

Variation in barnacle recruitment over small scales: larval predation by adults and maintenance of community pattern

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Abstract

Over small spatial scales, variation in the density of settlers of benthic sessile species is the result of interactions among larval behavior, local hydrodynamic conditions, and the physical, chemical and biological characteristics of the benthic habitat. It has been shown repeatedly that adult benthic filter-feeders can consume larvae of their own and other species, but their effects on the distribution and abundance of recruits have rarely been demonstrated under natural conditions in the field, particularly on hard substrata. Here we experimentally quantified the effect of the large intertidal barnacle, *Semibalanus cariosus* (Pallas), on the density of recruits of three common barnacle species. The experiments were conducted at the peak of the barnacle recruitment season over three successive years, on the west coast of San Juan Island, Washington. A persistent and well documented community pattern in the mid intertidal zone of the study site is a sparse bed of adult *S. cariosus* with bare rock spaces essentially devoid of small barnacles among the large individuals. Field experiments consisted of small areas from which either all adult *S. cariosus* were killed leaving the shells attached to the rock, or live adult barnacles were left intact. Our results showed that over small spatial scales of a few to tens of centimeters, the large barnacle *S. cariosus* can interfere and significantly reduce net settlement and recruitment of conspecific as well as other barnacle species. Between 65 and 100% reduction in settlement could be attributed to larval predation by adults, as implied by barnacle settlement patterns on different treatments and by the presence of nauplius larvae in cirri and stomach contents of *S. cariosus*. The negative effect on barnacle settlement was consistent between years of relatively low barnacle recruitment, which appears to be the most common situation at the study site, but it disappeared on a year of unusually high recruitment, when settling larvae seem to have swamped the filtration ability of adult *S. cariosus*. The different barnacle species displayed contrasting settlement patterns on bare rock and on the lateral shells of the large barnacles, which appear to be a result of differences in larval behavior. Comparisons against the relative availability of these substrata in the experimental plots suggested that larvae of different species sample the benthic microhabitat in very different ways.