



Popular science summary of the PhD thesis

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Title of the PhD thesis	Defence in diatoms: mechanisms and trade-offs
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Marine phytoplankton are unicellular organisms that form the base of the marine food web. They are arguably the most important group of primary producers as they account for roughly half of the planet's primary production. About 40% of this is accounted for by diatoms, a phytoplankton group of characterized by e.g., the cell being encapsulated in a glass shell.

Defence plays an important role in shaping the planktonic food web and the interaction between predation and defence is key in driving and maintaining species diversity. For this to be true, there must be a cost to a defence, otherwise all species would be equally defended.

A wide array of defence mechanisms has evolved in phytoplankton, including morphological, physical, and behavioural defences. For diatoms, these includes, e.g., tough cell walls, colony-formation, toxin production and production of resting stages. Many of these defences are inducible, i.e., they are harnessed or intensified when predators are present. Inducible defences are believed to evolve when the defences are costly, however, the trade-offs to defences have been notoriously difficult to demonstrate and quantify.

In this thesis, I explored the inducibility and trade-offs of defence mechanisms in diatoms. Specifically, we demonstrated how different species of diatoms are capable of increasing the thickness of their shell when chemical cues from predators are present. This reduces the mortality rate, as demonstrated in previous black-box experiments, but the trade-off is lowered growth rate and cell size. Through direct video observations, we demonstrated how well-defended, thick-shelled diatoms have a much higher chance of being rejected by copepods, compared to less defended, thin-shelled diatoms.

During our experiments, we made the new discovery that some diatom species aggregated heavily, when exposed to chemical cues from copepods. We explored this phenomenon further and found, that some species increase the stickiness of the cell, when predator cues are present. The sticky cells form aggregates that sink to deeper waters or sediments. Because predation pressure is lower in the deeper waters and sediments than in the surface, we argue that aggregation may be a defence mechanism and a way of escaping predation.