

Combined effects of nutrients from aquaculture and agriculture on macroalgal growth: A bioassay study

Streicher Michael D., Reiss Katrin and Reiss Henning

Benthos Ecology Research Unit, Ecology Division, Nord University, Universitetsalléen 11, 8026 Bodø, Norway

E-mail: michael.d.streicher@nord.no

A sustainable expansion of marine aquaculture is only possible if farms are managed according to the resilience and carrying capacity of their respective environments. Until now, many fish farms are operated as open-systems, releasing immense amounts of dissolved nutrients into surrounding waters. Increased nutrient levels around fish farms cause higher macroalgal growth in the direct vicinity. However, it is still unknown how nutrient pollution from fish farms interacts with other coastal nutrient sources such as agricultural run-off from land. Thus, the aim of this study was to assess effects from two different nutrient sources alone and in combination on different macroalgal species.

In a bioassay experiment, we measured the effects of nutrient release from aquaculture (varying distance to a fish farm) and agriculture (addition of fertiliser) on the growth and nutrient up-take of four different macroalgae: bladder wrack (*Fucus vesiculosus*), dulse (*Palmaria palmata*), sea lettuces species (*Ulva* spec.) and the common green branched weed (*Cladophora rupestris*). The experiment was running over a course of 4 weeks in a northern Norwegian fjord. Both nutrient sources alone increased growth rates of most algal species. However, combination of both nutrients had strong species-specific effects on growth rates. Specifically, growth rate of *Cladophora* strongly increased. Our preliminary results highlight the importance of interactive effects of several human-induced impacts on ecosystem properties.

Keywords: ecosystem effect; marine aquaculture; bioassay; macroalgae; eutrophication; nutrient pollution