EXPERIMENTAL APPROACH TO THE POTENTIAL RESPONSE OF A LONG-LIVED INVERTEBRATE SPECIES FACING THE WARMING IN THE NW MEDITERRANEAN

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Abstract
The precious Mediterranean red coral *Corallium rubrum* is a colonial and aposymbiotic octocorallian characterized by low dynamics and limited dispersal ability. Recently, shallow populations of this species were differentially affected by positive thermal anomalies possibly related to global warming. The question of differential individuals fitness in front of this new environmental disturbance arises. As a first step, we choose to study the relationship between these organisms and their local environment. Populations dwelling in contrasted temperature regimes (i.e.; warm and variable vs. cold and more stable) were reciprocally transplanted. The individuals' fitness was evaluated through the measurement of growth during 6 months including the summer period. These results are discussed in the light of population genetic structure.
Keywords: Genetics, Global Change, Conservation, Mortality

The study of the underlying ecological and/or genetic factors involved in the differential responses of populations to temperature anomalies is a key issue to better understand the impact of the ongoing climate change in the rich Mediterranean communities. This require among other things, the analysis of the degree of adaptation of populations to their local environment (i.e. local adaptation). The different responses observed at the population level during recent mass mortality events (MME) could reflect different levels of thermotolerance [1] that could be linked to different adaptation to local thermal regimes. We conducted reciprocal transplants experiments to test for local adaptation. The Mediterranean red coral *Corallium rubrum* was used as a model species. Reciprocal transplants of colonies dwelling at 20 m (shallow habitat) and 40m depth (deep habitat) were carried out at two regions (Riou Archipelago (Marseille) and Scandola (Corsica). Contrasted temperature conditions characterize shallow (warm and variable regime) and deep (cold and stable regime) habitats. Colonies were transplanted into experimental plates and labelled with calceine at the beginning of the experiment (spring 2006) for about a 6 month period (Fig 1A).

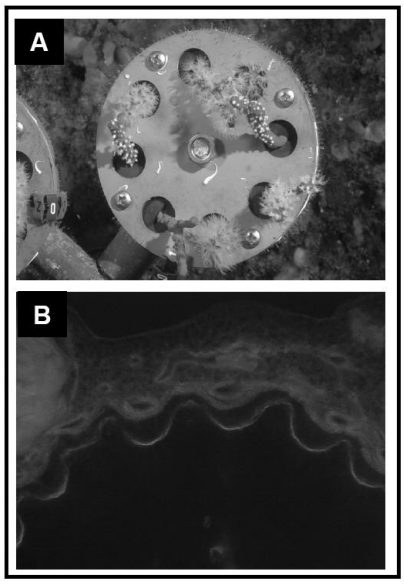

Fig. 1. **A.** Transplant plates used for the reciprocal transplant experiment in 2006, Riou Sud 20m. **B**. Stereomicroscope image showing the calceine labelling in a transplanted red coral colony

Growth rate during the transplant period was used to estimate the relative fitness value (Fig 1B). Only the population from Riou Sud 20 m showed significant decrease in growth rate when transplanted to 40m (from 0.10 mm to 0.04 mm over the 6 month period) (Fig 2).

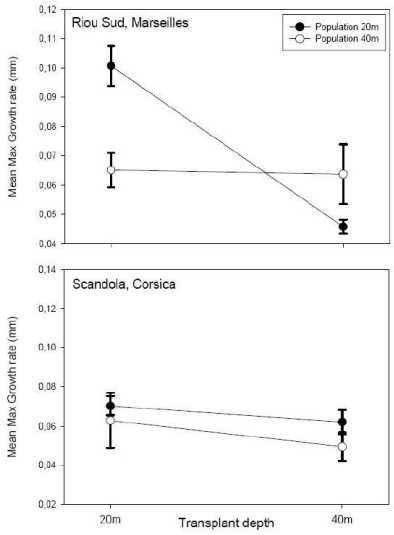

Fig. 2. Mean maximum growth rates (mm) from the transplanted colonies in different depths (20-40 m) in the two regions studied (Marseilles and Corsica)

All other populations tested did not show significant differences between treatments. Genetic analysis based on 10 microsatellites showed significant structure between populations. Therefore, we conclude that different genotype*environment interactions exist in the studied populations. This result is an important step in the characterization of the local adaptation in the populations of *C. rubrum*.

References
1 - Garrabou J., Coma R., Bally M., Bensoussan N., et al., 2009. Mass mortality in northwestern Mediterranean rocky benthic communities : effects of the 2003 heat wave. *Global Change Biology*, 15: 1090-1103.