90. Paradoxical Mortality Rates of Subtidal Abalone in an Area Long-Foraged by Sea Otters. ANSON H. HINES, Center for Coastal Marine Studies, University of California, Santa Cruz, California.

Subtidal populations of *Haliotis rufescens* and *H. walallensis* at Pacific Grove, California, have been stable over at least the last six years. However, their mortality rates appear much greater than the populations can sustain and are primarily due to sea otters, which have foraged extensively in the area since the early 1960's. Mortality rates of abalone in a 1600 m^2 study area at a depth of 10 m were estimated by following survivorship of abalone mapped in permanent quadrats and by measuring the production rates of fresh shells. Monthly collections of all abalone shells from the study area showed that more than 600 abalone of all sizes died over the last year, while density measurements and size structures of the live populations paradoxically have remained unchanged at only 350 abalone. Comparisons of species composition, size-frequency, and breakage of the shells with measurements of the live populations indicate that sea otters select abalone larger than proportionally are available, and thus take more *H. rufescens* than *H. walallensis*, and they break the heavier-shelled *H. rufescens* more often than *H. walallensis*. From observations of the number and diet of sea otters foraging in the area, these mortality rates correspond well with calculations of the number of abalone taken by the predators. Evidence for the impact of fish and invertebrate predators on abalone accounts for mortalities in only the smaller (< 6 cm) size-range. The paradox is discussed with respect to the importance of the crack refuge, population turnover, and dynamic equilibrium of the predator/prey relationship.

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