Integrating social and biophysical data to develop and evaluate marine protected area planning at a local scale: the 1998 Cairns Area Plan of Management as a case study.

Thesis Submitted by

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STATEMENT OF CONTRIBUTION OF OTHERS

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ABSTRACT

Use management in marine protected areas is a complex and often changing process, both because of political and legislative requirements and because of the diversity of user groups. It is therefore essential to have accurate and reliable information to guide development of the most appropriate management instruments within a given area.

This thesis explores the challenge for marine protected area managers of making cost-effective use of scientific information in planning for reasonable use of the Great Barrier Reef Marine Park. Using the 1998 Cairns Area Plan of Management as a case study, I develop methods for integrating biophysical and social data in the development and evaluation of marine protected area planning. I also provide an analysis of the interaction between human perceptions and the ecological status of the reef resources.

The main objectives of this study are:

1. to assess the criteria and methods used by government agencies to allocate resource use in the Great Barrier Reef Region (GBR), at both regional and local scales;
2. to identify ways in which existing information on reef resources can be integrated into a format that is easy to access and use;
3. to develop methods to help managers map the location and types of use;
4. develop methods to assess the relationships between information on marine ecosystems and patterns in human use, perceptions and values;
5. to estimate the effectiveness of the 1998 Cairns Area Plan of Management, from the perspective both of its objectives and of its information base.

In order to achieve these objectives, I employ a variety of methods and techniques. First, I conduct an extensive literature review of marine conservation, marine protected areas, the history of the Great Barrier Reef Marine Park and the goals, criteria and

methods used in selection and planning of Marine Protected Areas. I then collate data on planning and management specifically in the Cairns Planning Area. These data are obtained by surveying marine park managers and reviewing existing literature. Results from this survey and review reveal a lack of information on how people perceive the resource they use and what environmental conditions influence their experience and behaviour. Therefore, I conduct a survey of regular reef users in the Cairns Planning Area, with the aim of in collecting such information. Using multivariate and univariate models, I then make comparisons between the human perception of reef resources and scientifically measured indicators of coral reef status. This information is used to assess the ability of humans to perceive and monitor environmental variables. Finally, I demonstrate the use of a decision support system to integrate available biophysical and social information to support use allocation decisions.

As a result of this research I arrive at several conclusions. In the literature review chapters, I identify the need for development of clearly defined, applicable and functional objectives and criteria for marine protected areas such as the Great Barrier Reef Marine Park. Such objectives and criteria would assist with transparent and objective decision making regarding the social and economic values of marine resources during the planning and management of a marine protected area. I present a range of decision support modeling methods that are available to assist managers in the systematic use of data and information sources to select marine protected areas and designate varying levels of protection. I recommend the use of several of these methods to examine information from all sources simultaneously, using a systematic process. This integrated approach is demonstrated using the Cairns Area Plan of Management as a case study.

My survey of regular reef users in the Cairns Planning Area provides information on social conditions, perceptions of reef quality and levels of acceptable use. This type of information should be collected as an integral part of planning and decision making in marine protected areas.

Regular reef users are found to be quite capable of describing the environment that they frequent and detecting change over time. The respondents indicate that the reefs in the Cairns Planning Area are of high quality, with offshore reefs receiving higher ratings than inshore reefs. The perceived quality of coral cover and diversity of fish species are the best indicators of overall reef quality. High quality sites are those with excellent coral cover and high diversity of fish species, while low quality sites have low coral cover and limited underwater topography.

Over fishing, anchoring and cyclones are perceived to cause the most damage to reefs over time. Overcrowding is an issue at most reefs within the Cairns Planning Area, particularly those near a major port. The number of vessels at a reef location is considered to make more of a visual impact than the number of people, and thus may be a better indicator of social impacts.

Using multivariate and univariate models, I compare biological monitoring data with the perceptions of reef quality of regular reef users. Comparisons between the quality variables "coral cover" and "diversity of fish species" suggest higher quality sites have more hard coral, less soft coral and fewer fish species commonly associated with branching corals in back reef locations. In addition, I demonstrate that scientific information could be used to predict areas that could be of high quality for marine park users.

Using decision support software and other statistical techniques, I demonstrate how marine protected area managers could integrate social and biophysical data to develop

and evaluate marine protected area planning at a local scale. Comparisons between management settings, information from the survey of regular reef users and data from biological monitoring programs indicate that the Cairns Area Plan of Management maintains current levels of use but does not necessarily reflect diversity in abundance of reef biota at different locations.

This thesis demonstrates the need for formulation of very clear and specific aims and objectives for a marine protected area, prior to the application of different management tools (e.g. settings). When these aims and objectives are clear, input from scientists is necessary to help identify: (a) exactly what needs to be protected and in what manner (b) specific information requirements needed to meet the objectives.

In the case of the Cairns Planning Area, managers could have determined the relative importance of each objective to the overall goal of managing the area. The contribution of various datasets to each objective could then have been determined by scientists. In this way a clear, transparent and flexible decision process for allocating use in the area could have been developed.

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