Ecology, evolution and conservation of species with extreme life-histories: the emblematic Mediterranean red coral Corallium rubrum

Ignasi Montero-Serra*[1], Cristina Linares[1], Daniel F. Doak[2], Jean-B Ledoux[3], Pierre Drap , and Joaquim Garrabou[3]

[1]Departament d'Ecologia, Universitat de Barcelona (UB) – Spain
[2]Environmental Studies Program, University of Colorado at Boulder (UC) – United States
[3]Institut de Ciències del Mar (CSIC) (ICM-CSIC) – Spain

Abstract

Understanding how different disturbances and protection levels shape demography and the long-term viability of structural species is a challenge in marine conservation. In this study, we focus on the long-lived Mediterranean red coral *Corallium rubrum* as a model species. Due to the high value of its carbonate skeleton for the ornamental industry, *C. rubrum* has been intensively harvested for millennia. Nowadays, most of its populations at shallow depths remain functionally impaired and warming represents a new threat to the viability of this species. We used long-term photographic series over nine *C. rubrum* populations located in the NW Mediterranean Sea subjected to different disturbance levels to develop population projection models to address two questions: (I) What are the demographic processes underlying the extreme life-history strategy of *C. rubrum;* (II) Are marine protected areas (MPAs) an effective tool to preserve the long-term viability and functional dynamics of *C. rubrum* populations? The results were complemented with an extensive literature review of demographic studies of marine sessile species to understand the evolution of extreme longevities. The precious *C. rubrum* was at the slow extreme of the *fast-slow continuum* of marine sessile species, given its high survival and low reproduction success. Due to high survival of *C. rubrum* colonies, marine protected areas did not affect *C. rubrum* population's extinction risk. However, protection decreased partial mortality rates and enhanced the functional dynamics of *C. rubrum* populations. Our results provide important insights into the management implications for marine invertebrates with extreme life-history strategies.

Keywords: Demographic Models, Precious Corals, Marine Protected Areas, Marine Sessile Invertebrates, Life History

*Speaker