


# Modulation of different kelp life stages by herbivory: compensatory growth versus population decimation

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**Abstract** Partitioning the effects of herbivory on different life stages of primary producers is key to understanding the population-wide consequences of herbivory. We assessed the performance of microscopic (MiS <1 mm) juveniles, macroscopic (MaS) juveniles and adult kelp (*Laminaria ochroleuca*) under contrasting herbivory regimes through a herbivore exclusion field experiment. The abundance of MiS and the survival of MaS decreased by 67 and 63%, respectively, when herbivorous fishes and sea urchins were present. Blade growth (linear and area) of adult kelp displayed contrasting patterns under herbivore pressure: a 60% increase and a 46% decrease, respectively. These results indicate that while herbivory severely reduces juvenile survival, it

may also induce compensatory growth (measured as linear growth) in adult kelp. In summary, we here demonstrate how herbivory affects all sporophyte life stages of the kelp *L. ochroleuca*. This is likely to have important implications for situations where historical patterns of herbivore presence and herbivory are changing, such as is increasingly the case in many temperate regions due to warming around the world.

## Introduction

Plant–herbivore interactions play a critical role in the dynamics of populations and assemblages across different habitats (Burkepile 2013) and productivity gradients (Proulx and Mazumder 1998). Green food webs, where herbivore–plant interactions play a significant role in energy transfer, are ubiquitous (e.g. Gaines and Lubchenco 1982; Duffy and Hay 2000; Moles et al. 2011) and the strength of such interactions shapes the patterns of distribution and abundance of many species involved (Maron and Crone

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