

The roles of latitude and ecotypic adaptation on the demography of subtidal kelp populations in the northeast Pacific: a pilot study in Kasitsna Bay, Alaska.

Matt Edwards (San Diego State University)

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Species that exhibit wide-ranging geographic distributions typically encounter high levels of spatial variability in environmental conditions that result from site-specific differences in local ocean temperature, nutrient availability, hydrodynamic forces, substrate stability and irradiance, as well as from latitudinal differences in ocean circulation, temperature and photoperiod. However, while a vast literature exists on the impacts of site-specific or small-scale processes on the ecology and demography of marine populations, the role of latitude itself is far less-well understood despite its relevance to basic ecological theory. Here, a pilot study is outlined that will examine how latitude influences the population demography of subtidal kelps through a series of field experiments and subtidal surveys. The main focus of this research will be to determine if variability in kelp demographic characters exists along a latitudinal gradient, and if so, if this variability is simply the result of corresponding differences in local conditions or if the responses by these kelps result in ecotypic adaptation by local populations. Specifically, this will involve 1) assessing the timing and intensity of sporophyte reproduction, 2) assessing the impacts of kelp stand density and dispersion on the timing and intensity of sori production and spore release, and on growth rates of new kelp recruits through manipulative stand-thinning experiments, 3) assessing differences in adult sporophyte morphology, and 4) examining the growth rates and timing of sexual reproduction in microscopic gametophytes all along a latitudinal gradient (the primary focus of this proposal, however, is to support work in Kasitsna Bay, Alaska). The first three components of this study will focus on subtidal field manipulations of adult sporophytes and the subsequent monitoring of the timing and intensity of spore production and release, and on adult growth and morphology, while the third component will involve the field collection of reproductive blades, which will be induced to release propagules that will be cultured in environmental growth chambers at temperatures and photoperiods characteristic of the study sites. Upon completion of this pilot study (and depending on the nature of the results), a research program will be developed that will focus on assessing ecotypic adaptation of several kelp species to their ambient photoperiod, temperature and nutrient environments as they occur along a latitudinal gradient from central Baja California to Alaska. In particular, potential differences in the timing and intensity of spore release from adult sporophytes and of sexual reproduction in microscopic gametophytes, as they are affected by changes in day length and oceanographic conditions, will be examined in greater detail. Also, whether certain population parameters influence the timing and intensity of spore production and release, and whether sporophyte growth and morphology vary along this gradient will be assessed. This pilot study will allow me to assess the potential for future work in Alaska and will provide baseline data for future experimental manipulations.