), demanded an explanation. *Libinia* attacks sizes of *Asterias* out of proportion to its chela size. Further, when *Libinia* which has relatively slender chelae (Andrews, 1883), was kept together in tanks with *Cancer irroratus* Say, which has strong chelae, and *Callinectes sapidus* Rathbun which is a very agile and powerful predator; *Libinia* was the only crab to attack the starfish, even though none of the other crabs fed for several weeks.

In the following work, the behavioural pattern allowing this predation, the sizes of *Libinia* that would prey upon *Asterias*, the relative sizes of *Asterias* that they attacked, their feeding rates upon them, and the existence of this predation in the field were all examined.

MATERIAL AND METHODS

Crabs used for observation and for feeding experiments were supplied from the stock tanks of the Marine Biological Laboratory, Woods Hole. Other crabs examined to determine the natural incidence of predation upon *Asterias* were dredged in Great Harbor, Woods Hole. All of the dredged crabs were examined within four hours of collection. Crabs were maintained in the laboratory in running sea-water tables at the ambient temperature (November, 1970) of 12-13°C, thus both the experimental crabs and those dredged experienced the same temperature regime.
Four groups of crabs were tested for their size preference of live *Asterias*. Ranges of prey sizes, proportional to the sizes of the crabs, were presented and their size preference determined by the numbers of arms consumed. These same four groups of crabs were then used for tests of their rate of consumption of live *Asterias*. Starfish were supplied ad libitum in the preferred sizes for each group. Each group of crabs consisted of four animals of similar size and sex, the size range (30-450 g) between the groups being the widest obtainable.

An attempt was made to correlate the size of a starfish with the size of its ossicles. These measurements were made by drying the animal, dissolving organic material with 'Clorox' and measuring the ossicles with an optical micrometer. At the same time, the organic proportion of the wet weight (8.4% av.) was determined for the estimation of the calorific value of *Asterias*.

**RESULTS AND DISCUSSION**

**Behaviour**

*Libinia emarginata* has relatively slender chelae, in keeping with the elongation of the pereiopods implied in the common name spider crab. On several occasions crabs were observed inserting their chelae into barnacles and prying them apart by twisting the chelipeds in opposite directions. This same motion is used when

![Diagram of crab and starfish](image)

*Fig. 1. An 85 g female *Libinia* pinching the arm of a 14 g *Asterias*. The crab will twist its chelae in opposite directions, making a tear in the body wall.*