

Unveiling the genetic basis of diatom-bacteria interactions for novel algae biotechnology strategies

Background

P. tricornutum is a marine pennate species that has become an experimental standard model used to understand diatom biology. In biotechnology this diatom is used as monoculture biomass for aquatic animal feed and as a cell factory for production of its inherent valuable compounds which includes omega-3-fatty acids, pigments such as eicosapentaenoic acid (EPA) and fucoxanthin.

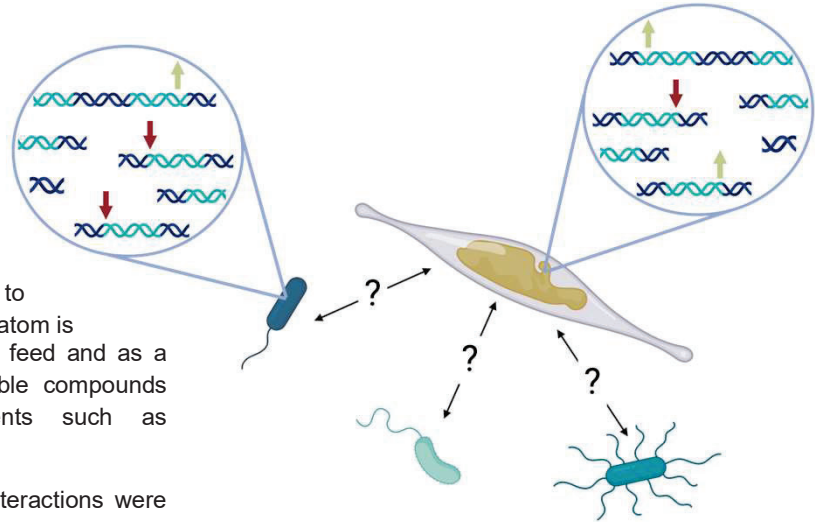
In polycultures, several *P. tricornutum*-bacteria interactions were mutualistic or facilitative leading to increased biomass and lipid content. Hence, investigation into diatom-bacteria interactions would extend the understanding in diatom and bacteria biology, provide knowledge of ecological value, as mechanisms triggering increase in biomass could be translated to mechanisms in algae blooms, yet also provide knowledge for commercial value.

However, knowledge regarding either interaction is limited, therefore the present PhD project will investigate the genetic mechanisms in both organisms that are fundamental for the positive interactions through these objectives.

Objective 3

Functional characterization of genes involved in the interaction mechanism:

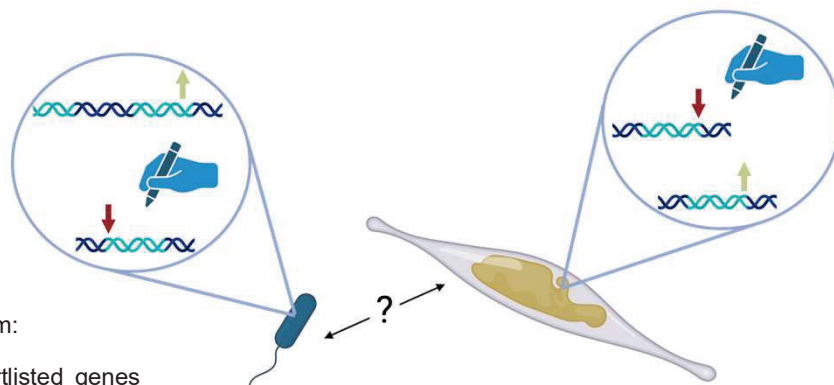
Investigate the function of the shortlisted genes involved in diatom-bacteria interaction (Obj. 2) by construction of KO-KD libraries using developed toolbox, elucidating which genes are essential for the interaction and/or phenotype.



Objective 1 and 2

Investigation of which of the following bacteria (*Marinobacter* sp., *Roseobacter*, *Stappia* sp. K01, *Sulfitobacter* sp. SA11) interacts with *P. tricornutum* in a way that induces the best phenotype in both species using flow cytometry and evaluation of a range of factors.

Interaction-induced genetic response: Investigation of the genetic basis for the shortlisted diatom-bacteria interactions through transcriptomic, proteomic, and bioinformatic analysis.



Expected research output

Developed **gene-editing tools** for *P. tricornutum* and bacteria, constructed library of **optimized strains**.

Review publication regarding prior knowledge in the research field. **Research publications** regarding gene-editing tools developed, discoveries made through transcriptomic and proteomic data. **Proposals** of genetic and/or metabolic mechanisms responsible for algae-bacteria interactions.