GLOMAR

Doctoral Colloquium

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Evaluation of Octocoral Responses to Global and Local Factors: Ocean Acidification, Warming, and Organic Eutrophication

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and online via Zoom

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Climate change, a global factor with ocean acidification and warming as its main consequences, threatens coral reefs worldwide. Concomitant local factors such as organic eutrophication occur simultaneously, but knowledge about the interaction between global and local factors is scarce. In addition, octocorals, including soft corals and gorgonians, are highly under-investigated, although they are an essential functional group in reef ecosystems. This thesis aimed to evaluate the ecophysiological responses of octocorals to ocean acidification, warming and organic eutrophication simulated as dissolved organic carbon (DOC).

We addressed the following research questions:
1) How does the physiology of different octocoral genera respond to simulated ocean acidification?
2) How does DOC, warming, or their interaction affect the physiology of octocorals?
3) What are the physiological responses of soft corals to prolonged warming?

The approach comprised a series of aquaria experiments on octocorals spanning from 40 to 120 days. We assessed diverse metrics, including mortality, bleaching, pulsation, growth, oxygen (O2), carbon (C) and nitrogen (N) metabolism, and N-cycling bacterial community dynamics.

Findings revealed that octocorals in all treatments exhibited 100 % survival and maintained growth, no bleaching and positive photosynthesis except for Xenia umbellata under prolonged warming and Pinnigorgia flava under warming and DOC addition. In particular, X. umbellata showed high tolerance to local and global factors and increased N-fixation, supporting the holobiont functioning under stress.

Our findings suggest that ocean acidification, warming and organic eutrophication will have lesser impacts on soft corals than most hard corals as, according to the literature, and supports soft corals as winners under future scenarios, although they are not entirely resistant to the factors assessed. This thesis contributed insights into soft corals' ecophysiological traits and mechanisms driving their tolerance, which may be key to understanding potential shifts of coral species dominance in current and future reefs. Our findings can contribute to enhancing the incorporation of soft corals within the scope of priorities for mitigating global and local factors and for devising effective reef management and improved conservation strategies.