Local and meso-scale patterns of recruitment and abundance of two intertidal crab species that compete for refuges

Sergio A. Navarrete, Mirtala Parragué, Evie A. Wieters

Abstract

Interference competition for limited habitat or refuges is known to produce density-dependent mortality and generate patterns of micro-habitat distribution. While in mobile species the outcome of interference at a local scale can usually be determined from diverences in body size and behavior, the population-level consequences of such interactions vary depending on rates of settlement and recruitment at a site, which are not directly correlated to local reproductive success. Previous experimental studies in central Chile demonstrated that interference competition for refuges is the primary factor driving microhabitat segregation between the predatory crabs Acanthocyclus gayi and Acanthocyclus hassleri, with the latter species monopolizing galleries inside mussel beds and excluding A. gayi to rock crevices. Between April 2001 and March 2006 we quantiWed monthly recruitment rates in artiWcial collectors at 17 sites over 900 km of the central coast of Chile. Results show that recruitment rates of A. hassleri are almost two orders of magnitude lower than those of A. gayi, and that they are tightly and positively correlated among sites across the region, suggesting that at scales of kilometers larval stages of these species are affected by similar oceanographic processes. Total crab densities per site were also positively correlated between species and strongly associated to mussel cover, with overall low crab densities at all sites where mussel cover was lower than about 60%. At all sites with mussel cover >60%, the ratio of A. gayi to A. hassleri density progressively decreased from recruits (2.6) to juveniles (0.5) to adults (0.04), overcoming initial differences in recruitment rates. The relative success of the inferior competitor at sites with low mussel cover does not appear to provide a potential mechanism favoring regional coexistence through dispersal to other sites ("mass effects"), because their densities were lower than at sites of high mussel cover. Yet, at many sites of low mussel cover the dominant competitor is virtually absent, allowing A. gayi to attain larger population sizes at the scale of the region. Thus, the factors limiting the dominant competitor from successfully utilizing other microhabitats seem to be the most critical factor in promoting both local and regional coexistence between these species.