INTRODUCTION

Understanding the effects of environmental variability and extremes on natural populations and ecosystems is a key priority as global environmental change intensifies. High local variability in physical and chemical ocean properties can create extreme climatic environments, where marine species persist under suboptimal environmental conditions such as highly variable temperatures, acidification at CO$_2$ vent sites and changings in the saturated state of aragonite ($\Omega_{\text{arag}}$). By 2100 the worst scenario shows a reduction of oceanic pH of 0.4 points passing from 8.1 to 7.7 and on the other hand in the best one there will be a reduction of 0.2, from 8.1 to 7.9$^{1-4}$. Moreover, nowadays aragonite saturation state is above 3.5, while in the worst scenario until 2100 it will decrease below 1.5-2 and in the best one will be above 2$^5$ (Fig. 1). These conditions have brought a new threat to calcifying organisms, by reducing the availability of carbonate ions that corals need to build their skeleton, and it will worsen in the following years.

Fig. 1. Modelled variations in pH and calcite ($\Omega_{\text{calcite}}$) and aragonite ($\Omega_{\text{aragonite}}$) saturation state in the surface oceans modelled for a range possibilities for future CO$_2$ emissions in 2100.

Warming and ocean acidification are amplified in the Mediterranean Sea, because of its low depth (1.5 km, ocean have an average value of 3.8 km), the absence of a continuous fresh water flow (being semi-enclosed sea), high evaporation and exploitation by human activities$^1$. Studies conducted in the Mediterranean Sea can be used to highlight how marine ecosystems and organisms could respond to the new and severe environmental
Among calcifying benthic organisms, this project will focus on the Mediterranean scleractinian coral *Balanophyllia europaea*, on the bivalves *Chamelea gallina* and *Mytilus galloprovincialis*.

The aims of this study are to

1. characterize the environmental parameters along a pH gradient generated by a Mediterranean CO₂ vents, off the Panarea Island (Sicily) and along the latitudinal gradient in Adriatic Sea;
2. investigate biometry, skeletal properties and growth in on the Mediterranean scleractinian coral *Balanophyllia europaea*, and in the bivalves *Chamelea gallina* and *Mytilus galloprovincialis*.
3. investigate polycyclic aromatic hydrocarbons (PAHs) concentration in three biological compartments (i.e. skeleton, tissue, and zooxanthellae) of the coral *Balanophyllia europaea* along the pH gradient and in the bivalves *Chamelea gallina* and *Mytilus galloprovincialis* along the latitudinal gradient.

References