Spatial and temporal patterns of recreational use at Ningaloo Reef, north-western Australia

This thesis is presented for the degree of Doctor of Philosophy in the School of Environmental Science, Murdoch University

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DECLARATION

I declare that this thesis is my own account of my research and contains as its main content work which has not previously been submitted for a degree at any tertiary educational institution.

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Claire B. Smallwood Date

Abstract

Worldwide, studies of recreational use at fine temporal and spatial scales within marine protected areas are rare, even though this knowledge is essential for successful management with respect to biodiversity conservation, resource allocation and visitor experiences. Ningaloo, a diverse fringing coral reef extending 300 km along the coast of north-western Australia, is reserved as a multiple use marine park. Its isolation from major population centres and limited access has, until recently, shielded it from extensive tourism. However, a growing population and increased publicity have led to a growth in visitor numbers and development pressure. This study aimed to map the fine-scale patterns of recreation at Ningaloo over a 12-month period using a multi-faceted survey approach which recorded >40 000 people. Synoptic patterns were described from 34 aerial surveys, while specific activities (e.g. recreational line fishing, snorkelling and windsurfing) were characterised using 192 land-based coastal surveys. During peak months from April to October, spatial distribution and density of use increased by up to 50% and included expansion of boating activity beyond the sheltered lagoon environment. Sandy beaches were preferred sites for recreation and people were generally clustered around infrastructure such as boat ramps and camping sites. Park zonation influenced activities and recreational fishers exhibited >85% compliance with sanctuary zones. Significant relationships between user characteristics, recreational activities and adjacent land tenure (e.g. national parks and pastoral leases) were revealed through analysis of 1 208 interviews with people participating in recreational activities on the shores of the Marine Park. These geo-referenced interview data allowed tracing of travel pathways from accommodation to coastal access points (or boat ramps) and recreation sites and highlighted the node-focused nature of visitor use. Strong clustering and rapid distance decay was especially evident from beach access points, with a median distance of 100 m travelled for shore-based recreation. The robust and multi-

faceted sampling design applied in this study resulted in high spatial accuracy with strong congruency between different survey techniques and could be widely applied to other marine parks adjacent to coastlines. This study provides essential benchmark data on recreational use which can contribute to the design of cost-effective monitoring programs, enables managers to focus resources at high use sites and at peak times of year, and predict effects of coastal developments in dispersing or concentrating visitor use.

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