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Ecological aspects of marine *Vibrio* bacteria
Exploring relationships to other organisms and a changing environment

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Abstract

Heterotrophic bacteria of the genus *Vibrio* are indigenous in the marine environment although environmental cues regulate their growth and distribution. The attention brought to this genus is due to its many species/strains that are pathogenic to humans and other organisms. *Vibrio* abundances are strongly coupled to water temperature and salinity but abundance dynamics occur even where these hydrographical parameters are stable. In this thesis, I have studied *Vibrio* dynamics in relation to other organisms such as phytoplankton (papers I, II and III) and a bivalve host-organism (paper IV) in a changing environment where increasing temperature (paper III) and ocean acidification (paper IV) may influence survival and proliferation of these bacteria. In particular paper I showed that in a tropical coastal area, where the water temperature and salinity were stable across seasons, abundances of *Vibrio* were tightly coupled to phytoplankton biomass and community composition. A diatom bloom during December seemed to support high numbers of vibrios in waters with otherwise low levels of dissolved organic carbon. Paper II further supports that some phytoplankton can favor *Vibrio* growth while others seem to have a negative influence on *Vibrio* abundances. For instance, *Skeletonema tropicum*, a common diatom in Indian coastal waters, easily eradicated *Vibrio parahaemolyticus* from sea water in our experiments. In temperate marine areas culturable *Vibrio* predominantly occurs in the water column during the warmer months. Sediments are suggested to be potential reservoirs when conditions in the water-column are harsh. Accordingly, in paper III we showed that cold-water sediments from geographically separate areas in a boreal region of Scandinavia all contained relative high abundances of total *Vibrio* spp. and that all sediments also included culturable *Vibrio*. In agreement with paper I, the fresh input of organic material from phytoplankton blooms, for which chlorophyll *a* was used as a proxy, seemed to positively influence *Vibrio* abundances also in the sediments (paper III). Therefore, the pelagic-benthic coupling which can supply the sediments with biomass from the primary production could influence the abundance of *Vibrio* spp. Increasing temperature had variable influence on sediment-associated *Vibrio* abundance, with a significant increase in abundances in sediments originating from one area when the temperature reached over 21°C and a generally negative influence of increasing temperature on abundances in sediments originating from another area (paper III). This suggests that the sediments contained different *Vibrio* communities with varying temperature tolerance traits. Rising levels of carbon dioxide in the atmosphere does not only lead to higher water temperature through the green house effect, but also to acidification of the oceans. Paper IV illustrated how a common bivalve pathogen, *Vibrio tubiashii*, can be favored in the interaction with a calcifying bivalve host, *Mytilus edulis*, when this host-pathogen combination was exposed to levels of ocean acidification projected to occur by the end of the 21st century. Thus, global environmental changes may enhance the probability of *Vibrio* infections in higher organisms.

Keywords: Vibrio spp. / Phytoplankton / Organic material / Sediments / Increasing temperatures / Ocean acidification / Bivalves / Host-pathogen interactions.