

Refuge utilization and preferences between competing intertidal crab species

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Abstract

Many invertebrates avoid predation risk by seeking and defending refuges that can be in limited supply, producing strong intra- and inter-specific interference competition. Previous experimental studies in central Chile demonstrated that interference competition for refuges is the primary factor driving hábitat segregation between the predatory crabs *Acanthocyclus gayi* and *A. hassleri*, with the latter species monopolizing galleries inside mussel beds in the mid intertidal zone and limiting *A. gayi* to rock crevices. Yet, habitat partitioning between rival species can result from differences in habitat preferences and not solely from interference interactions. Moreover, since *A. gayi* is also known to shelter in turf-forming algae (predominantly *Gelidium*), which dominates extensive areas in the low intertidal zone, among-sites variation in the turf morphology and abundance could modify habitat preferences and the pattern of inter-specific interactions. We experimentally evaluated refuge habitat preferences of individual, similarly-sized adult *A. gayi* and *A. hassleri* in the laboratory, comparing choice patterns across multiple trials with paired combinations of the main refuge types commonly used by crabs in the field: a) mussel galleries, b) rock crevices, c) short algal turf, and d) tall algal turf. Our results showed that both species display a strong ranking of preferences for some refuge habitats over others. In general, mussel galleries were the preferred refuge type for both crab species, but their preference rankings changed depending on turf morphology. When turf was short, *A. hassleri* and *A. gayi* made identical refuge choices, strongly preferring mussel galleries over crevices and these over the short turf. In contrast, when the turf was tall *A. gayi* selected equally the tall turf or mussel galleries, and these were strongly preferred over crevices. *A. hassleri*, on the other hand, largely ignored tall turf and kept the highest preference for mussel galleries. A field experiment in which crabs were offered to foraging birds demonstrated that *A. hassleri* is more susceptible than *A. gayi* to predation by kelp gulls when outside refuges. Differences in patterns of coloration between crabs may underlie between-species differences in predation susceptibility and their habitat choices. These results suggest that the among-site differences in turf morphology (height and shape of fronds), which is largely driven by varying intensity of upwelling, could affect crab preferences for refuge habitats and the relative importance of inter-specific interference competition.

Key words: Chile, Habitat modification, Habitat preference, Interference competition, Refuges, Turf algae