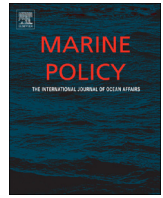




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An assessment of the effectiveness of *in-situ* signage in multiple-use marine protected areas in providing information to different recreational users



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ABSTRACT

In-situ signage is a cost effective environmental education tool used in marine protected area (MPA) management, and the design and location of signage is crucial to attract the attention of targeted audiences. The implementation of multiple-use MPAs increases the challenges of communicating awareness of MPA boundaries and permitted activities. Currently, little is known about how effective signage in multiple-use MPAs is in communicating information to stakeholders that will promote supportive attitudes and behaviours towards MPAs. This study evaluated the usefulness of *in-situ* signage in an existing multiple-use MPA, to determine if signs pertaining to the MPA captured the attention of recreational users, and provided adequate information. Structured interviews with recreational fishers, divers, and other users, were used to determine users' awareness of being in an MPA, their awareness of management objectives and associated zoning scheme, together with levels of agreement or disagreement on whether or not current *in-situ* signage adequately communicates information about the MPA. It was evident that the types and accessibility of *in-situ* signs in the MPA may not be effective at capturing the attention of intended audiences and providing relevant information, with the exception of signs located at the dive site, due to their design, size, and placement. Awareness differed among the three user groups, together with their views on the effectiveness of signage. Many recreational fishers believed existing signage was inadequate and unclear, and expressed frustrations with the complexity of zoning rules and location of their boundaries. Based on this study, recommendations about the presentation, content, and placement of signage relative to access points, and information required by MPA users, is provided.

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1. Introduction

Marine protected areas (MPAs) are used worldwide as a management tool to address adverse impacts of anthropogenic activities by controlling the types of recreational and commercial activities allowed in specific marine areas [16,18]. MPAs are established through consultation with stakeholders and often aim to address societal, political and ecological objectives. These objectives can vary and include conservation of marine biodiversity, restoration of marine habitats, protection of threatened species, fisheries management, and opportunities for public appreciation and enjoyment [2,25,18]. Multiple-use MPAs are a widely used type of MPA that aim to both conserve biodiversity and accommodate the demands of multiple-users in coastal areas. This is achieved through the use of zoning to allocate resources spatially to various users, combined with a range of permitted and restricted activities [14]. In Australia, multiple-use MPAs (marine parks) are free to

use and are generally divided into several management zones that are either 'no-take', or allow specific activities. Hence, each zone has objectives that focus on conservation, sustainable fishing (commercial and/or recreational), and opportunities for public enjoyment ([23]; [15]). Multiple-use MPAs are more challenging and costly to manage than MPAs which are entirely no-take because of increased compliance and enforcement costs associated with complex zoning designs [9]. Compliance with regulations is paramount to an MPA's success [20] and can be optimized through education and awareness management strategies [27].

Educational and awareness strategies, including the use of signage, can play a key role in MPA management if implemented effectively [1,5,7], and are more cost effective than enforcement, and have a greater impact on the community when raising awareness of an MPA and promoting positive attitudes and behaviours [1,19]. Well-marked zone boundaries, and use of signage as a passive means of communicating complex information about multiple-use MPAs, are both important management tools to increase stakeholders' knowledge and understanding of management zones and increase voluntary compliance [21,27]. *In-situ* interpretive/informative signage can be effective

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if well-designed and written, and has the ability to communicate a consistent message to numerous people in a fixed location, 24 h a day, which can be viewed at visitors' convenience ([33]; [13]). They can engage visitors, whilst communicating messages to the reader to influence stakeholder knowledge, values, and attitudes, thereby playing an important role in encouraging positive environmental attitudes and behaviours towards natural resources [8]. Careful consideration of the design, intended audiences, and location of signage in multiple-used MPAs is crucial to optimize its effectiveness, since visitor response to a general non-targeted approach to signage varies according to their motivations and intentions for visiting natural areas [6,17]. Visitors whose recreational activities are non-exploratory (e.g. swimming, relaxation, fishing) may be less receptive to interpretive messages with conservation themes and are less inclined to pay much attention, compared to visitors whose recreational activities are exploratory (e.g. diving, walking, photography, bird watching), and who are more likely to be influenced by conservation messages [6,17]. In particular, when targeting recreational fishers specific signage is required to effectively communicate relevant messages that address their interests, and encourage voluntary compliance with management objectives and regulations [6].

The use of interpretive and informative signage in multiple-use MPAs is essential to raise awareness, communicate information about zoning and associated permitted/restricted activities, and to encourage greater understanding and support for MPAs in general. However, there is limited evaluation on the effectiveness of signage in multiple-use MPAs, although there is evidence that signage is largely ignored or overlooked by visitors and fishers ([22,10,26]). Despite signage at key entry points to MPAs indicating their protected status, unlawful collecting of organisms and fishing was frequently observed, particularly in the absence of active enforcement [22]. Signage about MPAs can confuse visitors [10] and signage is frequently overlooked despite their quantity and location [26]. This suggests the design and location of signage used in MPAs requires greater attention to optimize their effectiveness, which if done well has the potential to attract the attention of numerous visitors to raise awareness and communicate important information and messages.

This research aims to explore the effectiveness of *in-situ* signage used in an existing Australian multiple-use MPA that are designed to provide relevant information to a variety of recreational users. This aim was achieved by evaluating the usefulness of *in-situ* signage, and using questionnaires to determine recreational users' awareness of being in an MPA, and their awareness of management objectives and associated zoning scheme, together with levels of agreement or disagreement on whether or not current *in-situ* signage pertaining to the MPA adequately communicates information about the MPA.

2. Methods

Port Stephens–Great Lakes Marine Park (PSGLMP) is located in the Hunter Region of New South Wales (NSW), Australia, and was declared in 2005. It extends from the mean high water mark to the three nautical mile limit of NSW waters, and covers an area of approximately 980 km² of marine and estuarine habitats, including two rivers and lakes, with their creeks and tributaries to the limit of tidal influence ([24], p. v). This is a multiple-use marine park, divided into four management zones; no-take sanctuary, habitat protection, general use, and special purpose zones, which vary in size and have different management objectives and regulations. Visitors to the marine park do not pay an access fee. This study focused on the southern end of the Port Stephens area, which lies within a sheltered tidal influenced estuary with shoreline access at many public and private points, including beaches, jetties, and boat ramps (Fig. 1).

This study took an inductive approach that sought to make observations and develop explanations as the research evolved, which is a common feature of social science research [11]. The study consisted of two components: (i) an evaluation of signage, and (ii) an assessment of respondents' awareness of being in an MPA, awareness of management objectives, zoning scheme and boundaries, together with levels of agreement or disagreement on whether or not current signage pertaining to the MPA adequately communicated information about the MPA. A visual evaluation of *in-situ* signage identified the different types of interpretive and informative signs installed in the marine park in 2005 at boat ramps, jetties, and a



Fig. 1. Map showing survey sites in the study area only of Port Stephens–Great Lakes Marine Park. Signage was located at sites indicated with a star (Taylors Beach, Soldiers Point, Fly Point, Little Beach, Shoal Bay and Fingal Bay). NB. This map does not represent the entire area of the marine park.

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