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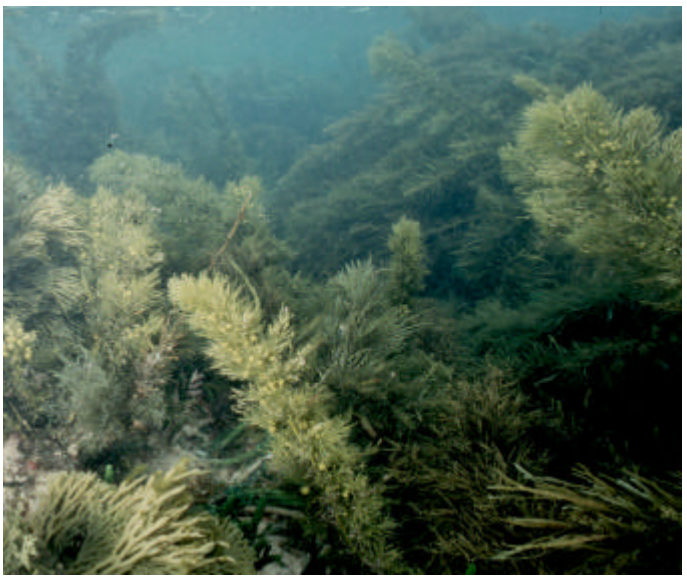
Environmental Inventory of Victoria's Marine Ecosystems Stage 3 (2nd Edition)

Understanding Biodiversity Representativeness of Victoria's Rocky Reefs



Lawrance W. Ferns and Don Hough (Editors)

Parks, Flora and Fauna Division

Environment Australia

Victoria The Place To Be

ENVIRONMENTAL INVENTORY OF VICTORIA'S MARINE ECOSYSTEMS STAGE 3 (2ND EDITION) – UNDERSTANDING BIODIVERSITY REPRESENTATIVENESS OF VICTORIA'S ROCKY REEFS

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Information on the *National Representative System of Marine Protected Areas* and associated publications are available at the Environment Australia Website at **http://www.environment.gov.au/marine/marine_protected/nrsmpa/main.html**

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Cover: Victorian rocky reef macroalgae community dominated by *Cystophora* species and *Sargassum* species. Photography courtesy of Matt Edmunds.

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The following individuals contributed to the development of Stage 3

Scott Chidgey (Marine Ecologist, Consulting Environmental Engineers)

Matt Edmunds (Marine Ecologist, Australian Marine Ecology Pty Ltd)

Tim O'Hara (Marine Ecologist, Museum of Victoria)

Ralph Roob (Senior GIS Scientist, Marine and Freshwater Resources Institute)

Simon Willcox (Marine Ecologist, Consulting Environmental Engineers)

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Lawrance Ferns

Don Hough

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GENERAL INTRODUCTION

The *Environmental Inventory of Victoria's Marine Ecosystems* is a multi-stage project to provide information on the diversity of marine ecosystems at various spatial scales. The program was initiated in 1992 as part of national arrangements towards developing a *National Representative System of Marine Protected Areas* (NRSMPA), and to assist bioregional planning arrangements to ensure the marine environment is managed in an ecologically sustainable manner and to support decisions on, for example:

- Identification, declaration and ongoing management of comprehensive, adequate and representative system of marine protected areas (MPAs);
- protection of significant species and ecosystems;
- marine pest management and risk assessment;
- ecological sustainable use of wild fisheries resources; and
- marine industries and infrastructure planning such as shipping, gas pipelines, petroleum exploration and aquaculture

Such decisions require information that is organised and accessible to key stakeholders. The Environmental Inventory has been developed in such a way that it will be applicable to both strategic and operational management requirements into the 21st century.

Second Edition

This report is the second edition of the original Volume 1 report for Stage 3 of the Environmental Inventory Program (published December 1999). It contains two additional chapters that finalise the documentation of information products developed for Stage 3. This second edition also provides an updated overview of the project's relationship to current Victorian and national initiatives for the management of the marine environment, particularly the establishment of MPAs. The report is broken into six chapters:

- Chapter 1 – provides a synthesis of the work and presents Victoria's approach to representing and classifying marine biodiversity through mapping and quantitative analysis of biological data.

- Chapter 2 - details the techniques used to map Victoria's nearshore marine benthic environment.

- Chapter 3 - examines biogeographic patterns of selected marine taxa on rocky reefs around southern Australia, with particular emphasis to Victoria.

- Chapter 4 – investigates the association between biological communities and physical variables on Victorian rocky reefs.

- Chapter 5 – assesses if habitat categories based on dominant vegetation types can act as surrogates for representing associations of smaller sessile and slow moving species that inhabit canopies and holdfasts of larger vegetation.

- Chapter 6 – introduces a community classification system, termed *Marine Ecological Communities* (MECs), for macrophyte, macroinvertebrates and fish communities associated with shallow water rocky reefs within the Central Victoria and Flinders bioregions.

Towards a National Representative System of Marine Protected Areas

Victoria is committed to establishing a system of Marine National Parks that will make a substantive contribution to the NRSMPA. Since the introduction of the *National Reserve System Program*, Victoria has worked cooperatively with the Commonwealth, States and Territories by adopting national approaches and scientific guidelines to facilitate the identification and establishment of protected areas.

The system will be based on the Victorian Government's consideration of the *Marine, Coastal and Estuarine Investigation Final Recommendations* (Environment Conservation Council 2000). Development of the recommendations involved the acquisition and assessment of detailed environmental, social and economic data, and extensive consultation with the community and key stakeholders.

The Environmental Inventory Program was a key source of environmental and ecological data for the *Marine, Coastal and Estuarine Investigation*. Particular attention has been taken to ensure the approaches and data collection contribute to national arrangements outlined in the *Guidelines for Establishing the Representative System of Marine Protected Areas* (ANZECC TFMPA 1998) and the *Strategic Plan of Action for the NRSMPA* (ANZECC TFMPA 1999).

Other Related Initiatives

The Environmental Inventory supported the establishment of the *Interim Marine and Coastal Regionalisation for Australia* commonly referred to as "IMCRA" (Interim Marine and Coastal Regionalisation for Australia Technical Group 1998), and has since provided additional information on the characteristics of individual bioregions that form a framework for marine conservation planning in Victoria.

IMCRA is recognised in *Guidelines for Establishing the Representative System of Marine Protected Areas* (ANZECC TFMPA 1998) and the *Strategic Plan of Action for the NRSMPA* (ANZECC TFMPA 1999) as the bioregional planning tool for the establishment of a representative system of MPAs, and as a framework for setting bioregional priorities for biodiversity management in general [see also *Victoria's Biodiversity Strategy (2000)*]. The 'staged' approach of the Environmental Inventory Project allowed for the hierarchical collection of information from a national / statewide strategic level to that required for the management of specific locations such as MPAs.

Aside from directly supporting the development of a NRSMPA, the Environmental Inventory directly supports nationally important initiatives such as the *National Strategy for Ecologically Sustainable Development* (Commonwealth of Australia 1992). Mapping and classification of significant marine habitats serve as tools for representing biological diversity for programs managed under principles of ecological sustainable development. The ANZECC State of the Environment Reporting Task Force (1999) has recommended that long-term monitoring of the extent and condition of marine and estuarine ecosystems be adopted as core environmental indicators for *National State of the Environment Reporting.* The data collected for the Environmental Inventory can support reporting on national trends according to the pressure-state-response framework presented in the *State of the Marine Environment Report for Australia (1996).*

The information products developed from the Environmental Inventory will be made accessible to stakeholders through the *Australian Coastal Atlas Program* (ACA). *The* ACA provides a distributed on-line, interactive geographical information system which can disseminate information products developed from the Environmental Inventory across the Internet through the World Wide Web (Slater 1999). The ACA is linked to the Capacity

Building component of *Coast and Clean Seas* and the *Estuaries and the Sea* component of the *State of Environment Reporting Program* (Ward *et al* 1998). The ACA will provide stakeholders with images and explanations of marine data related to the Victorian component of the NRSMPA such as:

- distribution and characteristics of Victoria's marine ecosystems;
- management planning initiatives associated with MPAs; and
- reporting on performance assessment related to the NRSMPA.

Overview of the Environmental Inventory Program

In developing the Environmental Inventory there has been significant collation of existing physical and biological attributes related to Victoria's marine environment, and collection of new data to fill data gaps in the distribution and characteristics of Victoria's marine ecosystems. Briefly, the program has completed the following stages:

- *Environmental Inventory - Stage 1* (1992, 1994)

  This study involved two parts, the first part was conducted to source a comprehensive list of available data sets to support the development of a biophysical classification of Victoria's coastline (Consulting Environmental Engineers 1992). The second part developed a meso-scale biophysical regionalisation of Victoria's marine waters which then served as the template for the IMCRA process (Victorian Institute of Marine Sciences *et al* 1994).

- *Environmental Inventory - Stage 2* (1994)

  This study extended the meso-scale regionalisation to offshore waters. The analysis involved physico-chemical classification of marine waters of the Bass Strait (Hamilton 1994).

- *Environmental Inventory - Stage 3* (2000)

  This study made considerable progress towards mapping and classifying the diverse range of shallow subtidal marine habitats along Victoria's open coastline, and investigated the distribution of biological assemblages associated with rocky reefs at various spatial scales (Ferns and Hough 2000, this report). Highlights of the work included: remote sensing and underwater sampling techniques to map and characterise components of *Marine Habitat Classes* as a measure of biodiversity 'comprehensiveness'; quantitative surveys of rocky reef flora and fauna to classify *Marine Ecological Communities* as a measure of biodiversity 'representativeness'; and the use of dominant vegetation as a surrogate for representing associated suites of species.

- *Environmental Inventory - Stage 4* (1999; 2000)

  This study characterised soft benthic ecosystems of Victoria's open coast by sampling soft sediments at depths of 10, 20 and 40 m at approximately 20 km intervals to support the identification of candidate MPAs that represent soft benthic ecosystems. For Part 1 of Stage 4, a physical classification of sediments was used to further update the habitat mapping from Stage 3 (Ferns 1999). For Part 2 of Stage 4, biota from the sediment samples were sorted and classified to provide an insight to the distribution of species biodiversity within the sediments of Victoria's nearshore soft benthos (Ferns 2000).

Complementary Information Systems

A marine and coastal geographic information system (GIS) for Victoria was developed concurrently with the Environmental Inventory. Development of the GIS has been completed in three stages:

- *Development of a Marine and Coastal GIS for Victoria - Stage 1* (1995)

  This study outlined the requirements for a marine and coastal GIS for Victoria, including identification of preliminary data sets, applications and modification of the NRE Corporate Geospatial Data Library (CGDL) to facilitate offshore map tiles (Roob *et al* 1995)

- *Development of a Marine and Coastal GIS for Victoria - Stage 2* (1997)

  This stage of the project involved the implementation of offshore map tiles in the NRE CGDL, and the development of five information products, including the substratum mapping developed for Stage 3 of the Environmental Inventory program (Mahon 1997).

- *Development of a Marine and Coastal GIS for Victoria – Stage 3* (1999)

  This stage formally developed a NRE Marine and Coastal CGDL and provide direct support for the Victorian Node of the ACA. Approximately fifty information products have now been populated onto the Marine and Coastal CGDL which will support a range of programs and information dissemination tools (Ferns and Catlin 1999).

The NRE Marine and Coastal CGDL is the principle means of managing the data derived from the Environmental Inventory. The GIS library design is well developed and recent GIS projects (Mahon 1997; Ferns and Catlin 1999) demonstrates the capability of the corporate GIS to manage and integrate data to meet decision support requirements. While much of the raw data collected through the Environmental Inventory will be compiled as a series of discrete GIS layers the extent to which individual data layers will be integrated is dependent on the 'information products' needed to inform specific decisions. Information is constantly compiled and progressively loaded onto the NRE Marine and Coastal CGDL. This approach ensures prompt data integrity management and allows key information products to be immediately available in a format that can be readily used to support management decisions. The long term focus is to continue the development of a GIS coverage and attribute database referred to as "SUBSTRATA100" (Roob *et al* 1997). SUBSTRATA100 covers the entire open coast and arrangements are in place to incrementally update SUBSTRATA100 as data from field programs become available.

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