Using “crowd-sourcing” information to map and study shallow reef ecological hotspots andunique areas in support of Israeli Mediterranean MPA planning, monitoring andEcosystem-Based Management

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Abstract

Shallow rocky reefs are among the richest marine habitats on earth and are also heavily exposed to human pressures due to their proximity to the shore and their rich resources. Globally, the most severe anthropogenic impacts on these reefs are the removal of large predators by fishing and the rapid disappearance of habitat-forming macroalgae for a variety of reasons including coastal development, the direct impact of ocean warming, and the movement of highly effective grazers to new areas due to warming. Until about a decade ago there was very little quantitative information on the ecological status of such reefs on the Mediterranean shores of Israel. Recent surveys, however, have shown that the reefs today are highly degraded. They are strongly affected by overfishing, ocean warming and the domination of thermophilic alien species in many taxonomic groups, including fish and macroalgae. Macroalgal forests, that are highly important habitats, appear to be extremely rare, and this is probably a result of overgrazing by invasive rabbitfish. Nonetheless, these surveys, when compared to other data sources, revealed a large knowledge gap. The surveys, that are mostly conducted by SCUBA diving, appear to severely under-estimate the presence and abundance of many ecologically and/or economically important species (EEIS) in some areas. These EEIS include mostly large predatory fish (e.g., groupers, jacks and drumfish, that are fearful of SCUBA divers and their bubbles), as well as the macroalgae forests. Our preliminary data indeed show that many of these EEIS fish are totally missed in our SCUBA surveys but are often detected in the same areas by free-diving and stationary video camera deployments, both inside and outside MPAs. This is because SCUBA surveys have both methodological limitations and relatively poor spatial cover. There is increasing evidence, mostly from reports gathered by the rapidly growing community of recreational and professional divers (mostly freedivers), that are now equipped with HD cameras and GPS devices, that these fish are still abundant on shallow reefs all along the coast in discrete and unique areas, inside and outside existing and suggested MPAs. This information is invaluable for marine conservation, and specifically for the planning, management and monitoring of the network of Mediterranean MPAs planned for Israel.

In this project, we will (1) use “crowd-sourcing” reporting to obtain valuable information on EEIS sites, (2) verify their location using low-cost surveys via free-diving, (3) assess EEIS abundance in key hotspots using a combination of video, diving and mini-ROV surveys, and (4) follow selected EEIS sites over time to detect ecological stability and temporal dynamics. We will also use surveys and experiments to (5) decipher the mechanisms making EEIS hotspots “special”, focusing on seascape features that can affect the presence of large predators and the activity of grazers. We will deliver to managers and policy-makers (a) detailed GIS maps of all shallow water EEIS sites, (b) assessment of temporal dynamics in hotspots, (c) insights on the possible mechanisms that make EEIS sites unique and (d) recommendations for their management and for future monitoring to help evaluate the success of the suggested MPA network.