INFLUENCES OF TYPE AND CONCENTRATION OF FOOD ORGANISMS ON THE SURVIVAL, DEVELOPMENT AND FEEDING BEHAVIOR OF THE ZOEA LARVAE OF *SCYLLA SERRATA* (CRUSTACEA, PORTUNIDAE)

A THESIS SUBMITTED TO THE GRADUATE DIVISION OF THE UNIVERSITY OF HAWAII IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE

IN OCEANOGRAPHY

AUGUST 1975

By

Clyde M. Simon

Thesis Committee:

John Caperon, Chairman
John Bardach
John Stimson

ABSTRACT

Experiments were undertaken in the laboratory to examine the effects of the type and concentration of food on the survival, development and feeding behavior of the zoea larvae of the crab Scylla serrata. The food value, in terms of zoeal survival and molting success, of selected organisms from the crab's natural habitat which could be regularly supplied in sufficient quantity were compared with Artemia nauplii.

Zoea were able to ingest a wide range of sizes of food organisms. The larvae survived well on a diet of mixed diatoms, but did not molt. A combination of diatoms and Brachionus promoted rapid development, but yielded poor survival. Of the diets examined, only Artemia nauplii supported growth and development at relatively high survival rates in the cultures.

Survival, molting frequency, size increment at molting, and feeding rate were measured for zoea fed Artemia at concentrations in the range of 1-18 nauplii per ml. Survival showed a tendency to increase with food concentration up to 10 nauplii per ml., but the differences in the 2.5 to 15 nauplii per ml. range were small. Molting occurred fairly regularly in all concentrations, except the lowest, at 4½ to 5 day intervals. Size differences in zoea reared under different food-concentration regimes did not appear until the fifth zoeal substage. Zoea of all substages, however, responded to increasing food concentration by feeding at higher rates. Two widely-used models, one linear and one hyperbolic, for the relationship between food concentration and feeding rate were applied to the feeding data. A comparison of the implications of the two models with observations of zoeal feeding

behavior indicated that the hyperbolic model was better justified biologically than the linear model, due to the discontinuous nature of feeding imposed upon the zoea by the large size of the prey. The hyperbolic was too simplistic, however, to give an accurate picture of zoeal feeding in that maximum feeding rates were overestimated.

Whether the discrepancy between the feeding response and the growth response of the early zoea was due to "superfluous feeding," the accumulation of food reserves, or other causes could not be determined.