

KleinJan Hetty – Doctoral Thesis

The influence of bacteria on the adaptation to changing environments in *Ectocarpus*: a systems biology approach

ABSTRACT

Ectocarpus subulatus depends on its associated bacteria for growth in fresh water, which stresses the significance of the “holobiont” during abiotic stress. The aim of my thesis is to elucidate the molecular mechanisms that underlie this phenomenon. Targeted co-culture experiments require cultivable organisms. Therefore, I have cultivated and characterized 388 *Ectocarpus*-associated bacteria, which belong to 33 different genera. None of the cultivated bacteria tested had a beneficial effect on algal growth in fresh water. For functional studies, I continued to work with mild antibiotic-treated holobionts that differed in their response to fresh water. The metatranscriptome and metabolome of these holobionts were analyzed during acclimation. In-depth analysis is ongoing, but first indications point towards a change in the microbiome regarding nitrogen assimilation and virulence. In parallel and complementary to the above, potentially beneficial algal-bacterial cross-talk was predicted *in silico* using metabolic network analysis on a subset of cultivated bacteria, and the predictions were experimentally verified using co-culture experiments. Together, these results contribute to a better understanding of how the *Ectocarpus* holobiont responds during abiotic stress and especially how bacteria are involved in this process.