The use of connectivity in the design of networks of marine protected areas

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Abstract:

Marine protected areas (MPAs) are an area-based conservation strategy commonly used to safeguard marine biodiversity and ecosystem services. Population connectivity governs the exchange of individuals among spatially fragmented habitats and is an essential criterion in the design of MPAs. However, detailed computational methods for connectivity are inconsistently applied in management decisions. We reviewed the scientific and management literature to explore the use of connectivity in MPAs located in countries with advanced marine spatial planning. Only 7.8% of 739 MPAs considered connectivity as an ecological criterion, although it has been increasingly used since 2007, suggesting progress in spatial conservation planning towards the use of ecological conservation objectives. In most cases, connectivity was measured implicitly using either rules of thumb or size and spacing guidelines. Of the MPAs that considered connectivity, 67% were for state marine conservation areas or reserves in California and commonwealth marine reserves in Australia. This pattern indicates substantial geographic biases and significant differences in conservation planning and prioritization among countries. We suggest that the incorporation of connectivity in conservation planning needs to become more accessible to practitioners. Prioritizing connectivity as an ecologically important criterion in MPA design will more adequately address metapopulation persistence and recovery.