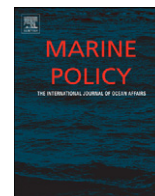




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## Measuring the benefits and costs of community education and outreach in marine protected areas

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## ABSTRACT

Conservation organizations often invest considerable resources in education and outreach activities in and around marine protected areas (MPAs). The expectation is that such efforts will change local knowledge, attitudes and ultimately behavior. This is one of the first studies to assess the efficacy of using education and outreach activities to improve community knowledge and attitudes about an MPA. Random sample surveys in 2005 and 2010 ( $n=1213$ ) before and after education and outreach activities are compared. Program budgets for the same period give the investment levels. With an investment level averaging US\$24 per capita/year, the result was an average increase of 33% in “yes” responses across 15 indicators of knowledge and attitudes towards marine conservation. The increase in knowledge and positive attitudes was associated with a large decrease in “not sure” responses, suggesting that community members with fewer initial preconceptions are the most effective target for education and outreach activities. This study demonstrates that investments in MPA education and outreach can generate increases in local knowledge and positive attitudes, and changing knowledge and attitudes is expected to contribute to the long-term compliance with MPA regulations.

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### 1. Introduction

Over the past decade, research on the factors that lead to conservation success has increasingly focused on the social context of conservation [1–3]. Within the realm of marine conservation, research suggests that the primary determinants of a marine protected area's success or failure are social factors rather than its biological or physical characteristics [4–7]. Several studies note that broad social support for a marine protected area (MPA) is linked to successful conservation [8–11], and without this support, an MPA may lack legitimacy or community ‘buy-in’ leading to a lack of compliance with fishing and access regulations [12].

To build broad-based community support for an MPA, a common approach is to use a participatory design process that convenes and engages stakeholder groups to provide input on the placement and design of the MPA as early in the process as possible [13–15]. Another approach, which is more often used

by governments, is to establish an MPA and then invite local stakeholder groups to provide inputs on its management [16].

The advantages of a participatory design process include greater ownership of the results by stakeholders, increased compliance with resource regulations, and greater flexibility in resource management [15], but without local knowledge of an MPA's function and likely impacts, and without positive attitudes towards an MPA, participation is unlikely to be fruitful or sustained [12].

To build knowledge and positive attitudes about marine conservation, one approach is to invest in education and outreach linked to specific conservation strategies, such as MPA design and management. A number of conservation organizations are known to use this approach in marine conservation including the World Wide Fund for Nature (WWF), Conservation International (CI) and The Nature Conservancy (TNC).

Given that current funding for marine conservation is insufficient to meet global conservation goals [17], ensuring that existing and future marine conservation investments are cost effective is important for maximizing conservation benefits. There are increasing calls to measure the cost effectiveness of various conservation strategies (e.g., [18–21]). More data on the conservation benefits and the financial costs of a strategy can help decision-makers to choose appropriate strategies. For example,

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Haisfield et al. [22] show it is more cost effective for MPA managers to invest in enforcement and achieving compliance with regulations than to invest in coral reef rehabilitation [22]. Alder [23] compared the costs of education versus enforcement for changing awareness, attitudes, and behaviors in Australia's Great Barrier Reef Marine Park and found that education programs have a wider impact on the community and are cheaper than enforcement [23].

In early 2005, TNC commenced community education and outreach activities in the Raja Ampat District of eastern Indonesia, focusing on Misool and Kofiau islands in support of two of the seven MPAs in the 1,185,940-ha Raja Ampat MPA network. The education and outreach activities included the creation of a network of village community organizers for the dissemination of conservation information and to support the revival of traditional marine management systems, convening village conservation groups to provide local input on MPA design, publishing a marine conservation-themed newspaper, developing locally relevant environmental curricula with school teachers, creating a community program of small grants for conservation activities, and developing village regulations to manage local terrestrial and marine resources. In addition, there was a social marketing Rare Pride campaign focused on destructive fishing practices and overfishing.

Though many communities in Raja Ampat and eastern Indonesia have a long history of customary marine tenure systems called 'Sasi' (a seasonal prohibition to harvest marine resources) [24], modern MPAs that are co-managed with the local government are new to the district. Raja Ampat is also remote with minimal radio, television or other media penetration and relatively few exogenous factors to consider.

Here data collected from Raja Ampat's Misool and Kofiau islands are used to answer the questions: (i) do education and outreach activities result in greater knowledge and more positive attitudes about MPAs among local people; and (ii) what were the financial costs of these activities?

## 2. Methods

Thirteen villages on Misool and Kofiau islands were targeted for education and outreach activities. These villages were identified in 2003 through a baseline household survey as communities with tenure rights or permission to extract resources from the Misool or Kofiau MPA areas.

Three perception monitoring surveys measuring local peoples' knowledge and attitudes about marine environmental issues were conducted in the 13 villages (Fig. 1). The first was in May 2005 as education and outreach activities began at both MPAs. The second was 15 months later, and the third was in June 2010, after five years of activities. The surveys were designed to guide the allocation of program resources and inform strategic alternatives within an adaptive management framework rather than for measuring outcomes. Hence, there were no villages included that serve as counterfactuals.

Here the 2005 and 2010 survey data are used to compare responses before and after the implementation of education and outreach activities. The 2006 survey data were not included due to an inconsistent methodology and data quality issues. When differences in questions between the two surveys were accounted for, 15 identical questions addressing knowledge and attitudes were identified in the 2005 and 2010 surveys. These 15 questions were the basis for this analysis.

For both surveys, enumerator selection procedures, sampling procedures, interview procedures, and the structured questionnaire followed Bunce & Pomeroy (2003) [25]. Local enumerators

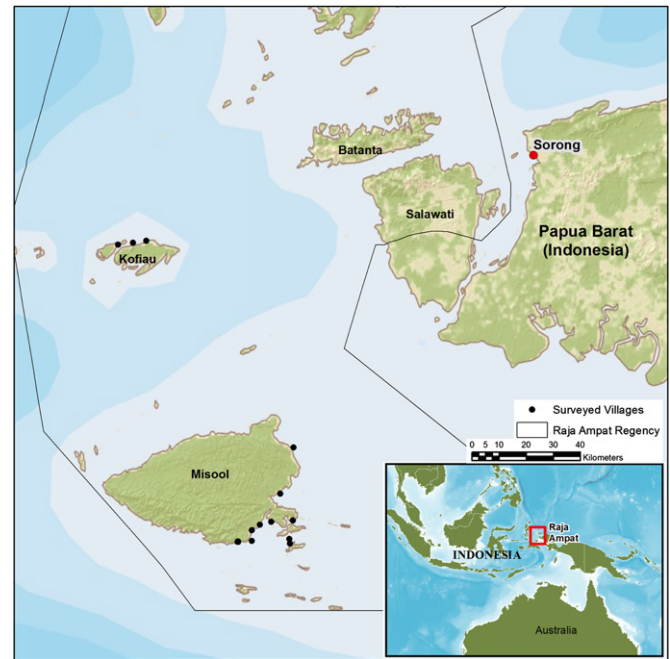


Fig. 1. Map of the villages surveyed for perceptions near the two Raja Ampat marine protected areas.

were selected from a pool of university students in West Papua and trained on-site in interviewing techniques and protocols. The 2005 survey questionnaire was developed and localized with the assistance of an international expert in household surveys. Each questionnaire was pre-tested twice and revised as needed. Survey households were randomly selected from government census lists. Verbal consent was obtained from participants before conducting interviews. During verbal consent, participants were informed about the survey purpose, the time needed for the questionnaire, and how the data would be utilized.

The survey questionnaire was split into a household section and an individual section. In the household section, an adult in the household was asked to provide information on housing characteristics and demographic data on family members. In the individual section, one male and one female respondent were interviewed in each of the selected households. Individual respondents were selected randomly from a list of all household members between 15 and 59 years old drawn up as part of the household interview. The individual section covered the respondent's background, knowledge of environmental protection, attitude towards the environment, exposure to information, and participation in stakeholder organizations.

Thirty households in each village were selected for participation in the survey. In the two villages with fewer than 30 families, all households were included. At the aggregate level, this provided a Confidence Interval for the data sets of 95% or higher. In 2010, the total population in the survey area was approximately 6000 people (Table 1).

To analyze changes in responses between the 2005 and 2010 surveys, proportional comparisons were made and tested for statistical significance using  $\chi^2$ ,  $t$ -tests or Mann-Whitney  $U$ . Data were analyzed using SPSS version 15.0.

For the cost data, information was compiled from US\$-denominated work plans developed at the beginning of each financial year. Education and outreach were specific budget categories in the annual work plans. The education and outreach costs comprise the outreach staff who worked directly with villagers, relevant operating expenses, and the perception monitoring surveys but

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