ECOPHYSIOLOGICAL CHANGES OF A SIMPLIFIED CORAL REEF COMMUNITY FACING OCEAN ACIDIFICATION: A ONE YEAR STUDY IN ARTIFICIAL REEF MINICOMS

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Highlight

A simplified reef community has been able to face increased pCO₂ during one year: calcification of hermatypic scleractinians were unchanged, or even enhanced for the Pocilloporidae family. The main bioeroders from this reef, Echinometra mathaei, was also able to deal with pCO₂ : unchanged growth, respiration or coelomic fluid pH. Nevertheless bio-erosion increased: this could shift the balance between a calcifying and an eroding reef.

Background

Ocean acidification, which is one consequence of increasing pCO₂ partially dissolving in the seawater, is today an undisputed fact. The future of coral reef ecosystems depends on the balance between the accretion of CaCO₃ by calcifiers and the bio-erosion by eroders. In this study, we describe the effects of a progressive higher pCO₂ (during 6 months reaching predicted pH for 2100) followed by 6 months of stable pH on a simplified reef community using original minicoms developed at UMONS.

Material and methods

Two twin minicoms were developed, each composed of a control and an experimental tanks. Accurate control of pH, temperature, salinity, alkalinity, light, nutrients, etc. is performed. Physico-chemical conditions found in La Saline Lagoon, Réunion Island, are simulated including their daily variations.

Results

The simplified reef community was composed of “reef building corals” (hermatypic scleractinians; Fig 2 A-D), important bio-eroders of the La Saline Reef, Echinometra mathaei (Fig 2 E) and also calcareous reef substrate containing algae, micro-organisms, gastropods, etc.

Discussion and conclusions

The future of the coral reef ecosystems will depend on the balance between the reef accretion and erosion. Working at ecosystem scale was thus important to catch a global picture of the effects of a pCO₂ increase on the different organisms involved.

Minicoms devices were suitable for this kind of approach. The present study highlighted that the progressive pH decrease gave to organisms the possibility to acclimatize to contrasted conditions. In one hand, calcification of reef building corals was not impacted, and was even enhanced when confronted to acidified conditions.