reproduction in kelps: consequence for resource management and aquaculture

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Abstract

In the coasts of Europe, habitat-forming brown seaweeds like kelps often dominate marine habitats, creating highly productive and diverse communities comparable to forests. Environmental changes and human activities seem to threat critically these marine forests resulting in wide populations' declines and distribution shifts. We used different complementary approaches on large brown seaweeds from the different fields of ecology, genetics and evolution to address the questions of local adaptation, landscape genetics and ecology. Kelps are characterized by a two-phase reproductive life cycle: A generation of large diploid individuals (the sporophytes) produces by meiosis spores that will differentiate into microscopic dioecious haploid individuals (male and females gametophytes). A direct consequence of this type of cycle is the effect of selection that will tend to purge rapidly the deleterious alleles within the haploid generation. Our study aims to deepen knowledge about the reproduction of this species. The question that arises here is that of the variation of the compatibility of crossbreeding between individuals according to their similarity and of the selective value of their descendants since the reproduction between genetically too similar individuals would suffer from an accumulation of deleterious mutations (Inbreeding depression) whereas the crossing between too different individuals would cause a rupture of the adaptive complexes (outbreeding depression). While the effect of genetic distances between parents on reproductive success is commonly studied in higher plants, this is still very little known in algae.In addition, kelp responses to temperature at range limit compared to core populations were compared both in the field and under controlled conditionssuggesting that parthenogenesis is more likely to arise at the range limits, where populations are sparse, fragmented, and more prone to local extinctions. This knowledge has important consequences on the management of natural resources and on the development of aquaculture.

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