ROLE OF MARINE PHYTOPLANKTON BIODIVERSITY FOR COMMUNITY STRESS TOLERANCE (HEAT SHOCK AND SALINITY CHANGES)

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Abstract
Outdoor mesocosm experiments were conducted in Thessaloniki (Greece) and Kiel (Germany) in order to study the combined effect of warming and salinity stress on marine phytoplankton biodiversity. Phytoplankton species number and abundance decreased with warming in both experimental sites. Phytoplankton species number decreased with salinity changes in both sites while phytoplankton abundance showed different response.

Keywords: Phytoplankton, Thermaikos Gulf, Biodiversity

Predictions for climate warming support that the average global temperature will rise up to 6°C by 2100. Previous studies on marine primer producers showed a shift towards smaller species during increasing seawater temperature (Sommer and Lengfellner, 2008) as well as a decline in phytoplankton biomass (Sommer and Lewandowska, 2011).

In this study, we examined the effect of climate warming combined with increased/decreased salinity on marine phytoplankton biodiversity in two outdoor mesocosm experiments. The first was conducted in Thessaloniki, Greece on a natural phytoplankton community from Thermaikos Gulf-Mediterranean Sea (June-July 2015) and the second in Kiel, Germany on a natural phytoplankton community from Kiel Bight- Baltic Sea (October-November 2015). Twenty four mesocosms set up in each experiment, two phytoplankton communities (ambient and +6°C) in three salinity levels (ambient, -5psu, +5psu) and in four replicates for every treatment. The volume of the mesocosms was 15L. Mesocosms were filled with phytoplankton inoculums pretreated for six days at ambient temperature and heated shocked by 6°C warming. The mesocosms were placed outdoor in Thessaloniki and floating in seawater in Kiel. Thus, temperature and light imitate natural conditions at each study site.

Dinoflagellates (*Gymnodinium*, *Prorocentrum*, *Heterocapsa*) were the most diverse and abundant group within the summer phytoplankton community in Thermaikos Gulf in contrast with the dominance of diatoms (*Skeletonema*, *Thalassiosira* spp.) in the autumn phytoplankton community in Kiel Bight, giving us the advantage to study the response of different taxonomic phytoplankton groups under stress conditions (water temperature and salinity). Warming resulted in changes in species diversity and abundance of phytoplankton inoculums in both cases. The number of species decreased from 30 to 26 in the Thessaloniki experiment and from 31 to 25 in the Kiel experiment after applying the warming treatment (temperature changed from 19°C to 25°C and from 12.4°C to 18.4°C respectively). Large diatoms species such as *Rhizosolenia pungens* and *Guinardia delicatula* in the Thessaloniki mesocosms and large dinoflagellates species such as *Ceratium fusus* in the Kiel mesocosms were in disadvantage and were not recorded in heated shock treatments. Together with species loss, a decreased phytoplankton abundance was noticed for heated shock treatments. Changes in salinity were found to have a prominent impact upon biodiversity and abundance of phytoplankton communities in both experimental systems. The mesocosms with ambient temperature and salinity had the highest number of species and values of Shannon's diversity index H. The response of phytoplankton abundance to salinity changes differed between the two experiments. In Thessaloniki, ambient salinity supported the highest phytoplankton abundance while increased and decreased salinity lead to lower abundance. In contrast, in Kiel decrease of salinity lead to an increased phytoplankton abundance.

References
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