

UNIVERSITY OF CALIFORNIA
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**The Dynamics and Mechanisms of Egg Mortality in the crab
Cancer anthonyi (Decapoda)**

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by

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ABSTRACT

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In Chapter 1, the impact of Carcinonemertes epialti, a nemertean egg predator, on brood mortality of the crab, Cancer anthonyi, was investigated. The prevalence of Car. epialti on Can. anthonyi was high; over 95% of the crabs were infested. Worm density and crab egg mortality exhibited significant summer and winter peaks in occurrence. Egg mortality on Can. anthonyi ranged from 0.0-30.5%. Infestations of Car. epialti were associated with approximately 1.5% egg mortality (1-30 worms/pleopod) to 5.0% egg mortality (121+ worms/pleopod). Site-specific mortality was examined by sampling from 6-9 different sites within the egg mass. Mortality and worm number were highest in the medial base region of the crab pleopod. Worms on Can. anthonyi never reached the dramatic levels of the related Car. errans on the more heavily fished Can. magister. Thus, this study provided a direct comparison of Carcinonemertes infestations at low levels with infestations at high, outbreak levels.

In Chapter 2, temporal and spatial changes in the dispersion patterns of different nemertean egg predators on their respective crab hosts were examined with various statistics. The reproductive and embryogenic cycle of the host species appeared to be dominant factors in shaping the aggregation patterns of the different worm species. Worm immigration and emigration were tightly linked to crab reproduction and these processes contributed much to the observed aggregation patterns. Seasonality also played a role in symbiont aggregation. Marked differences in seasonal patterns were noted between worm species and host species. The negative binomial frequency distribution generally did not fit the dispersion patterns of Carcinonemertes spp. on their hosts. Patchiness and the patchiness regression provided information about the underlying mechanisms of aggregation.

The mechanisms leading to egg mortality were investigated in Chapter 3. Several potential pathogens are known to occur on crab eggs. The roles of the three symbionts (Lagenidium callinectes, a fungus; Leucothrix sp., a bacterium; and Car. epialti) were investigated in vitro. A multifactorial experimental design determined their contributions to egg mortality. The nemertean worm was found to contribute most to egg mortality because its

prevalence was high (>95%) and it had a relatively constant feeding rate. The fungus caused from 20-75% egg mortality on individual crabs but its prevalence was low (<3%). Bacteria were omnipresent but they caused negligible egg mortality. Temperature had a significant effect on worm feeding rates and fungal attack rates. At higher temperatures, egg mortality due to the symbionts increased, whereas at low temperatures, mortality appeared related to temperature shock and not to the presence of the symbionts.