# Trophic subsidy through ecosystems: role and dynamics of nearshore subtidal detrital accumulations of *Laminaria hyperborea*

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Kelps are major foundation species that support one of the most productive habitats in coastal environments (1-2 kgC.m$^{-2}$.yr$^{-1}$). Despite kelp forests being extensively studied in term of biodiversity and ecological functioning; the area of influence of such productive ecosystem is largely underestimated and remains little-understood. In Europe, the dominant kelp species, *Laminaria hyperborea,* is not hardly influenced by grazing and a major part of the biomass is exported via erosion, old-frond detachment or dislodgment. Kelp accumulations are observed on the coast as beach wracks but also offshore in benthic habitats where debris settle depending on topography (depressions, canyons) or current. Kelps supply adjacent habitats in organic matter and constitute a source for external food webs. “Hotspots” of secondary benthic production arise when detritus accumulates. To describe the degradation dynamics of *L. hyperborea* accumulations and to investigate the role played by the debris in structuring adjacent habitats and benthic communities, two six-month litter-bag experiments have been deployed *in-situ*. We used a multidisciplinary approach combining community ecology, trophic ecology (stable isotopes), biochemistry (chemical defenses), physiology (PAM and respiration proxy) and microbiology. According to the experimental depth, *L. hyperborea* degradation is a slow process leading to an average biomass loss of 15%.month$^{-1}$. The large fragments remain visually fresh and respond to light stimuli (PAM) after 5-6 months of degradation. These results suggest that *L. hyperborea*, even dislodged and exported could still fulfil the primary-producer function after several months. At the same time, kelp tissues are rapidly colonized by macrofauna and a relatively complex multitrophic ecological succession develops after 3-4 months. Kelp forests are important habitat modifiers and through the process of export and accumulation can impact a variety of subtidal ecosystems.

Keywords: kelp beds; degradation; production; connectivity; stable isotopes