CHANGES IN THE GREAT BARRIER REEF SINCE EUROPEAN SETTLEMENT

IMPLIEDATIONS FOR CONTEMPORARY MANAGEMENT

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BSc (Hons) (Sheffield), MSc (Birmingham)

August 2005

for the degree of Doctor of Philosophy in the School of
Tropical Environment Studies and Geography (TESAG),
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This research has been funded primarily by an APA(I) Award of the Australian Research Council, with additional funding by the Great Barrier Reef Marine Park Authority (GBRMPA). Dr. Peter Griggs and Professor Helene Marsh, both of the School of TESAG at James Cook University, and Dr. David Wachenfeld of GBRMPA, have undertaken the supervision of this project. Other contributions have been made by the oral history informants who took part in the qualitative interviews; many other individuals suggested informants, commented on the progress of the study, or contributed historical photographs. I have also received professional assistance from numerous staff in many libraries, archives and historical societies during this study. Several individuals at James Cook University – especially Margaret Cooper, Eva King and Claire Ovaska – have provided assistance with administration, including the organisation of research trips. Rod Armstrong and Steven Stanley provided technical support with ICT.

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Benjamin Daley  Date
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Many individuals have contributed data or technical advice to my research. I am particularly grateful to the oral history informants who took part in qualitative interviews; those individuals remain anonymous in this thesis, but their names are listed in the collection of oral history transcripts held at the GBRMPA Library in Townsville. I thank also those individuals who suggested informants, provided photographs or commented on the progress of my research and who are acknowledged in the thesis. Staff of the Australian Museum, Bowen Historical Society, Cairns Historical Society, James Cook University Library, John Oxley Library, National Library of Australia, Queensland State Archives and State Library of Queensland also provided assistance in locating documents, photographs and oral history materials.

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This thesis is dedicated to Edward, Anne, Jo, Clare and Jean, with my gratitude.
This thesis presents the results of research into the environmental history of the Great Barrier Reef since European settlement, with particular emphasis on the period from 1860 to 1970 for which comparatively little scientific information about this ecosystem has been collected. Few environmental histories of the Great Barrier Reef have been written; those that exist have made limited use of archival and oral history sources. My research used archival and oral history sources more extensively in order to write three narratives of changes in the coral reefs, islands and marine wildlife of the Great Barrier Reef. Recent scholarship within the sub-discipline of environmental history has acknowledged that the production of such narratives – that focus on the changing relationship between human societies and the environment – is an essential task of environmental historians. My narratives are based on detailed descriptions of environmental changes, collected using qualitative methods including textual analysis and semi-structured interviewing; those narratives constitute an interpretive account of numerous ways in which humans have used and modified the Great Barrier Reef between 1860 and 1970.

Changes in coral reefs are described in the context of the geomorphological evolution of the east Australian continental shelf during the Holocene epoch, which resulted in deteriorating water quality and the progression of some reefs – especially nearshore reefs – from juvenile to senile geomorphological states. Subsequent natural and anthropogenic impacts have brought several of these vulnerable reefs close to critical ecological thresholds, beyond which their recovery from degradation is unlikely. My research has found evidence that early European reef fisheries, coral mining, coral collecting, shell collecting, the creation of access channels and tracks, and military impacts have degraded some coral reefs; I present evidence to indicate the extent of these various impacts. In particular, no accounts of historical coral mining and coral collecting in the Great Barrier Reef have previously been written, yet those activities resulted in the removal of considerable quantities of coral from many reefs over long periods of time. As a result, some coral reefs were probably far from pristine at the time of the formation of the Great Barrier Reef Marine Park (GBRMP) in 1975.
Changes in many islands of the Great Barrier Reef have also been substantial: for example, the construction of the navigation beacon at Raine Island, the removal of guano from many islands, the destruction of native vegetation and fauna, the introduction of exotic species such as coconut palms and goats, and the development of infrastructure. Some islands have been significantly transformed as a result of these activities, including Raine Island, several islands of the Capricorn-Bunker Group, and the most accessible tourist resort islands in the Cairns, Townsville and Whitsunday areas. Considerable impacts have also occurred on some marine wildlife species, including the commercial fishing of dugongs and turtles in the Great Barrier Reef and in adjacent coastal waters. I provide reconstructions of the extent and impacts of those fisheries, based on analysis of the reports and records of various Queensland Government Departments together with oral history evidence. I also describe other changes in marine wildlife, including the effects of the commercial humpback whale fishery and the effects of Indigenous hunting of dugongs and turtles.

Together, the three environmental history narratives contained in this thesis represent an account of almost continuous human exploitation of the Great Barrier Reef between 1860 and 1970 which probably amounts to considerable degradation of the ecosystem, at least in localised areas and for particular species. Consequently, my research has several implications for the contemporary environmental management of the Great Barrier Reef World Heritage Area (GBRWHA). I argue that the re-evaluation of some ecological baselines is necessary, as documentary and oral history evidence indicates that the Great Barrier Reef has been exploited earlier, for a longer period, in more locations and more intensively than has previously been documented. In particular, some coral reefs, islands and marine wildlife species require additional scientific research and monitoring – linked with agreed performance indicators – in order to ensure their effective conservation. In addition, I have evaluated the use of qualitative methods in environmental history research. While the coverage of documentary sources describing the Great Barrier Reef is uneven for the period before 1970, those sources contain rich information about environmental changes. In comparison, oral histories provided sparse data, although some evidence about coral mining was obtained only from oral history sources. My research indicates that the use of multiple methods can best inform accounts of environmental changes in the Great Barrier Reef.
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## Abbreviations and acronyms

### Abbreviations and acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACRS</td>
<td>Australian Coral Reef Society</td>
</tr>
<tr>
<td>Admin.</td>
<td>Administration</td>
</tr>
<tr>
<td>AGPS</td>
<td>Australian Government Publishing Service</td>
</tr>
<tr>
<td>AIATSIS</td>
<td>Australian Institute for Aboriginal and Torres Strait Islander Studies</td>
</tr>
<tr>
<td>AIMS</td>
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<td>AM</td>
<td>Australian Museum</td>
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<td>ANFB</td>
<td>Australian National Film Board</td>
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<td>Australian National University</td>
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<td>AR</td>
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<td>A.U.S.N.</td>
<td>Australasian Union Steam Navigation</td>
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<td>CCL</td>
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<td>CHS</td>
<td>Cairns Historical Society</td>
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<tr>
<td>CIF</td>
<td>Chief Inspector of Fisheries</td>
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<td>COTS</td>
<td>Crown of Thorns Starfish</td>
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<tr>
<td>CRC</td>
<td>Co-operative Research Centre</td>
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<tr>
<td>CRES</td>
<td>Centre for Resource and Environmental Studies, Australian National University</td>
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<tr>
<td>CSIR</td>
<td>Council for Scientific and Industrial Research</td>
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<tr>
<td>CSIRO</td>
<td>Commonwealth Scientific and Industrial Research Organisation</td>
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<tr>
<td>CTC</td>
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<td>Dept.</td>
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<td>DDNA</td>
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<td>ENSO</td>
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<td>GBRMP</td>
<td>Great Barrier Reef Marine Park</td>
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The terms \( \text{ka} \) and \( \text{Ma} \) are defined according to the convention described in M. Bell and M. J. C. Walker, *Late Quaternary environmental change: physical and human perspectives*, 2nd edn, Pearson, Harlow, 2005, p. 16.
### Measurements

Where used in the text, measurements have been cited exactly as they appear in the original source. The following conversion factors may be useful:

- 1 ton = 20 cwt (approximately 1016 kg)
- 1 cwt (hundredweight) = 112 lb (approximately 50.80 kg)
- 1 qtr (quarter) = 28 lb (approximately 12.70 kg)
- 1 lb (imperial pound) = 16 oz (approximately 0.45 kg)
- 1 oz (ounce) = approximately 0.028 kg

- 1 gal (imperial gallon) = approximately 4.546 l

- 1 ft (foot) = 12 in (approximately 0.30 m)
- 1 in (inch) = approximately 0.0254 m
Monetary values are given, in this thesis, exactly as they appear in the original sources and no conversion factors have been applied. The following symbols denote imperial currency values:

£1 (imperial pound) = 20 s
1 s (imperial shilling) = 12 d (imperial penny)
1 d (imperial penny)

These units were used in Australia until 14 February 1966, on which date the imperial currency was replaced with the modern, decimal system of dollars and cents. In this thesis, the modern symbol ($) is used to refer to the Australian dollar, except where confusion with the American dollar may occur; in that case, the symbol A$ is used specifically for the Australian dollar. In 1966, following decimalisation, an approximate conversion for the Australian dollar (in relation to the imperial pound) is £1 ≈ $2.5.

During the period that I have considered (1860-1970), however, the purchasing power of the imperial pound and the Australian dollar varied. Furthermore, those values differ from the modern purchasing power of each currency. An indication of the modern purchasing power of historical sums of money, in relation to an index value for the year 2003 (index value = 715.2), can be obtained using the following formula:

\[
\text{Equivalent sum of money} = \frac{\text{Amount to be revalued} \times 715.2}{\text{Earlier year’s index}}
\]

Index values for the years from 1860 until 1966 (when decimalisation occurred in Australia) are provided in the following Table:²

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A note on referencing

The referencing system used in this thesis is based on the guidance provided in the sixth edition of the *Style Manual* of the Australian Government Publishing Service (AGPS), including minimal capitalisation of book and journal article titles.³ Place names have either been cited exactly as they appear in the original sources or, where the use of a modern name is required for clarity, those names have been given as they appear on the *Detailed Maps to the Great Barrier Reef Marine Park*, published by the Great Barrier Reef Marine Park Authority (GBRMPA).⁴

Original oral history evidence presented in this thesis is referenced using the abbreviation OHC (Oral History Cassette), followed by the cassette number, the date on which the interview was recorded, and the pagination used in the electronic version of the collected transcripts. The citation details of the original oral history collection are: *Changes in the Great Barrier Reef since European Settlement*, Oral History Collection, School of Tropical Environment Studies and Geography (TESAG), James Cook University (JCU). Copies of the transcripts are held at the GBRMPA Library, in Townsville, and at the JCU Library. Additional details about the oral history evidence are provided in the References for this thesis.

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