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Estimating Anchor Site Usage and Potential Pollution Loads for Recreational Vessels in Moreton Bay Marine Park Using Aerial Surveys

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Introduction

Impacts from recreational and tourist vessels in marine protected areas are of major concern to all major stakeholders including tour operators, local communities and regulators. Until recently, very little quantitative monitoring information was available about the use of popular anchorage sites in marine national parks near major urban and tourism centres and the annual (and peak and off-peak) pollution loads associated with this use. This study presents results for a popular marine protected area, the Moreton Bay Marine Park, near Australia's fastest growing urban centre – the Brisbane to Gold Coast growth corridor in south-east Queensland, with an estimated population of more than 2 Million people in 2001 (ABS census) and 95 000 registered recreational vessels (2006). The objectives of this study included:

To develop an empirical model for predicting the number of vessels (by type) staying overnight at popular anchorages in Eastern Moreton Bay (EMB) and

To calculate load estimates (seasonal, annual) for N,P and total faecal matter, and Cu associated with recreational and tourist vessels using EMB.

Methods

A survey protocol was developed to photograph and, later, count recreational and tourism vessels at 20 anchor sites in EMB by aerial surveys from a light aircraft flown at ~100 knots at 500 ft, and to assign each vessel to one of 9 original categories.

An analysis of preliminary data (49 surveys) were conducted to investigate counts for each anchor site, to develop indices for leisure time availability and boating forecast weather scenarios, and to investigate relationships between independent variables. Based on the preliminary analyses, regression models were developed for interpolating the number of vessels in each category for each day in EMB in 2005 and pollution loads and errors for Cu, N, human faecal matter and urine were calculated using the predicted vessel numbers and data from the literature.

Results

Over 3600 individual high resolution digital images from more than 55 aerial surveys of 20 different anchor sites and nine classes of vessels were processed (enhanced) and analysed to document vessel usage and to discriminate between visitors and permanently moored craft. Results from this study based on an overall count of more than 18 000 vessels provided governmental regulators, tour operators and members of the local community with the first quantitative figures about the type of vessels and the time of the year for vessel use of popular anchor sites, and of Eastern Moreton Bay (EMB) as a whole. The empirical models developed from vessel counts also allowed esti-

mation of sewage and Cu loads associated with recreational and tourist vessels between Tangalooma and Tipplers in EMB.

The key predictor of boating activity was leisure time availability (lti), which was in line with results from similar work by Widmer and Underwood (2004) in Sydney Harbour and other locations elsewhere (Crompton & Kim 2004, Samdahl & Jekubovich 1997, Dwyer 1988). For weather variables, however, only some aspects were found to influence vessel numbers, and only for certain boat categories. Overall, an estimated 59,000 vessels used the 20 anchor sites investigated during 2005, emitting an estimated 0.6 +/- 0.4 t of Cu from antifouled hulls. Almost 14% of all vessels and their associated pollution loads were estimated to occur during the 2 major peak seasons, Christmas/New Year (~10 days) and the Easter weekend (~3 days). The total load of N released from all vessels using Moreton Bay were likely to be in the order of 5 t per annum, or equivalent to a modern sewage treatment plant (partial N removal) with an average flow of 2.5 10^6 l/d.

Conclusion

Findings from this study provided clear evidence for the benefits of ongoing monitoring for efficient management of the potential conflicts associated with such a large number of vessels kept in such close proximity to a marine protected area. Changes to marine pollution regulations limiting the discharge of untreated and partly treated sewage have been implemented and are now being policed by relevant authorities in all pollution hot spots in Eastern Moreton Bay.

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