



## Marine reserve networks could benefit fishing and conservation

**Marine protected areas (MPAs)** usually entail a trade-off between conservation goals and the goals of commercial and recreational fishing. A new study indicates that connecting MPAs into networks could reduce this trade-off. It suggests design guidelines for these networks in terms of size, spacing, location and configuration.

**The conservation benefits** provided by individual MPAs tend to be minor, mainly due to their small size compared with the geographic ranges of the species they are designed to protect. Although larger MPAs could increase conservation, they could also incur large economic and social costs. Nations such as Australia and the USA have pursued an alternative approach by creating networks of marine reserves. Using previous research the study provided guidelines on the design of MPA networks.

**Size and Spacing.** Evidence suggests that fisheries can benefit from a reserve area that is divided into a network of small closures spaced closely together to maximise the dispersal of adults and larvae to fished areas between the reserves. From a conservation perspective, larger reserves are preferred because they increase the protection of adults and the likelihood that larvae will settle in a protected area. Research has indicated the middle path between these two positions could be moderately sized reserves of several to tens of kilometres along the length of the shore, with distances of tens to one hundred kilometres between them.

**Locating Reserves in a Network.** Some sites are “connected” by ocean currents that carry eggs and larvae to suitable sites where they can grow to be adults. These “connected sites” should be protected by reserves. Other sites may produce many young but ocean currents take them out to sea or to places with poor adult habitat. These sites are better targeted for fishing.

**Proportion of Protection in a Region.** Very approximately, one-third of a region should be placed in reserves to produce simultaneous benefits for conservation and fisheries. For example, under California’s Marine Life Protection Act the guidelines for reserve size is 20km and maximum spacing is 50km, which yields a fractional area of 29 per cent of the total region covered by the legislation.

Although there have been advances in MPA network design, several challenges remain. For example, MPA network designs do not currently consider the interaction with future climate change. In addition, the effectiveness of MPA networks has yet to be tested in real ecosystems, but this will soon change since networks are now established.

**Source:** Gaines, S.D., White, C., Carr, M.H. & Palumbi, S.R. (2010). Designing marine reserve networks for both conservation and fisheries management. *Proceedings of the National Academy of Sciences*. Doi: 10.1073/pnas.0906473107.

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