IMPACT OF WARMING AND ACIDIFICATION ON THE PELAGIC, MICROBIAL FOOD WEB IN THE EASTERN MEDITERRANEAN – A MESOCOSM EXPERIMENT

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Warming and acidification of the oceans are two major drivers of climate change. The impact of increased CO₂ on the pelagic ecosystem has been recently studied in mesocosm experiments, however the simultaneous impact of CO₂ and temperature increase can only be studied in land based facilities where temperature can be regulated. The mesocosm facilities of HCMR in Crete (CRETACOSMOS) are one of few facilities of the kind and are the only ones providing the possibility to study such phenomena in real oligotrophic conditions due to the position of HCMR site in the Eastern Mediterranean. A large scale mesocosm experiment focusing on the study of the simultaneous impact of warming and acidification on the planktonic, microbial food web of the Eastern Mediterranean was taken place from 30 August to 14 September 2013 at the mesocosm facilities of HCMR in Crete, in the framework of the EU funded project MedSea. During the experiment, two different pCO₂ (present day-8.13 and predicted for year 2100-7.83) were applied in triplicate mesocosms of 3 m³. This was tested in two different temperatures (ambient seawater T (25°C) and ambient T plus 3°C). Twelve mesocosms in total were studied and were incubated in two large concrete tanks, one of which was constructed for the needs of this experiment. Temperature was controlled by sophisticated, automated systems. A large variety of chemical, biological and biochemical variables were studied, including salinity, temperature, light and alkalinity measurements, inorganic and organic, particulate and dissolved, nutrient analyses, biological stock (Chla concentration, enumeration and community composition of microbial, phyto- and zooplankton organisms) and rate (primary and bacterial production, copepod egg production, N₂ fixation, P uptake) measurements, bacterial DNA extraction and phytoplankton transcriptomics, calcifiers analyses. Temperature was successfully controlled in both tanks, the variation was ± 0.5°C of the target temperature. Acid conditions (pH=7.83) in the two acidified treatments were reached after two days of continuous acidification and pH remained then stable throughout the experiment. The effect of acidification was evident in the Chla (mainly in the pico-sized fraction) and the pico-eukaryote concentration; Chla and pico-eukaryotes increased in both acidified treatments whereas the effect of warming was seen on the primary production. Bacteria abundance did not vary at all among treatments whereas bacterial production showed a small variation. Twenty three scientists from 6 institutes and 5 countries participated in this experiment which is expected to elucidate the impact of climate change on the pelagic food web, at the ecosystem level.