

# SOCIOECONOMICS OF MARINE PROTECTED AREAS: A REVIEW OF EMPIRICAL EVIDENCES

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## Abstract

Recent trends in the science of marine protected areas (MPAs) highlight the need to strengthen the integration between socioeconomic and ecological aspects in the early stage of the planning process. So far, however, the magnitude and relevance of the socioeconomic consequences of MPA creation are still highly uncertain. Here, we present a synthetic review of the empirical evidences of benefits and costs (B/Cs) of MPAs, in order to inform the planning of future protected areas.

*Keywords: Economic valuation, North-Central Mediterranean*

**Introduction.** Marine environments offer extremely valuable resources in terms of extractive and non-extractive uses. The establishment of MPAs, partially or totally limiting human uses, raises important socioeconomic issues that should be included in the planning process at an early stage to increase compliance and general acceptance [1]. However, economic consequences of MPA establishment are often limited to collateral information evaluated *a posteriori* and are generally not integrated in the planning process [2]. Here, we review published empirical evidence of B/Cs of MPA establishment. Results are reported hereafter and summarized in Fig 1.

**Fishery-related B/Cs of MPAs.** We reviewed 95 ISI papers, focusing on 39 MPAs all over the world, that analyze B/Cs in terms of 1) spillover from MPAs toward fishing grounds; 2) change in market value of exported fishes; 3) effect of protection on catch variability; 4) effect on fishing effort; 5) effect on overall catches. Results show that spillover is a common benefit in well-established marine reserves, as it was detected in about 75% of the case studies. Worldwide, spillover from MPAs has been detected for a suite of different species, including finfish and invertebrates. Spillover of lobster has been observed in 6 Mediterranean MPAs. The increase in mean size of commercially important species in the surroundings of MPAs is another common benefit, detected in 28% of the MPAs under study. On the other hand, only four studies analyzed the effect of MPAs on catch variability. Even though theoretical studies suggest that MPAs could diminish catch variability, in 3 MPAs greater catch variability was detected after protection. Displacement of fishing effort associated with MPA creation was detected in almost 25% of analyzed cases studies that reported biomass export. Only 8 of the 39 empirical studies that analyzed spillover collected enough information to assess the effect of protection on overall catches. In 6 cases, MPAs resulted in a net advantage to local fishermen (fishing yields higher with MPA than without); in 2 cases, instead, a decrease in catches after MPA creation occurred due to excessive reduction of fishing grounds.

**Non-consumptive B/Cs of MPAs.** We reviewed 20 ISI papers analyzing the B/Cs of recreational use of 28 MPA in coral reef areas and in the Mediterranean. We focused on the effects of protection on 1) increase of touristic activities; 2) improvement of recreational use; 3) damage from increased visits. Attractiveness of protection on tourism and improvement of recreational use have been detected in 14 over the 28 MPAs, especially for divers, snorkelers and sailors. However, information about increased visits is often anecdotal and it is often impossible to distinguish how much of the revenues from touristic activities are due to the MPA presence itself. In 10 MPAs, contingent valuation and travel cost methods were used to estimate recreational users' willingness to pay (WTP) for enjoying the reserve or simply preserving the seascape. Such surveys are extremely useful for determining fees that can be introduced to sustain long-term financing [3]. In 3 MPAs, the estimated annual revenue from tourism could cover MPA's operating and management costs. Despite the importance of tourism as an income voice, 7 studies detected detrimental effects of recreational use on marine habitats [4]. In 2 MPAs, damages from increasing visits have been quantified in terms of decreased WTP for recreational use due to decline in reef quality [5] and crowding [6].

**Review on MPAs management costs** shows that acquisition, management, enforcement and transaction costs constitute an effective problem for effective management: in a surveys of 83 MPAs worldwide, it emerges that in only 15.7% of the cases current funding was sufficient for effective conservation [7]. The total annual running costs per unit area has been found

to decrease with MPA size [7], meaning that MPAs cost more to run, per unit area, where they are small.

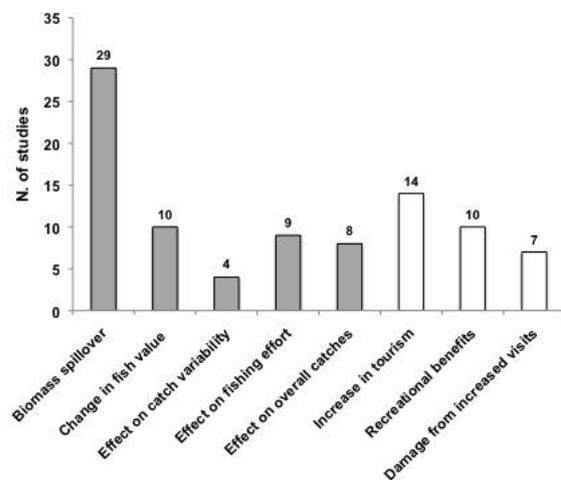


Fig. 1. Number of valuations of socioeconomic effects of MPAs found in the literature. Gray bars refer to consumptive B/Cs, white bars refer to non-consumptive B/Cs.

**Conclusion.** Our analysis revealed that consumptive users of marine resource can benefit from MPA establishment, as spillover of biomass from reserves is a common benefit in existing MPAs. Non-consumptive benefits are a crucial aspect in determining the degree of financial self-sustainment of MPAs, as long as no habitat damages from increased visits occur. Information on MPAs management costs shows that economy of scale encourages the expansion of existing networks of MPAs to foster the recovery of marine ecosystems.

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