

## Competition and Facilitation in Marine Benthic Macroalgae

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Three dominant marine benthic algae, the furoids *Fucus gardneri* and *Pelvetiopsis limitata* (Phaeophyta) and the red alga *Mazzaella cornucopiae*, on the west coast of Vancouver Island, British Columbia, Canada were used in a series of field experiments to examine interspecific interactions. These experiments showed complex patterns which included an interchange of negative (inhibition) and positive (facilitation) interactions depending on neighbor distance and a reversal of competitive dominance depending on the life history stage of the competitors.

Less furoid recruitment occurred in the plots with greater percent cover of a turf forming red alga, *Mazzaella cornucopiae*. However, experimentally removing *Mazzaella* turf (the turf was considered to be blocking furoid recruits or shading growing recruits) did not increase recruitment. This result indicated that there may be another factor(s) involved in the survivorship of juvenile furoids in the turf-removed plots. Morphological differences in the adult plants between *Mazzaella* and the two furoids resulted in another type of interaction; these began when furoids successfully settled and grew nearby or within the red algal turf. By monitoring microhabitats at the individual plant level for two years, I found that survivorship of furoid recruits showed different species-specific patterns. The pattern also varied as the microhabitat changed from *Mazzaella* turf edge to open space. For *Fucus*, longevity respectively goes from low to high to intermediate with increasing distance from the turf edge. In contrast, longevity of *Pelvetiopsis* at all distances tested was similar. A reason for high longevity of *Fucus* individuals at edge microhabitats may be that these sites have one side open to light and nutrients and another side that buffers them from desiccation and wave impact. In the *Mazzaella*-*Fucus* interaction, neighbor distance was a key factor in determining whether the outcome of the interaction would be competition or facilitation (or protection).

The effect of furoids on *Mazzaella* was investigated by a field manipulative experiment using artificial furoid thalli. This experiment tested three hypotheses, shading, whiplashing, and allelopathy, imposed by potential furoid effects on *Mazzaella*. Only the shading effect was significant, indicating that adult furoid thalli reduced *Mazzaella* biomass underneath the furoids.

This study provides experimental evidence that detectable biological interactions occur in this physically harsh environment. The well-balanced and non-hierarchical interaction webs among the major macroalgae support the high likelihood of species coexistence in the community.