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Resilience of marine protected areas: Linking species composition and biodiversity to ecosystem resistance

Reefs over the world are under strong degradation threat as human population is steadily increasing on coastal areas. Biodiversity conservation relies on multifaceted human interventions, which ultimately depend on ecosystem resistance and resilience to succeed. Empirical data on ecosystem resistance and resilience is mostly lacking and their quantification remains a challenge. Here, we took a multivariate approach to develop a method based on species composition and biodiversity that provides resistance and resilience metrics. We used underwater visual census of fish, invertebrates, and algae to calculate species composition and biodiversity in three marine areas of Cabo de Gata (Mediterranean Sea) differing in management pressures, i.e., total, partial, and no protection. We aimed to identify resistance and sensibility of managed areas (partial and no-protection) to become reserves if management pressures were eliminated. The species abundance compositional data showed that the intermediate area resistance was lower (32%) than no-protected area (42%), whereas the sensibility to change was around 70% and 55% for partial and no-protected area, respectively. Both managed areas showed lower resistance to change considering species turnover than species composition (30%). Our results suggest that, after management cessation, bringing back species abundances is more complex than restoring species presence. Our results shed light on the evaluation of resilience frameworks on marine ecosystems, with strong implications in conservation. Marine ecosystem management and policy actuations based on the resilience properties of the systems may increase the efficiency of our interventions and make a significant step forward to understanding and preserving marine biodiversity.

Biography

Mikel A Becerro completed his PhD in 1992 at the University of Barcelona. He has ample postdoctoral experience in the University of Guam Marine Laboratory, the University of Hawaii, and the Smithsonian Institution. He is the Director of the BITES lab, a researcher group based at the Spanish Research Council. He has published over 50 papers in top journals and edited a number of books.

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