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Gradients and instability: Ecology of macrozoobenthic communities in the Benguela Upwelling System off Namibia

The seafloor of the Benguela Upwelling System off Namibia is characterized by organic matter-rich diatom mud belts with periodic diffusion of hydrogen sulphide (H2S) from the anoxic sediments. The low oxygenated and sulphur-rich sediments offer a suitable environment for sulphur-oxidizing bacteria but are toxic for higher life. At the same time, the perennial sedimentation of fresh particulate organic matter, from the productive surface, offers a nutritious food source for benthic animals. Indeed, the central benthic community off Namibia is biologically poor while the boundaries of the OMZ house high-standing stocks of macrofauna. Despite of its intriguing ecological aspects and the current expansion of Oxygen Minimum Zones worldwide, the Namibian marine biodiversity has one of the world's largest knowledge gaps in taxonomy, so thus ecologically. In this context, this PhD research aimed to improve this knowledge gap by centrally asking how organisms are successfully living in this harsh environment, focusing on physiological, trophic' and communities' ecological aspects. The three specific aims of this study were: 1) To understand the metabolic responses of a boundary' dominant mollusc species to oxygen variability. 2) To study the trophic ecology of molluscs species, including a symbiotic interaction. 3) To describe the macrozoobenthic communities off Namibia, and gain additional insights into community structure and environmental predictors. We sampled macrozoobenthic organisms between 17°S and 25°S latitudes and between 25 m and 1523 m water depth on board of the RV Meteor during the EVAR Expedition M157. Multivariate analyses were conducted with biodiversity data of samples from M157 and other cruises.Analyses of nutrients uptake/excretion measurements, bulk and amino acids specific stable isotopes and RNA sequencing were employed in trophic ecological studies. QPCR with primers of enzymes from aerobic and anaerobic metabolic pathways was conducted with tissues of bivalves exposed to hypoxia and reoxygenation. In general, the present study concluded that the Namibian shelf macrozoobenthic communities are significantly structured by temperature, hydrogen sulphide, and interseasonal oxygen average and oxygen variability. The dominant mollusc species living in the sediments of the Namibian shelf employ similar physiological strategies to organisms living in other oxygen-variable ecosystems. Furthermore, they nutritiously profit from sedimented diatoms and sulfur-oxidizing symbionts. Moreover, the symbionts profits from ammonium abundant in this reducing environment.