Soutenance du diplôme HDR du

Dr. Alexander VENN

Département de Biologie Marine, Équipe de Physiologie et Biochimie
Centre Scientifique de Monaco

Lundi 5 décembre 2022 à 14h30

Salle de Conférences, Musée Océanographique de Monaco

‘La physiologie environnementale des coraux : Régulation du pH dans la symbiose et la calcification’

‘The Environmental Physiology of Corals: pH regulation in symbiosis and calcification’

Composition du jury :

Président/te du jury :
Dr. Sylvie Tambutté (Centre Scientifique de Monaco)

Rapporteurs/trices :
Professor Colin Brownlee (Marine Biological Association, UK)
Professor Paola Furla (Université Cote D’Azur, France)

Examinateurs/trices :
Dr. Catherine Lorin Nebel, (UMR Marbec, Université de Montpellier, France)
Dr. Jérémie Vidal-Dupiol (IHPE UMR 5244, Université de Montpellier, France)
Professor Denis Allemand (Centre Scientifique de Monaco)

Résumé / Abstract

Coral symbiosis with photosynthetic dinoflagellates, and the formation of coral skeletons by calcification, underpin the trophic and structural foundation of the most biodiverse ecosystems in the ocean: corals reefs. pH regulation is a crucial aspect of the physiology underlying both coral symbiosis and calcification because it modulates the availability of dissolved inorganic carbon (DIC) for these processes and is crucial to cellular function and homeostasis generally. Furthermore, pH regulation may be critical to determining the response of corals to ocean acidification driven by anthropogenic carbon emissions. Despite its significance to coral biology and the future of coral reefs, pH regulation received little attention in corals before the Physiology and Biochemistry team at CSM started working on this topic.

In this HDR defence I will describe the research I have carried out with my colleagues and students in the Physiology and Biochemistry team since joining the CSM in 2008. Firstly, I will describe how our work has revealed that symbiont photosynthesis drives extraordinarily large variations in coral intracellular pH, and that corals acidify the compartment around the symbionts to enhance DIC transport for photosynthesis. Secondly, I will explain how we made the first in vivo measurements of pH in the coral's extracellular calcifying medium (ECM) and how it is regulated, providing insight into the physiological mechanisms of calcification. Thirdly, I will describe how our work on pH regulation in the ECM and paracellular permeability has allowed us to decipher mechanisms underlying the sensitivity of coral calcification to ocean acidification in different species of coral. I will also discuss our work on the effects of temperature variation on the physiology that drives coral calcification. Finally, I will outline our ideas for future research, including obtaining a systemic understanding of pH regulation across all the tissue layers of corals and our research into intracellular calcium regulation, which will provide exciting projects for masters and Ph.D. students in the coming years.

Mots-Clefs / Keywords :
Coral, climate change, acid-base regulation, cell, ocean acidification, carbon dioxide, photosynthesis, biomineralization