

## NICHE COMPLEMENTARITY AND FACILITATION DRIVE POSITIVE DIVERSITY EFFECTS ON BIOMASS PRODUCTION IN EXPERIMENTAL BENTHIC DIATOM BIOFILMS

Vanelslander Bart<sup>1</sup>, Aaike De Wever<sup>1</sup>, Nicolas Van Oostende<sup>1</sup>, Pattaratjit Kaewnuratchadasorn<sup>2</sup>, Frederik Hendrickx<sup>3</sup>, Koen Sabbe<sup>1</sup> and Wim Vyverman<sup>1</sup>

<sup>1</sup> Ghent University, Department of Biology, Laboratory of Protistology & Aquatic Ecology, Krijgslaan 281-S8, B-9000 Ghent, Belgium  
E-mail: [bart.vanelslander@ugent.be](mailto:bart.vanelslander@ugent.be)

<sup>2</sup> Southeast Asian Fisheries Development Center, Training Department, Phrasamutchedi Samutprakan 10290, Thailand

<sup>3</sup> Ghent University, Department of Biology, Terrestrial Ecology Unit, K. L. Ledeganckstraat 35, B- 9000 Ghent, Belgium

Up to now, relatively few diversity-production experiments have been performed using microorganisms. Benthic diatom communities from estuarine intertidal mudflats are especially interesting for this purpose as they are relatively species poor and are thus more easy to simulate in laboratory conditions. We studied the effect of diversity on biomass production during microcosm experiments with diatoms assembled in combinations of up to eight species. Our results demonstrate a highly positive effect of biodiversity on production, with transgressive overyielding occurring in more than half of the combinations. These strong positive diversity effects could largely be attributed to positive complementarity effects (covering both niche complementarity and facilitation), although negative selection effects partly counteracted the positive complementarity effects at higher diversities. We found a significant positive relation between functional diversity and the net biodiversity effects, indicating niche complementarity. In addition, we provide one of the first mechanistic evidences for facilitation by which biodiversity can enhance ecosystem functioning. This was demonstrated by the improved growth of *Cylindrotheca closterium* after addition of spent medium obtained from other diatom species. The stimulated growth of *C. closterium* was explained by a shift to mixotrophic growth with a down-regulation of the photosynthetic apparatus.