Identification of refugia from climate warming in the eastern Mediterranean Sea

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Abstract

The eastern Mediterranean Sea is the warmest sector of the basin. Due to the seawater temperature increases that occurred in the last few decades because of anthropogenic climate warming, many native species have been pushed beyond their tolerance to heat, causing large-scale population collapses and species eradications. In this doom scenario, a priority for conservation is the identification of refugia from climate warming, that is, areas where native biodiversity retreats to, persists in and can potentially expand from under changing environmental conditions. Hope is offered by two sites in particular: south-western Cyprus and south-western Crete, where strong northern winds cause coastal upwelling – the rise of cold waters from depth – maintaining surface waters 3 °C cooler than the rest of the basin in summer. In this project, we will provide evidence that these areas are indeed a refugium by analyzing their oceanographic (temperature and upwelling patterns) and biological (persistence, abundance and diversity of native species, paucity of thermophilic non-indigenous species) features. Based on intense sampling of benthic assemblages in seagrass and rocky substrates, which host the highest biodiversity in the Mediterranean Sea, and focusing on molluscs that are taxonomically and functionally diverse, we will describe current biodiversity patterns and we will reconstruct the historical diversity from shelly death assemblages to quantify biodiversity loss. We will eventually test the hypothesis that these refugia have not undergone major native biodiversity loss and are home to more diverse assemblages than the warmest parts of the basin. Our final aim is to offer a unique dataset to show the importance of these refugia to local authorities and all stakeholders, aiming at the definition of new marine protected areas in order to contribute to the effective protection of native biodiversity in the Mediterranean