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Impacts of the Moreton Bay Marine Park rezoning on commercial fishermen

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ABSTRACT

The design of marine protected areas now typically incorporates socioeconomic data to minimize potential negative impacts on stakeholders. However, these data have limitations that are not well understood. Furthermore, whether the application of socioeconomic data in planning actually reduces avoidable negative impacts on stakeholders is rarely evaluated. This study assessed impacts on commercial fishermen of the rezoning of the Moreton Bay Marine Park, in south eastern Queensland. Specifically, this study (1) compared estimates of opportunity costs of new no-take zones from before and after the rezoning was implemented, and (2) identified impacts of the new zoning scheme on fishing businesses and changes to working environment. Although estimates of aggregated opportunity costs before implementation matched those reported afterwards, these costs varied strongly between types of fisheries and individual fishing businesses. A large proportion of fishermen reported loss of fishing grounds. Some have found new grounds but reported that their travel times have increased and that the remaining open grounds are overcrowded. Fishermen have attempted to adapt to this new situation by changing the time spent fishing or diversifying into other fisheries, which required investing in new gear. The effectiveness of a structural adjustment package to compensate fishermen and minimize displacement of effort was limited by poor information on the number and use of commercial fishing licences and little understanding of the dependence of individual fishing businesses on particular fishing grounds. Ways of improving fisheries data for conservation planning and designing adjustment packages to more effectively mitigate impacts of MPAs on commercial fishermen are suggested.

Introduction

Globally, a growing population has resulted in increased pressure on marine resources [1]. In turn, this has increased the need for conservation efforts and resource management in the marine environment [2,3]. Marine protected areas (MPAs) [4], multiple-use areas in which extractive use is regulated, can be designed to achieve objectives for both conservation and resource use, and are therefore considered instrumental in mitigating the decline of marine resources [5]. Systematic conservation planning, a framework used to design protected areas to meet explicit conservation goals [6], is considered best practice for MPA design and has been used across the globe (e.g., Australia, the United States, South Africa [7–9]).

The inclusion of socioeconomic data in MPA design allows planners to select areas that meet objectives for biological conservation, whilst minimizing impacts on stakeholders [10–12]. Minimizing the impacts on stakeholders reduces conflict between resource users and the agency undertaking planning and ensures the MPA design is cost-efficient [10]. The most common socioeconomic consideration in marine protected area design is opportunity cost to fishers, typically captured with data on catch per unit effort (CPUE) [10]; however, there are well documented limitations of data on CPUE. Annual CPUE data, as used in conservation planning to date, produce a snapshot of current fishing effort that does not account for inherent temporal variability in fisheries or potential adjustments in fishing behaviour. Adjustments in behaviour of fishers are based on their synthesis of large amounts of information to inform decisions about when, where, and how to fish, considering variables such as price, weather, and management regulation [13]. In addition, CPUE data are often recorded at coarse resolution so the profitability of small fishing grounds can be missed or underestimated, leading to their

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inclusion in proposed marine reserves and increasing conflict with fishermen [11]. Further, CPUE data capture only current effort which might not reflect future effort, particularly if the mobility of the fishing fleet changes through time or if currently fished areas become unavailable through the establishment of MPAs [14].

In addition to the limitations presented by data on CPUE, there are two notable limitations of methods to include opportunity costs in decision support tools for MPA design: 1. data are typically aggregated across different types of fisheries; and 2. data are aggregated across individual businesses. Aggregation simplifies data for use in conservation planning software such as Marxan, but fails to capture the variable impacts on different user groups. Aggregation can result in inequitable distributions of costs across groups, undermining the long-term success of conservation efforts [15]. The recently released Marxan with Zones allows for costs to be assigned to separate fishing groups [16]. However, even this capability is likely to obscure the variable impacts of marine reserves on individual fishing businesses. Understanding variable impacts across businesses is important if structural adjustment packages, aimed at reducing displaced fishing effort from MPAs, are to be well aligned with the MPA design and effective in achieving equitable outcomes for stakeholders.

Apart from opportunity costs there are other costs of MPAs related to adaptation of businesses and changed working environments [17,18]. Examples of costs currently not captured in marine planning processes include closing off traditional fishing grounds, displaced fishing effort, forced gear diversification, increased travelling and fishing times, and overcrowding [18–20]. Commercial fishers can have a very strong "sense of place" or connection with specific locations having characteristics that make them special or unique and foster authentic human attachment and belonging [21,22]. In some areas, informal tenure agreements exist that can be disrupted by MPAs, leading to disputes over the remaining fishing grounds [23].

To be successful, MPAs require community support. Integral to gaining the support of communities is understanding and quantifying the impacts of MPAs on fishing activities and fishing businesses [24,25]. The 2009 rezoning of the Moreton Bay Marine Park is used as a case study to examine its perceived impacts, including non-financial costs, on commercial fishermen. Specifically this paper has two objectives. The first is to compare government predictions of opportunity costs of rezoning to the pre-rezoning and post-rezoning opportunity costs estimated and reported, respectively, by the fishermen. This comparison provides insights into the effects of the rezoning on total fisheries income, on income by fishery type and, importantly, on the variability of impacts across individual fishing businesses. The second objective is to identify the impacts of rezoning on operation of fishing businesses and the working environment of fishermen. Areas of future research are suggested to improve marine protected area design by better accounting for impacts on fishermen and consequently increasing the social acceptability of and support for MPAs.

Materials and methods

Study area

Moreton Bay Marine Park is located in south-east Queensland, Australia (Fig. 1). Moreton Bay Marine Park is characterised by highly productive and diverse marine ecosystems [26,27]. The area around Moreton Bay is home to nearly three million people, many of whom utilize the marine park for a variety of activities including recreational and commercial fisheries [26,28]. Moreton Bay Marine Park encompasses 3400 square kilometres and was

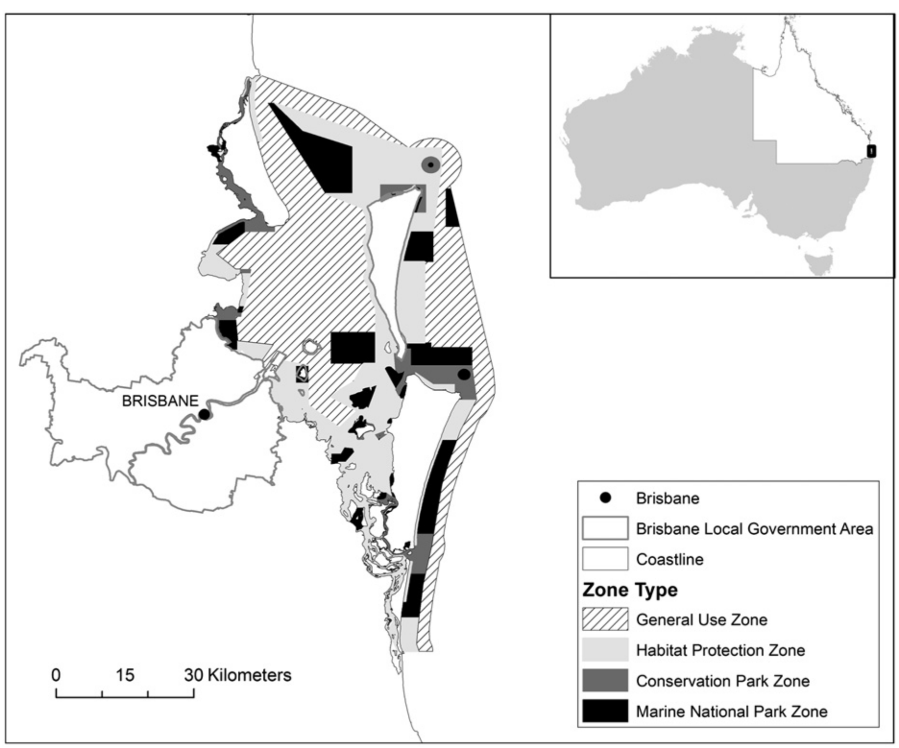

Fig. 1. Location, boundaries and geographical setting of Moreton Bay Marine Park. The centre of Brisbane and the boundaries of the Brisbane local government area indicate the extent of the city and its proximity to the Bay. The Moreton Bay Marine Park boundaries and zones are shown (permitted activities in each zone are in Table 1). The inset shows the state of Queensland with the location of Moreton Bay Marine Park in black.