1. **PUBLISHABLE SUMMARY**

Europe's marine biodiversity constitutes a vast but fragile resource of great cultural and economic importance to its people. Many marine species of the Mediterranean Sea are presently endangered and some are probably prone to extinction. The degradation of marine Mediterranean ecosystems began centuries ago, but there is no global summary of the magnitude of this change. This project aimed the direct and combined effects of global warming and invasive species on high-diverse coralligenous communities. The highly-diverse coralligenous communities support social and economic development in several European regions. Therefore, their protection is an imperative socioeconomic and environmental need. My research is therefore useful to provide information on the future impacts, allowing managers to anticipate ecosystem decline through an understanding of the sequences of species and habitat loss.

**A summary description of the project objectives and of the work performed since the beginning of the project**

**Factors that favour the spreading of the invasive species *Womersleyella setacea* and *Caulerpa racemosa*.**

The aim of this objective has been first, to elucidate abiotic conditions influencing invasive species biology and growth. In this line, we have monitored and studied *C. racemosa* and *W. setacea* populations in situ, besides to experimentally study effects of different temperature and irradiance conditions in the laboratory. On the other hand, I have also studied how biotic interactions with the native hosting assemblages can influence macroalgae invasions in the Mediterranean Sea.

**Response of calcareous algae and gorgonian populations face the warming trend and the invasive species *Womersleyella setacea* and *Caulerpa racemosa***

In order to assess the thermotolerance thresholds of gorgonian I set up an experiment submitting the target species to different temperature treatments. Furthermore, in order to evaluate the potential adaptation of different populations dwelling with different environmental conditions and genetic origin, the experiment was carried out with two different populations developing in contrasting abiotic conditions. On the other hand, and thanks to the expertise of my scientific in charge we have set up several experiments in the laboratory in order to elucidate temperature and irradiance requirements and tolerance of the most important calcareous species thriving in the Mediterranean coraligenous.

**Impacts of positive thermal events and invasive species on coralligenous communities**

Both invasive species had a strong and consistent negative effect on *P. clavata* fitness, demonstrated by the lower survivorship, higher necrosis rates and lower biomass of the colonies submitted to the invasive algae overgrowth. Furthermore, considering that the persistence of *P. clavata* populations affected by mass mortality outbreaks mainly depends on the recovery of small colonies, the most susceptible to the invasive species overgrowth, our results provided new insights into the additional negative effect of invasive species on the recovery of *P. clavata* populations already affected by mass mortality outbreaks.

