Foundations of kelp forest restoration PART 2: establishing populations of functionally important species

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Kelp forests are vibrant and productive ecosystems at risk of broad scale decline. Kelp habitat structure is pivotal in establishing populations of functionally important species, which support the health and stability of the system. This has significant ramifications for improved restoration of degraded kelp habitats. We aimed to determine the effects of habitat patch-size and canopy-density of Southern Australasia's most dominant canopy forming kelp, Ecklonia radiata, in facilitating the recruitment of influential fish and invertebrates. We monitored the recruitment of rock lobster (Jasus edwardsii), mussels (Mytilus galloprovincialis) and cryptic reef fish (Forsterygion gymnotum and Pictiblennius tasmanianus) across an array of 28 artificial reefs representing seven different patch-sizes (from 0.12m2, -6.68m2) crossed with four kelp densities (0, 4.1, 8.3 and 16.6 individuals/m2). Peak density and patch size characteristics for recruitment varied for the different species. Rock lobsters established best on large reefs with an intermediate kelp density. The highest recruitment of mussels took place under open canopies on smaller reefs. And cryptic fish favoured smaller reefs and were adversely affected by low kelp densities. We explore a range of physical and biological mechanisms relating to habitat structure driving these recruitment patterns. In order to promote the establishment of a diverse range of species and ecosystem services to kelp habitat, restoration needs to focus on providing a mosaic of habitat structures. This approach will restore increased diversity in ecological function, crucial to diverse, productive and resilient reefs.