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Marine reserve establishment and on-going management costs: A case study from New Zealand

U.A. Rojas-Nazar [a], R. Cullen [b], J.P.A. Gardner [a], J.J. Bell [a,*]

[a] School of Biological Sciences, Victoria University of Wellington, P.O. Box 600, Wellington 6140, New Zealand
[b] Faculty of Agribusiness and Commerce, Lincoln University, PO Box 85084, Lincoln 7647, New Zealand

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ABSTRACT

While there is considerable international research focused on the conservation outcomes of marine protected areas (MPAs) and marine reserves (MRs) there is little information on the economic cost to establish and manage these protected areas. This study estimated the MR pre-establishment and establishment costs for the Taputeranga Marine Reserve (TMR) in New Zealand (NZ) and determined the annual management costs for this reserve and four further NZ MRs. Finally, the cost to local rock lobster fishers resulting from the displaced fishing effort once the TMR had been established was estimated. This research found that the TMR pre-establishment cost was approximately NZ$508,000, and the establishment process cost was approximately NZ$353,000. The annual management costs across the five reserves ranged between NZ$43,200 and NZ$112,500 between 2008/09 and 2010/11. The annual fishers displacement cost at TMR was approximately NZ$22,000 per annum. This research showed that on a unit area basis, small MRs in NZ are just as expensive to maintain as large MRs. This study also highlighted how volunteer effort helped to considerably reduce the monetary cost of the MR pre-establishment process. This research increases our understanding of establishment and management costs, and supports future planning of MRs both within NZ and internationally.

1. Introduction

Marine protected areas (MPAs) are an important tool for protecting the marine environment [1–4]. However, to effectively designate, establish and manage MPAs requires an investment of time, money and appropriate expertise. When an MPA is proposed, understanding and assessing the costs involved is fundamental to support conservation management, as management agencies will need to account for such costs in future budgeting once the MPA is in place. These costs will be both direct and indirect. Direct costs are those that relate to the creation, establishment and operating costs of an MPA and include baseline data collection, public surveys, staff salaries, information gathering, and document writing. Indirect costs are those incurred as a consequence of the MPA being established in a specific place, for example, the cost of displacement of fishers from an MPA to other fishing areas.

Understanding the costs associated with MPAs is important for three main reasons: (1) to provide information to managers and non-government agencies to make the best use of current budgets [5,6]; (2) to support systematic conservation planning and optimise the available resources to achieve specific goals [6,7]; and (3) to identify, quantify, and if possible, map conservation costs to allow an understanding of where these costs are borne and by whom [6,8,9]. Currently, the costs associated with MPAs are poorly described [10,11], even in developed countries. While cost information is widely available for terrestrial protected areas (see [6,12]), marine areas require different management approaches and therefore the models used to estimate protected area costs on land cannot be easily applied to marine systems.

Conservation funding is limited and for that reason understanding conservation costs may help managers and stakeholders to design more efficient action plans, allocate budgets in the most effective way and identify when further funding should be sought to meet conservation goals [6]. Consequently, without a comprehensive understanding of MPA costs, the effect of limited funds to cover conservation management may mean some social and biological benefits are lost [11]. In addition, underestimating the cost may result in a 'paper MPA' being established, which is when an area is established but does not function as a protected area. Shortfalls in MPA budgets may also lead to inadequate infrastructure, insufficient staffing and equipment, and other management failures [11], resulting in an ineffective MPA. There are

* Corresponding author.

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examples of such paper MPAs in a number of countries including Indonesia [11], South Africa [13], and Ecuador [14], where the level of investment in protected areas is often insufficient to cover all costs, despite these sites containing high biodiversity [11,12]. Bruner [15] estimated that there is a financial shortfall for developing countries of US $2.074 billion annually (inflation adjusted to 2012) (US Inflation Calculator, 2012) to manage all existing protected areas, both terrestrial and marine.

Indirect costs, such as the relocation of fishing effort (by commercial, recreational and customary fishers) to areas other than their preferred fishing grounds because of an MPA closure [16,17] also need consideration. Such displacement often results in greater fishing costs for both commercial and recreational fishers [18], for example, they may need to travel further to reach suitable fishing grounds. While there is considerable evidence to support MPAs benefitting local non-protected areas through density-dependant processes (e.g. [19–21], it is important to recognise not only the benefits of MPAs, but also their costs [18]. Fishing costs are likely to increase when fishers move to continue their fishing activities outside MPAs. Operational costs [16], such as the increased fuel used to travel further to new fishing areas, sometimes new fishing gear, and the amount of time spent at sea, are all likely to increase. Once an MPA is established, the decision by fishers of where to fish will be based on the financial and opportunity costs they expect to incur if they relocate fishing effort [22]. This means identifying locations where they catch the same amount of fish (their quota) whilst trying to avoid extra costs. Fishers will likely try to maximise their profits by using their local knowledge [23] and individual skill [24] to decide which locations will be most suitable. Given the importance of this relocation, it is important to understand the costs involved in this decision making process in order to evaluate the full costs of MPA designation.

Previous studies have attempted to develop different models to calculate the cost of protected areas at global, national and regional scales (e.g. [6,8,10,12]). Despite agreements across the world that encourage the expansion of MPAs to cover larger areas of the oceans (particularly the Convention on Biodiversity, 2010, which encourages countries to protect at least 10% of worldwide marine environments) [25] there is little information on the costs associated with MPA establishment. This is an important information gap in supporting MPA expansion and ensuring funding allocations are appropriate.

Marine reserves (MRs) are one type of MPA used to protect marine biodiversity, although they can have different purposes and operational rules in different parts of the world. In New Zealand MRs are a common marine protection tool in the provision of area-based biodiversity protection [26]. Currently there are 44 marine reserves established in New Zealand territorial waters, from which five MRs were selected for this study. First, the pre-establishment and establishment costs for the Taputeranga Marine Reserve (TMR) in central New Zealand were assessed. Then data was collected on the on-going management costs of five MRs in central New Zealand (including TMR) Finally, the displacement cost to local rock lobster fishers as a result of the establishment of the TMR were estimated.

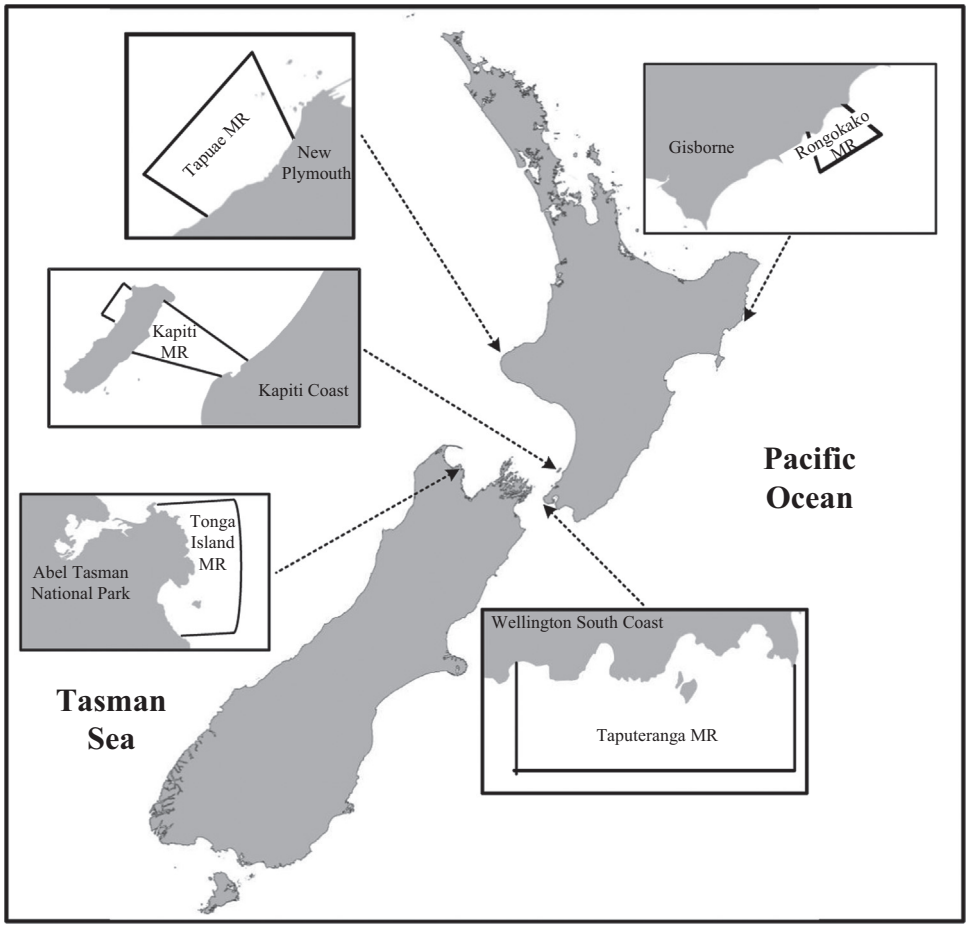

Fig. 1. Locations of five marine reserves in New Zealand used in this study. (a) Taputeranga MR, (b) Kapiti MR (KMR), (c) Tonga Island MR, (d) Te Tapuwae o Rongokako MR (RMR) and (e) Tapuae MR.