



IMPACT OF WARMING AND NUTRIENTS ON PERIPHYTON ALGAE AND SUBMERGED MACROPHYTE INTERACTIONS

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Temperature and eutrophication can significantly affect the interactions between periphyton and submerged macrophytes, leading to increased competition and impacting the functioning of aquatic ecosystems. We experimentally evaluated the effects of temperature and nutrient availability on the interaction between periphyton and the submerged macrophytes *Egeria densa*, focusing on the growth and development of both primary producers. Two experiments were conducted over 63 days, manipulating temperature (ambient and +3 °C), nutrient availability (oligotrophic and eutrophic), and biological interactions (macrophyte + periphyton, macrophyte without periphyton, and artificial macrophyte). Higher temperatures led to a decrease in the total fresh biomass of macrophyte but increased the production of lateral sprouts. However, these sprouts exhibited smaller size and average fresh biomass at higher temperatures, especially in the presence of periphyton. The periphyton exhibited different responses, with a higher density observed when not associated with natural macrophytes. When assessing the effect of substrate type on the periphyton, it was observed that the presence of the natural macrophyte had a positive effect on the total density, and growth rate of the periphyton, regardless of temperature. However, the relationship was further favored by the high temperature and oligotrophic concentration. Our results demonstrate the warming and eutrophication negatively impact macrophyte growth, particularly when associated with periphyton. Conversely, the periphyton responded more positively and promptly to the treatments, but considering the decline to submerged macrophyte, the periphyton would restrict your development in the environment and hence, may favor the phytoplankton dominance in the ecosystem. Our findings highlight the importance of understanding



coexistence mechanisms among primary producers in littoral zones under warming scenarios, with implications for ecosystem resilience and functioning.

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