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The World Federation for Coral Reef Conservation

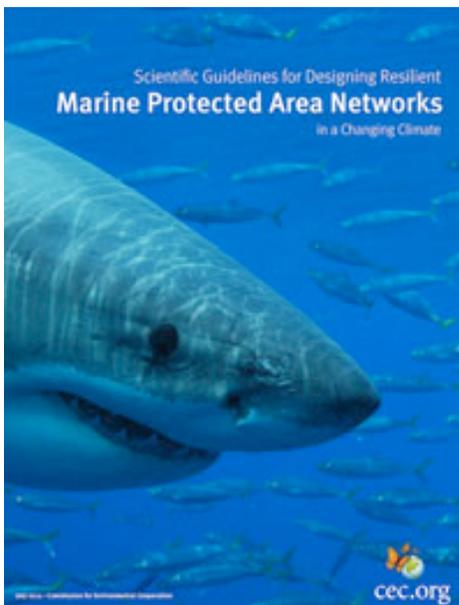
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Scientific Guidelines for Designing Resilient Marine Protected Area Networks in a Changing Climate



Climate change, resulting from both natural and anthropogenic factors, is expected to affect virtually every aspect of marine ecosystem structure and function from community composition and biogeochemical cycling, to the prevalence of diseases. Climate can affect all life-history stages through direct and indirect processes and the possible effects of climate change for marine populations include changes in population dynamics (body size, reproduction), community composition and geographical distributions. Climate change can be expected to affect populations, habitats, and ecosystems differently depending on their underlying characteristics (ICES 2011a, b). Although there are many uncertainties about the rates and spatial structure of future climate change, the probable and



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potential changes need to be considered in ecosystem management planning.

Ecosystems are complex, dynamic networks of interacting abiotic and biotic components, with a certain intrinsic capacity to adapt to perturbations such as climate change. Within ecosystems, it is individual organisms that perceive and respond to perturbations either directly through physical responses to abiotic factors or indirectly through interaction mechanisms such as predation and competition. When large numbers of individuals are affected, the response reverberates through higher levels of organization.

Those parts of the environment that together comprise a place for organisms to survive and prosper are defined as 'habitat' and include physical, chemical, and biological components. Physical structure is often the most visible aspect of a habitat and is therefore the basis for most habitat classifications. However, physical structure alone is not sufficient to provide a functional habitat for an organism. Habitats can also be dysfunctional, even though the basic physical structure is present, if aspects such as food webs or primary production have been altered. In addition, environmental properties such as temperature, salinity, and nutrient (food) availability greatly influence the use of these areas.

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