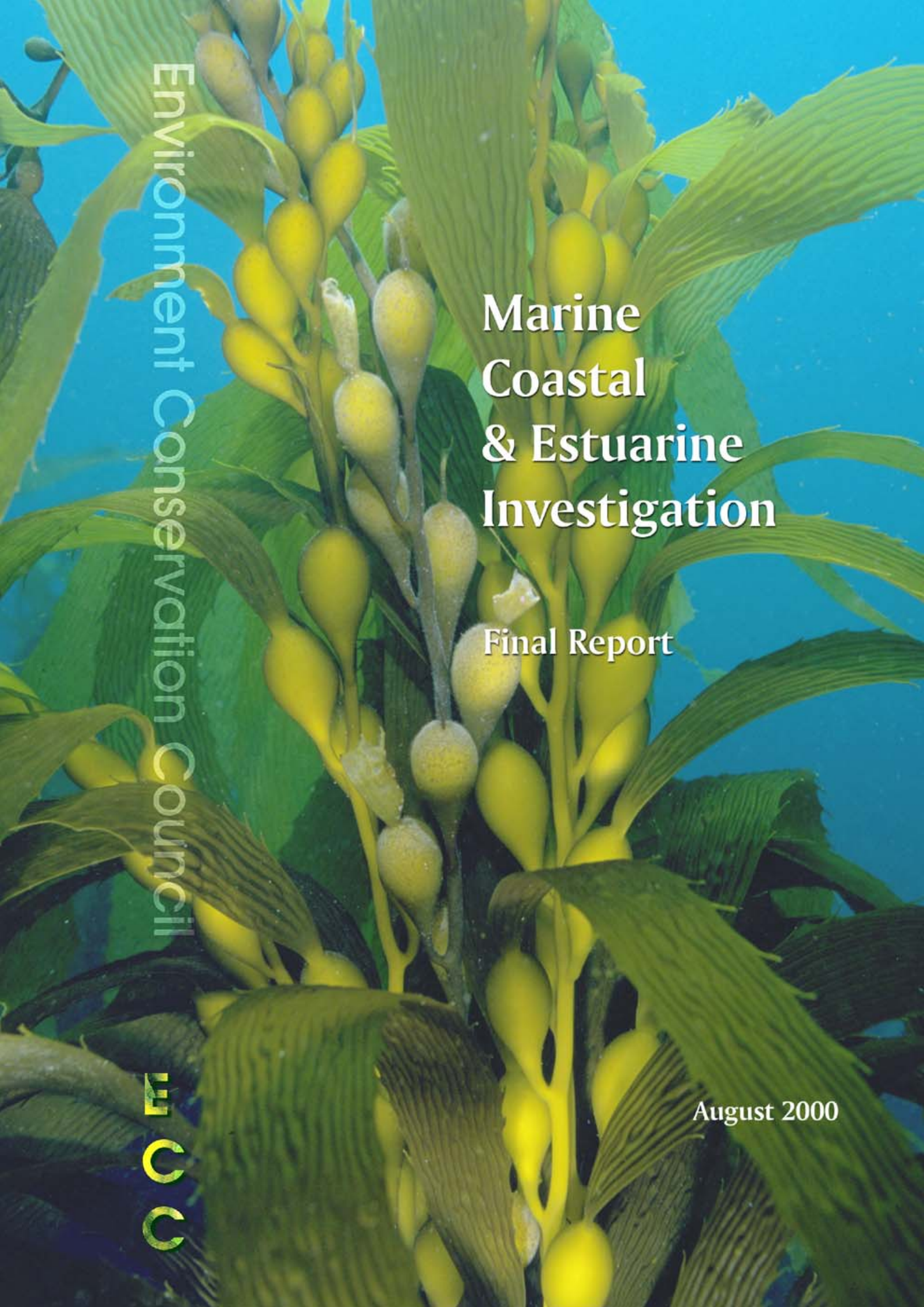




Environment Conservation Council

Marine Coastal & Estuarine Investigation

Final Report



August 2000

Marine Coastal & Estuarine Investigation

Final Report

August 2000

Environment Conservation Council

© Environment Conservation Council 2000

Published by the Environment Conservation Council
3rd floor 250 Victoria Parade
East Melbourne VIC 3002

Website: www.nre.vic.gov.au/ecc

This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

National Library of Australia Cataloguing-in-Publication entry:

Environment Conservation Council (Victoria)
Marine, coastal and estuarine investigation: final report

Bibliography

ISBN – 0 646 39971 3

1. Marine resources conservation - Victoria. 2. Marine parks and reserves - Victoria.
3. Coastal zone management - Victoria. 4. Estuaries - Victoria. I. Title

333.91641609945

ENVIRONMENT CONSERVATION COUNCIL

3rd Floor, 250 Victoria Pde, East Melbourne 3002

Phone: 0412 5100 Fax: 9412 5153

E-mail: ecc2@nre.vic.gov.au

Our Reference:

Your Reference:

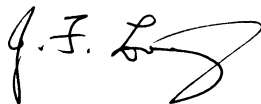
31 August 2000

The Honourable Sherryl Garbutt MP
Minister for Environment and Conservation
Parliament House
Melbourne 3002

Dear Minister,

MARINE, COASTAL AND ESTUARINE INVESTIGATION

In accordance with the requirements of Section 23(1) of the *Environment Conservation Council Act 1997*, the Environment Conservation Council is pleased to submit to you the Final Report for the Marine, Coastal and Estuarine Investigation.



JOHN F. LOVERING
Chairman

What is the ECC?

The Environment Conservation Council (ECC) was formed in mid 1997 replacing the Land Conservation Council. The ECC advises the Victorian Government on the use of public land; it makes recommendations, not decisions. It investigates issues at the request of the relevant Minister and, in doing so, takes into account resource use and social issues as well as environmental needs. The ECC's aim is to balance the competing needs of the environment and public land users, in order to achieve ecologically sustainable and economically viable public land use.

The ECC members are Professor John Lovering AO (Chairman), Mrs Eda Ritchie and Ms Jane Cutler who are supported by a team of professional staff.

Professor Lovering has held senior academic positions, chaired company boards and served on national and international scientific committees. He has also had considerable experience in natural resources management as Presiding Officer of the South Australian Natural Resources Council and as President of the Murray Darling Basin Commission.

Mrs Ritchie is a farmer from near Hamilton in Western Victoria with extensive experience in natural resources management. She is also Chairman of Rural Ambulance Victoria, a member of the Rural Finance Board, and Chair of the Ross Trust.

Ms Cutler has a Masters Degree in Environmental Science, holds a senior management position in the finance sector and has many years of experience managing environmental issues for the resources industry. She has served on a number of boards and trusts including as a Director of Landcare Australia.

The Council works with a wide range of groups including local government, Commonwealth and State agencies, business and industry, environment and conservation groups, Aboriginal people, recreation and tourism bodies, and interested individuals. The ECC is independent of other government agencies and develops its recommendations through data collection, the commissioning of expert research, and extensive consultation. Public input into investigations is encouraged and welcomed.

At the end of each investigation the ECC makes recommendations to the Minister. The State Government then considers these recommendations and makes decisions.

About this report

This report contains the Environment Conservation Council's final recommendations for the protection, use and management of Victoria's marine, coastal and estuarine areas. It marks the culmination of an investigation process begun in 1991 by the then Land Conservation Council (LCC).

The Environment Conservation Council (ECC) has visited all the recommended areas and sought input from a wide range of stakeholders, interested groups and individuals to better understand the broad strategic issues as well as the finer detail of marine management. There have been six formal periods for public comment, and about 4 500 written submissions received throughout the life of the investigation have been considered in detail. A large number of special reports were commissioned by both the LCC and the ECC. Reports commissioned or prepared by other agencies, other States and the Commonwealth have also been considered. The ECC has consistently sought to embrace and integrate the policies and strategies of various levels of government and other agencies as they relate to the marine and coastal environment.

Acknowledgements

The ECC wishes to gratefully acknowledge the assistance of all those individuals and government, community, and industry groups who have contributed to the investigation over the past nine years.

The report was prepared by Hania Bibrowska, Shane Dwyer, Peter Kinchington, Joan Phillips, Mandy Rossetto, Sue Street and Ari Vlassopoulos. Administrative assistance was provided by Geoff Blackman, Janet Hainsworth and Joy Vine.

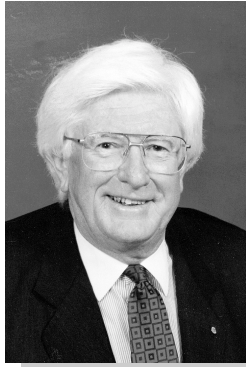
Information and technical advice was provided by an Advisory Group, formed for the ECC investigation: Kate Brent, Lawrance Ferns, Tony Landy, Andrew Levings, Garth Newman, Tim O'Hara, Bernadette O'Neil, Peter Rankin and Ross Winstanley.

In addition to the support provided by many Victorian government and non-government agencies, the following organisations also provided a great deal of assistance: Australian Marine Sciences Association, Department of Natural Resources and Environment, various sub-committees of the Fisheries Co-Management Council, Mirimbiak Nations Aboriginal Corporation, Parks Victoria, Seafood Industry Victoria, Victorian Aquaculture Council, Victorian Coastal Council, Victorian Marine and Coastal Community Network, Victorian National Parks Association and VRFish.

Design and layout services were provided by Wendy Havard. Cartographic services were provided by Graham Kenneday Graphic Design.

The cover image is based on a photograph by Mary Malloy. Other photographs included in the report were provided by Aboriginal Affairs Victoria, Hania Bibrowska, Peter Kinchington and Melbourne Water.

Printed by Gill Miller Press Pty Ltd.



Professor John Lovering
(Chairman)

A handwritten signature in black ink, appearing to read 'J. F. Lovering'.



Mrs Eda Ritchie

A handwritten signature in black ink, appearing to read 'Eda Ritchie'.



Ms Jane Cutler

A handwritten signature in black ink, appearing to read 'Jane Cutler'.

Council's Message

It is now more than 100 years since Victoria's first land-based national park was proclaimed at Wilsons Promontory. Since that time successive Victorian governments have established a system of national parks and conservation reserves covering about 15 per cent of the State which are recognised by our community as jewels in the environmental crown of Victoria. The people of Victoria are justifiably proud of their national parks and understand the critical role they play in protecting the State's unique biodiversity. They are enormously supportive of the fact that these parks are a haven for the protection of the plants and wildlife all Victorians can enjoy and which will always be available for the enjoyment and inspiration of future generations.

Until recent years the whole marine environment was seen as ripe for resource development in much the same way as was the land until our terrestrial national parks were created. But it is now obvious that harvesting of the ocean's biological resources has led in many areas to the degradation of marine ecosystems and threats to the sea's biodiversity. Unless a comprehensive, adequate and representative system of marine national parks with an adequate level of protection is established, we will not be able to hand on to future generations even some limited marine areas where our marine biodiversity is fully protected from human modification and degradation. This is the prime reason, and one which is widely accepted internationally, for the establishment of fully protected marine national parks and sanctuary areas.

The process of selecting and establishing marine protected areas is always a lengthy and controversial one. The sea and its resources are used for many purposes and the community and industry are accustomed to having access to virtually all marine waters. Different individuals and groups sometimes have legitimate but competing aspirations for particular areas and resolution of such issues is often protracted and always difficult. To these problems we must add the need to build community understanding that the balanced use of marine resources must include leaving some areas unused for the protection of marine ecosystems, for science and education, for non-consumptive recreation and for their own intrinsic value.

During the process of this investigation we have sometimes heard groups and individuals promoting multiple-use approaches to environmental management. The ECC is strongly of the view that its recommendations are an expression of multiple use of the whole marine environment. It is a central component of multiple use planning and management that some areas are specifically set aside for conservation of marine biological diversity.

In drawing up the recommendations and proposals in this Final Report, the ECC has given full consideration to possible social and economic impacts. On balance, the ECC believes that the environmental outcomes will, in the medium term, outweigh the possible initial economic and social costs. Nevertheless, if the possible short-term costs can be demonstrated to fall disproportionately on any individual or particular group, then it would be reasonable for the Government to develop a strategy to minimise any such hardship.

It is inevitable that for some, these recommendations and proposals will go too far and for others they will not go nearly far enough. However we suspect that twenty years from now, Victoria without a system of marine national parks would be as unthinkable as Victoria today would be without the Wilsons Promontory or the Grampians National Parks.

It was also part of the ECC's terms of reference to recommend areas suitable for marine aquaculture. The ECC believes that an environmentally sensitive aquaculture industry has the potential to contribute substantially to the Victorian economy, but preparing these aquaculture recommendations has been a difficult task, for technical, environmental and social reasons. There has been a lot of concern expressed to us about the perceived environmental risks associated with aquaculture in open marine waters, although there appears to be considerable support for land-based aquaculture. As well, from an industry perspective relatively few areas in Victoria are suitable for existing species and technologies, and several of these areas are ruled out because of their environmental significance and sensitivity.

The ECC is recommending aquaculture zones which are significant expansions of existing licence areas, as well as some new areas, and further recommends monitoring programs to clarify and document the nature and extent of the environmental impacts. Wide availability of the results of monitoring will assist in responsible management of marine aquaculture, and should assist in addressing community concerns.

Contents

Council's Message	v
Executive Summary	xi
Part One The investigation	
1.1 Introduction	3
1.2 Addressing the terms of reference	8
1.3 Policy context	9
1.4 Consultation and information	12
1.5 Economic and social assessments	12
Part Two Protection, use and management of Victoria's marine and coastal environment	
2.1 Aboriginal interests	19
2.2 Objectives for use	22
2.3 Protection of biodiversity	23
2.4 Catchment management	24
2.5 Threats	25
2.6 Use of marine resources	26
2.7 Implementation and management	28
2.8 Coastal reserves and coastal land use	30
Part Three Marine protected areas	
3.1 Victoria's marine biodiversity	35
3.2 Recommended approach to marine conservation	36
3.3 A comprehensive, adequate and representative system of marine protected areas	37
3.4 Community views	38
3.5 Principles for the selection and management of marine protected areas	38
3.6 Identification and selection of candidate areas for marine national parks	39
3.7 The proposed system	42
3.8 Existing parks and other areas	48
3.9 Biosphere Reserves	50
Recommendations for the Western biophysical region	51
A1 Discovery Bay Marine National Park	52
A2 Twelve Apostles Marine National Park	55
B1 Merri Marine Sanctuary	58
B2 The Arches Marine Sanctuary	59
C1 Cape Bridgewater	60
C2 Lawrence Rocks	60
C3 Portland Bay	61
C4 Deen Maar (Lady Julia Percy Island)	62
C5 Logans Beach	63
C6 Dinosaur Cove	63

Recommendations for the Central and Wilsons Promontory biophysical regions	65
A3 Point Addis Marine National Park	66
A8 Bunurong Marine National Park	69
A9 Wilsons Promontory Marine National Park	71
B3 Marengo Reefs Marine Sanctuary	74
B4 Eagle Rock Marine Sanctuary	75
B5 Point Danger Marine Sanctuary	76
B6 Barwon Bluff Marine Sanctuary	77
B10 Mushroom Reef Marine Sanctuary	78
C15 Summerland Peninsula (Phillip Island)	79
 Recommendations for the Eastern biophysical region	 81
A11 Ninety Mile Beach Marine National Park	82
A12 Point Hicks Marine National Park	84
A13 Cape Howe Marine National Park	87
B11 Beware Reef Marine Sanctuary	90
C16 The Skerries	91
C18 Gabo Island harbour	91
 Recommendations for the Bays, Inlets and Estuaries biophysical region	 93
Port Phillip Bay	95
A4 Port Phillip Heads Marine National Park	96
B7 Point Cook Marine Sanctuary	100
B8 Jawbone Marine Sanctuary	101
B9 Ricketts Point Marine Sanctuary	102
C7 Clifton Springs	103
C8 Werribee River estuary	104
C9 Capel Sound	104
 Western Port	 105
A5 Yaringa Marine National Park	106
A6 French Island Marine National Park	108
A7 Churchill Island Marine National Park	110
C10 Honeysuckle Reef	112
C11 Crawfish Rock	112
C12 Bass River delta	113
C13 San Remo	113
C14 Rhyll	114
 Other bays, inlets and estuaries	 115
A10 Corner Inlet Marine National Park	117
C17 Mallacoota Inlet (parts)	119

Part Four Marine aquaculture areas

4.1	Overview	123
4.2	Victoria's aquaculture programs and the ECC's role	123
4.3	Community views	124
4.4	Nutrient management and finfish culture in Port Phillip Bay	125
4.5	Principles for selection and management of marine aquaculture areas	126
4.6	The proposed areas	127
4.7	Recommended marine aquaculture zones	127

Recommended aquaculture zones	128
E1 Portland Aquaculture Zone	129
E2 Grassy Point Aquaculture Zone	129
E3 Clifton Springs Aquaculture Zone	130
E4 Point Lillias Aquaculture Zone (land-based)	130
E5 Avalon Aquaculture Zone (land-based)	131
E6 Bates Point Aquaculture Zone	131
E7 Kirk Point–Werribee Aquaculture Zone	132
E8 Beaumaris Aquaculture Zone	132
E9 Mount Martha Aquaculture Zone	133
E10 Dromana Aquaculture Zone	133
E11 Pinnacle Channel	134
E12 Flinders Aquaculture Zone	134

References	135
-------------------	-----

Glossary	151
-----------------	-----

Acronyms	154
-----------------	-----

Appendices	155
-------------------	-----

1	List of submissions received on the Draft Report (December 1999)
2	ECC's response to major issues
3	Mirimbiak Nations Aboriginal Corporation Consultation Report
4	Socio-economic assessment of the implications of the Final Report
5	Assessment of commercial fisheries catch and value
6	Victorian marine ecological data
6.1	Summary of marine ecosystem mapping in Victoria (1992–2000)
6.2	Marine habitat classes and ecological communities
6.3	Marine invertebrate species of conservation concern and significant locations
7	Technical criteria for marine aquaculture sites

Executive Summary

Victoria's marine and coastal environment is unique in its natural diversity – nowhere else in Australia is there such a rich diversity of flora and fauna, and cultural sites and landscapes, along such a compact and easily accessible coastline. In addition to its environmental values, the marine and coastal environment is a valuable economic resource. Victoria's commercial fish and shellfish industries generate jobs, exports and income. Recreational fishing, boating and sightseeing are important leisure activities and, together with tourism, provide significant economic benefits to coastal towns. Coastal and marine waters are used for shipping and trade, and Victoria's commercial ports are amongst the busiest in the southern hemisphere.

There is increasing pressure on marine environments, arising from agricultural, urban and industrial development in catchments draining to the coast, physical disturbances, fishing and harvesting, and the introduction of exotic marine organisms. The cumulative effects of commercial and recreational fishing are demonstrable for many fish and shellfish stocks in Victorian waters, and evidence of overfishing is available for at least two important fisheries: sharks and rock lobster. The alarming spread of introduced marine species in Port Phillip Bay is a serious threat to marine biodiversity.

The investigation

The Environment Conservation Council (ECC), at the request of the Victorian Government, has carried out an investigation of the State's marine, coastal and estuarine areas. The ECC's investigation built on earlier work of the Land Conservation Council (LCC) and also took into account work done by the Victorian Coastal Council and actions associated with the implementation of Australia's Oceans Policy. Government programs, such as the major buy-back of bay and inlet fishing licences, were also taken into account.

Terms of reference

The Government requested that the ECC make recommendations on the protection of significant environmental values and the sustainable use of Victoria's marine environment, with priority given to recommendations for a representative system of marine parks and for areas suitable for marine aquaculture. The full terms of reference are included in Part One of this report.

In accordance with its terms of reference, the ECC recommends:

- 13 highly protected **marine national parks**, covering the major habitats and biological communities of Victoria's five biophysical regions;
- 11 smaller highly protected **marine sanctuaries** to complement the marine national parks and to protect special values;
- 18 **special management areas** where special values are highlighted, but which generally require a lower level of protection;
- retaining the remaining **existing multiple-use marine parks** under current management arrangements;
- 12 **marine aquaculture zones** totalling 2 682 ha;
- reservation of all other marine areas as **Coastal Waters Reserve**;
- objectives and recommendations for protection, use and management of marine environments; and
- zoning of existing **coastal reserves** into Coastal Protection and Coastal Recreation zones, consistent with the Victorian Coastal Strategy.

The recommended highly protected marine national parks and marine sanctuaries total 63 136 ha or **6.2%** of Victoria's marine waters.

Scope of the Final Report

For completeness, this final report comprises all the ECC's recommendations for Victoria's marine, coastal and estuarine area, including the review of the Port Phillip Heads Marine Park requested by the Minister in December 1998, and the two aquaculture recommendations contained in the Interim Report (1988) currently under consideration by Government.

Consultation program

The recommendations in this report conclude a nine-year process which included six formal periods for public comment, as well as ongoing consultation with a broad range of community and industry groups, government agencies and interested individuals. An Advisory Group was established to provide input and advice regarding technical issues associated with the investigation.

About 4500 written submissions have been taken into account in the preparation of this report, almost 2500 of them received following the release of the Draft Report. This is a huge resource of information and informed comment which was enormously valuable in helping the ECC finalise its recommendations.

In addition to consideration of written submissions, the ECC has conducted numerous briefings and public meetings. Mirimbiak Nations Aboriginal Corporation was commissioned to facilitate and coordinate the input of Aboriginal people.

Major changes since the Draft Report

Following public consultation on the Draft Report the ECC has made several significant changes to its recommendations:

- an expanded discussion and recommendations relating to broad protection, use and management issues in the marine environment;
- changes to marine national park boundaries to address user issues, to improve habitat representation and to provide for easier boundary identification;
- minor changes to marine sanctuaries and special management areas, and additional special management areas recommended;
- a re-assessment of commercial fisheries catch estimates, and a social and economic assessment of impacts on coastal communities;
- existing multiple-use parks to retain their current names and management arrangements;
- a small number of changes to marine aquaculture zones to address user issues; and
- aquaculture investigation areas have either been removed or a smaller zone identified.

A summary of the changes to area recommendations is provided at the end of this Executive Summary.

Social and economic assessments

Both the ECC and the LCC have commissioned social and economic assessments throughout this investigation.

The annual value of commercial fisheries in the recommended marine national parks and marine sanctuaries is estimated to be approximately \$7 million, with most of the value derived from abalone harvesting.

The ECC recently commissioned Essential Economics Pty Ltd to carry out an assessment of the social and economic implications of its final recommendations, particularly on coastal communities. The full report is provided in Appendix 4. The assessment indicates that impacts on commercial fishers depend on whether or not catch can be secured from other areas. In the event that foregone catch is not sourced from elsewhere, the potential job loss is around 0.3% of all employment in towns located near recommended marine national parks and marine sanctuaries. However it is expected that individual incomes would be reduced rather than jobs lost, and the net effect on a town's economy is not expected to be significant.

The recommendations are assessed as unlikely to have any significant adverse impact on recreational fishing expenditures in the State.

Marine aquaculture is likely to generate significant employment for Victoria, with Portland a potential major beneficiary.

Employment generation in coastal towns may also be associated with management of marine protected areas.

The primary tourism benefit flowing from the recommendations is the opportunity for increased tourism marketing and development of new products associated with the new marine national parks or sanctuaries. However, tourism numbers are considered to be unlikely to increase as a direct result of implementing recommendations, and benefits are likely to be small and not measurable in terms of new jobs.

Environmental benefits flow from preservation of the State's coastal and marine biodiversity. Although difficult to quantify, improved scientific understanding, access to education opportunities and preservation of Victoria's natural assets for future generations are some of the benefits generated through implementation of the recommendations.

It was noted that the structural change evident in many of Victoria's coastal communities is driven by an ongoing shift from resource to service economies and, for some coastal communities, the net result has been population decline. Flowing from such structural shifts are community perceptions of loss and isolation and, in these circumstances, additional change through policy implementation can further entrench these sentiments.

Addressing the terms of reference

Maintaining the health and integrity of marine ecosystems is fundamental to good management of Victoria's marine and coastal environments. Care must be taken not to threaten the biological diversity and ecological processes on which continued use of the sea depends. Victoria's marine biodiversity is a significant part of the State's wealth. As a society we have a responsibility to pass on an environment to future generations that will continue to give them the benefits that it has given us.

In this report the ECC addresses the two priorities established in its terms of reference:

- a representative system of marine parks in Victoria, and
- areas suitable for marine aquaculture.

Marine protected areas

The recommendations for a system of highly protected areas within a framework of sustainable management are an expression of multiple-use management of the marine environment.

The ECC recommends a system of **13** highly protected **marine national parks** along the Victorian coastline. These parks, which are representative of the major habitats and biological communities in Victoria's five marine biophysical regions, form the major component of the marine protected areas system.

The marine national parks will be complemented by **11** smaller highly protected **marine sanctuaries**, recommended for protection of special features.

18 special management areas are also identified where a lower level of protection is sufficient to protect special features.

The **existing multiple-use marine parks** (other than the areas recommended to be included in marine national parks or marine sanctuaries) are recommended to be retained to be managed for a variety of uses which do not impact on the values and objectives of the park.

Out of a total Victorian marine area of 1 017 400 ha, the areas recommended as highly protected marine national parks and marine sanctuaries total 63 136 ha or about 6.2% of Victoria's marine waters. More information on all these areas is provided in Part Three of this report.

Coastal reserves and coastal land use

Coastal reserve zones provide protection for, and recognition of, the often narrow public foreshore land outside parks and other conservation reserves. These areas are a focus of recreational use and public enjoyment, and support often fragile coastal ecosystems and landscapes.

The Coastal Protection Zones should be managed to provide for conservation, or low impact recreation consistent with protection of the natural values of the areas. The Coastal Recreation Zones are capable of sustaining recreation for larger numbers of people, and should be managed for appropriate recreational use whilst minimising impacts on remnant values and the coastal environment.

The ECC, in conjunction with the Victorian Coastal Council, has mapped coastal zoning for coastal public land outside parks and reserves, and recommends that the zoning be incorporated into the Victorian Coastal Strategy.

Marine aquaculture

The ECC is recommending **12 marine aquaculture zones**. The zones total 2 682 ha. More information on all the proposed zones is provided in Part Four of this report.

The ECC also considers that there are major opportunities, and broad community support, for land-based aquaculture, and encourages its development.

Summary of changes to area recommendations since the Draft Report

Marine national parks

Final Report Recommendation	<i>the change</i>	<i>the reasons</i>
A1 Discovery Bay	straightening the offshore boundary –area reduction of 260 ha	easier identification of seaward boundaries
A2 Twelve Apostles	additional shoreline exclusions; offshore boundary straightened –area reduction of 530 ha	easier identification of boundaries, and additional areas for shore-based recreational fishing
A3 Point Addis	straightening the offshore boundary –area reduction of 215 ha	easier identification of seaward boundary
A4 Point Cook in Draft Report – see B7 below		
A4 Port Phillip Heads	Recommended in Interim Report 1998. Not included in Draft Report 1999. Change from multiple-use park to marine national park – for details see Part Three.	
A5 Yaringa	no change	
A6 French Island (formerly A6 North Western Port)	Post Office Channel included; name change –area increase 130 ha	easier identification of boundaries and better representation of channel habitats
A7 Churchill Island (formerly A7 Rhyll Inlet)	parts of channels used for fishing excluded; name change –area reduction of 335 ha	reduced impact on boat-based recreational fishing
A8 Bunurong	straightening the offshore boundary	easier identification of seaward boundary
A9 Wilsons Promontory	Glennies group of islands excluded –area reduction of 930 ha	reduced impact on commercial abalone fishery
A10 Corner Inlet (formerly B10 Corner Inlet Marine Sanctuary)	change of southern and eastern boundaries, name change to Marine National Park –area increase of 740 ha	better representation of <i>Posidonia</i> and <i>Halophila</i> seagrass
A11 Ninety Mile Beach (formerly A10)	the park relocated to the west of Seaspray; offshore boundary straightened –area reduction of 160 ha	reduced impact on shore-based recreational fishing; easier identification of boundaries
A12 Point Hicks (formerly A11)	Clifton Rocks excluded, Whaleback Rock included; offshore boundary straightened –area reduction of 1 800 ha	reduced impact on shore-based recreational fishing; easier identification of seaward boundary
A13 Cape Howe (formerly A12)	straightening the offshore boundary –area reduction of 380 ha	easier identification of seaward boundary

Marine sanctuaries

Final Report Recommendation	<i>the change</i>	<i>the reasons</i>
B1 Merri	La Bella reef area excluded –area reduction of 23 ha	easier identification of boundaries and reduced impact on commercial abalone fishery
B2 The Arches	no change	
B3 Marengo Reefs		
B4 Eagle Rock	adjustment of east and west boundaries –area increase of 9 ha	easier identification of boundaries from land and improved representation of nearshore reefs
B5 Point Danger	no change	
B6 Barwon Bluff		
B7 Point Cook (formerly A4 Point Cook Marine National Park)	Sheoak reef excluded and entire Point Cook reef included; change of name to Marine Sanctuary –area reduction of 215 ha	reduced impact on commercial abalone fishery and recreational fishing, ecological monitoring facilitated by inclusion of entire Point Cook reef complex
B8 Jawbone (formerly B7)	adjustment of western boundary –area reduction of 12 ha	the boundary moved away from Kororoit Creek mouth
B9 Ricketts Point (formerly B8)	reduction of the offshore area –area reduction of 120 ha	easier identification of boundaries and reduced impact on boat-based recreational fishing
B10 Mushroom Reef (formerly B9)	minor boundary adjustment	easier identification of boundaries
B11 Beware Reef	no change	

Special management areas

Final Report Recommendation	<i>the change</i>	<i>the reasons</i>
C1 Cape Bridgewater (formerly D1)	no change	
C2 Lawrence Rocks (formerly D2)		
C3 Portland Bay (formerly D3)		
C4 Deen Maar (Lady Julia Percy Island) (formerly D4)	name change	to reflect significance of area for Aboriginal people
C5 Logans Beach (formerly D5)	adjustment of the offshore boundary –area increase of 160 ha	consistency with the proposed Wildlife (Whales) (Logan’s Beach) Regulations 2000 under the <i>Wildlife Act</i> 1975
C6 Dinosaur Cove (formerly D6)	adjustment of the offshore boundary –area increase of 9 ha	easier identification of boundaries
C7 Clifton Springs (formerly D7)	no change	
C8 Werribee River estuary (new area)	new area –51 ha	to protect estuarine environment
C9 Capel Sound (formerly D8)	straightening of the boundary –area increase of 126 ha	easier identification of boundaries
C10 Honeysuckle Reef (formerly D9)	no change	
C11 Crawfish Rock (formerly D10)		
C12 Bass River delta (formerly D13)	no change	
C13 San Remo (formerly D12)		
C14 Rhyll (formerly D11)	adjusting the offshore boundary and additional areas –area increase of 246 ha	easier identification of boundaries and enhanced protection for wading birds
C15 Summerland Peninsula (Phillip Island) (formerly D14)	additional area –area increase of 372 ha	improved protection for seal and penguin populations
C16 The Skerries (formerly D15)	no change	
C17 Mallacoota Inlet (parts) (new area)	new area –340 ha	to protect areas of flora, fauna and geomorphological significance
C18 Gabo Island harbour (new area)	new area –23 ha	to protect nature based tourist values of Gabo Island harbour including little penguins and reef fish

Aquaculture zones

Final Report Recommendation	<i>the change</i>	<i>the reasons</i>
E1 Portland (formerly F1)	investigation area changed to zone –area reduction of 800 ha	to specify the area to be used for aquaculture
E2 Grassy Point (formerly E1)	no change	
E2 Clifton Springs (formerly E2)		
E4 Pt Lillias (formerly F2)	investigation area changed to zone –area reduction of 33 ha	to specify the area to be used for aquaculture
E5 Avalon	no change to previously recommended 17 ha area, possible additional 30 ha removed from recommendations.	more suitable area for aquaculture
E6 Bates Point (formerly E3)	no change	
E7 Kirk Point-Werribee (formerly F3)	investigation area changed to zone –area reduction of 5 600 ha	to specify the area to be used for aquaculture
E8 Beaumaris (formerly E4)	no change	
E9 Mount Martha (formerly E5)	–area reduction of 150 ha	reduced environmental impacts
E10 Dromana (formerly E6)	–area reduction of 130 ha	reduced impact on recreational boating
E11 Pinnacle Channel Recommended in Interim Report 1998. Not included in Draft Report 1999– for details see Part Four.	no change to previously recommended 1000 ha area	
E12 Flinders (formerly E7)	no change	
Areas previously listed in Draft Report		
F4 Corinella	investigation area removed from recommendations	community concerns about environmental sensitivity of the Ramsar-listed Western Port environment; not sought by industry
F5 Bass River	investigation area removed from recommendations	community concerns about environmental sensitivity of the Ramsar-listed Western Port environment; not sought by industry
F6 Anderson Inlet	investigation area removed from recommendations	community concerns of environmental risks; not sought by industry
E8 Waratah Bay	zone removed from recommendations	community concerns of environmental risks; visual amenity and coastal infrastructure issues; not sought by industry
F7 Corner Inlet	investigation area removed from recommendations	environmental sensitivity of this Ramsar wetland; potential conflicts with other uses; not supported by industry

The Investigation



1.1 Introduction

Victoria's marine and coastal environments

The Victorian marine and coastal environment is unique in its natural diversity – nowhere else in Australia is there such a rich diversity of flora and fauna, and cultural sites and landscapes, along such a compact and easily accessible coast. Spectacular coastal landscapes and marine animals such as the little penguin, southern right whale and Australian fur seal are major attractions.

Victoria has the highest population-to-coastline ratio of all the Australian states and territories. The coast has two major embayments, Port Phillip and Western Port; the largest estuarine lakes system in the southern hemisphere, the Gippsland Lakes; the large shallow lagoon system of Corner Inlet/Nooramunga; and numerous smaller inlets and coastal streams.

In addition to its environmental values, the marine and coastal environment is a valuable economic resource. Victoria's commercial fish and shellfish industries generate jobs, exports and income. Recreational fishing, boating and sightseeing are important leisure activities, and together with tourism, provide significant economic benefits to coastal towns. Coastal and marine waters are used for shipping and the major ports are vital for trade.

However, signs are emerging of problems resulting from use of marine resources and land use practices in catchments. The cumulative effects of commercial and recreational fishing are demonstrable for many fish and shellfish stocks in Victorian waters, and evidence of overfishing is available for at least two important fisheries: sharks and rock lobster (Winstanley 1996).

Other problems in Victoria's marine environment arise from the concentration of population and industry around the two bays, and agricultural use and development of the catchments draining to the coast. These problems are aggravated by the physical disturbances to marine environments from shipping and related works, coastal development and fishing, and by the introduction of exotic species.

The investigation process

The Victorian Government asked the Environment Conservation Council to carry out an investigation of Victoria's marine, coastal and estuarine areas.

The investigation builds on earlier work by the Land Conservation Council.

The Land Conservation Council, which was established by the *Land Conservation Act 1970*, commenced an investigation of Victoria's marine, coastal and estuarine areas under terms of reference provided by the Government in September 1991.

In June 1997 the *Land Conservation Act 1970* was repealed and replaced by the *Environment Conservation Council Act 1997*. Under this Act the Land Conservation Council ceased to exist and the Environment Conservation Council was established to respond to specific references from the relevant Minister.

The flowchart on pages 4–5 outlines the investigation process of the LCC and the ECC, highlighting formal opportunities for public input over the past nine years. In addition, the LCC and the ECC have received substantial informal input outside these periods. The investigation has received about 4500 written submissions.

Reports issued by the LCC

During the initial investigation, which began in late 1991, the LCC produced a number of important reports, in particular:

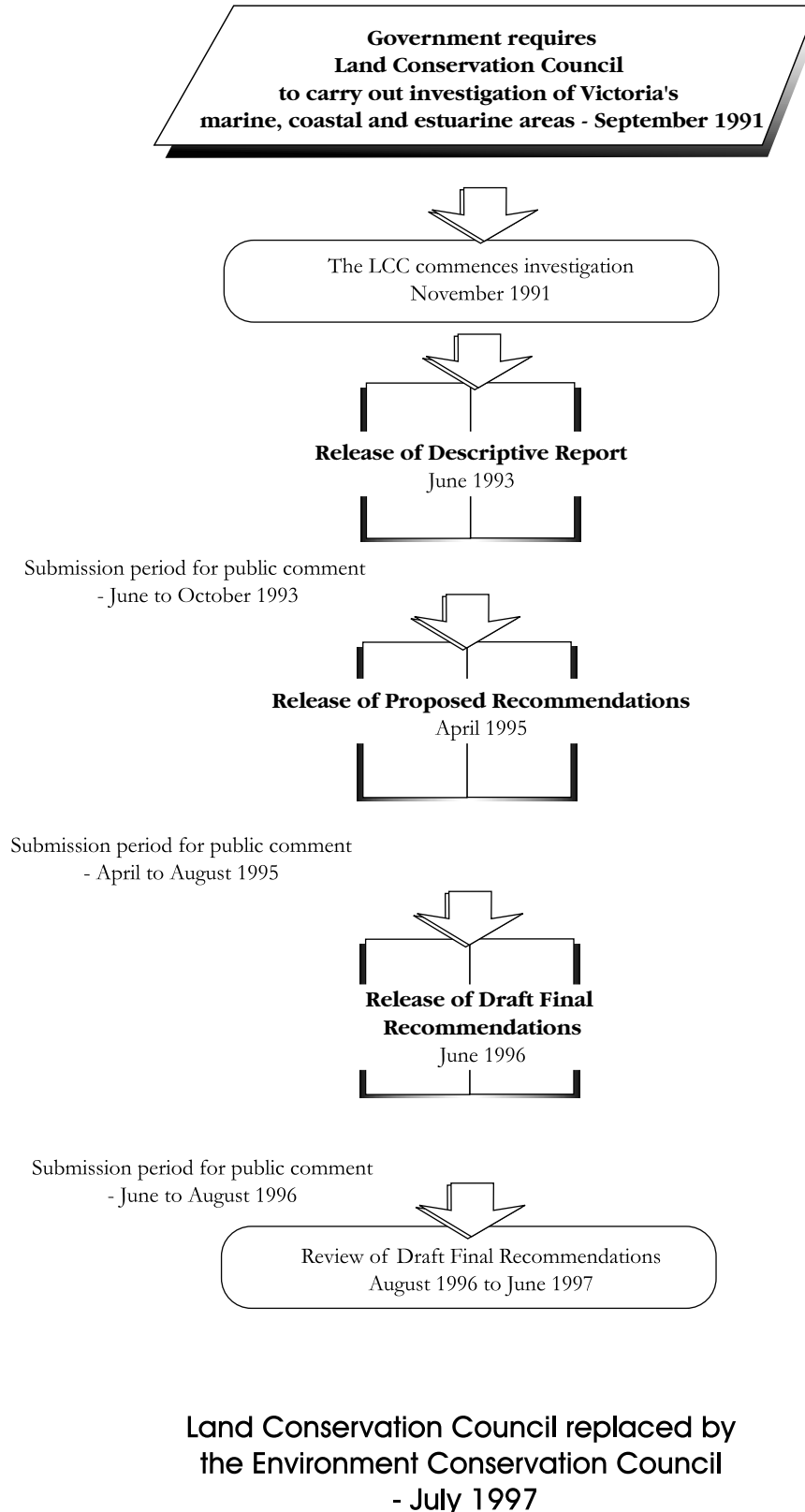
- Marine and Coastal Special Investigation Descriptive Report, June 1993
- Marine and Coastal Special Investigation Proposed Recommendations, April 1995
- Marine and Coastal Special Investigation Draft Final Recommendations, June 1996.

Each of these reports was widely distributed for public comment. The LCC commissioned various studies and research projects which added considerably to our knowledge of the marine environment.

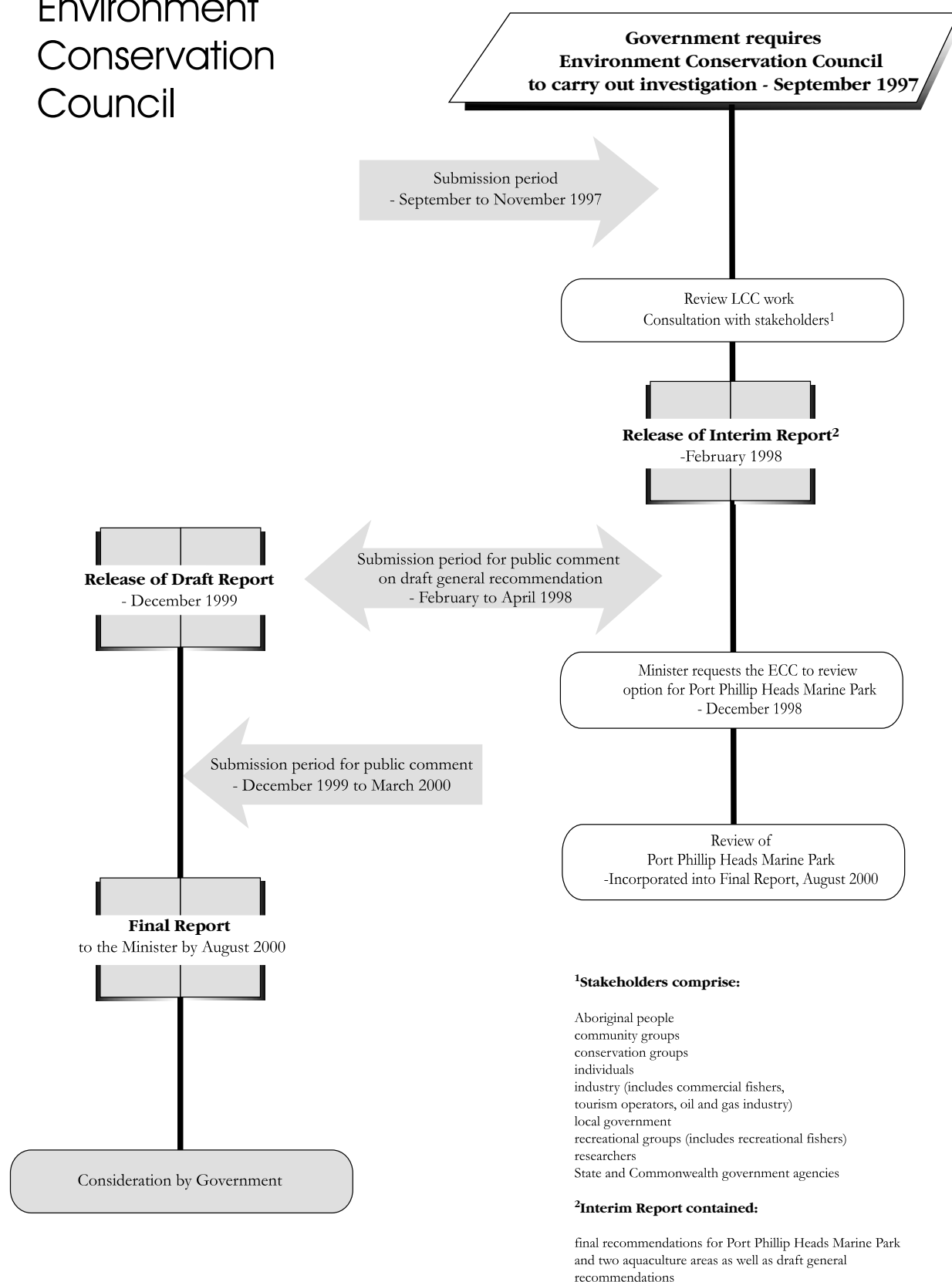
The LCC's Draft Final Recommendations (1996) included 21 recommendations for multiple-use marine parks and 22 recommendations for sanctuary (or highly protected) zones within the marine parks. Eight preferred marine aquaculture areas were also recommended. The LCC was in the process of considering submissions received following publication of the Draft Final Recommendations when it was replaced by the ECC. The ECC has access to all of the past work of the LCC and has made extensive use of it in the current investigation.



Land Conservation Council



Environment Conservation Council



The ECC's terms of reference

The Minister for Conservation and Land Management provided terms of reference to the ECC in 1997 for the investigation of Victoria's marine, coastal and estuarine areas. In particular, the terms of reference (quoted in full on page 7) required the Council to make recommendations on two matters:

- a representative system of marine parks, and
- areas suitable for marine aquaculture.

The ECC was required to provide an interim report recommending at least one marine park and at least one marine aquaculture area.

The ECC has produced two reports:

- Marine, Coastal and Estuarine Investigation Interim Report, February 1998
- Marine Coastal and Estuarine Investigation Draft Report, December 1999

The Interim Report, released in February 1998, recommended the establishment of a Port Phillip Heads Marine Park and two aquaculture areas, one in and one adjoining Port Phillip Bay.

As part of the Interim Report, the ECC also asked for public comment on:

- objectives and management guidelines for Victoria's marine, coastal and estuarine areas,
- principles for the selection and management of marine parks, and
- principles and criteria for selection and management of marine aquaculture areas.

The 236 submissions received in response to the invitation for public comment were taken into account in framing the draft recommendations.

The recommendations for the two aquaculture areas contained in the Interim Report are currently being considered by Government (see pages 131 and 134 for more details on these areas).

In May 1999 the Minister extended the time for the ECC to submit the report on the investigation to 30 June 2000, and directed the ECC to take into account the recently announced voluntary buy-back of commercial fishing licences, and further development of Commonwealth/State processes related to Australia's Oceans Policy.

The ECC released its Draft Report for public comment in December 1999. The recommendations built on the work of the LCC between 1991 and 1997, and took into account work done by the Victorian Coastal Council and the development of Australia's Oceans Policy.

The ECC's Draft Report included recommendations for marine protected areas, including twelve highly protected marine national parks and eleven marine sanctuaries (about 6.2% of Victoria's waters); and marine aquaculture areas, including eight aquaculture zones. The Draft Report also detailed proposals for management of marine waters and coastal land.

About 2500 written submissions were received commenting on the Draft Report, including about 120 letters received after the closing date (see Appendix 1 for the list of submissions).

In June 2000 the Minister approved a two month extension (until 31 August 2000) for the Final Report, to enable completion of socio-economic assessments and additional consultation related to Aboriginal interests and commercial fisheries values.

Review of the Port Phillip Heads Marine Park

In December 1998 the then Minister, under section 17(3) of the Act, requested that the ECC review the recommendation for Port Phillip Heads Marine Park, having regard to the incompatibility of incorporating major shipping channels in a marine park. The ECC's recommendation on this matter is included in Part Three as Recommendation A4.



Terms of Reference for the Environment Conservation Council's Investigation of Victoria's Marine, Coastal and Estuarine Areas

The Minister, under Section 17 of the Environment Conservation Council Act 1997 requires the Environment Conservation Council to complete a Marine and Coastal Special Investigation by 31 August 2000¹.

The investigation area extends from the Victorian offshore territorial limit (3 nautical miles) to a distance of approximately 1 km inland from the high-water, it includes the land (terrain, and overlying water) affected by marine, coastal and estuarine processes. Islands surrounded by marine and estuarine water are included in the investigation. On French Island the landward boundary of the area is approximately 1 km inland from the high-water mark. The bed and associated waters of the Gippsland Lakes are excluded. Land within cities and rural cities may be included at the discretion of the Council.

The Council is to investigate this area and make recommendations on the protection of significant environmental values and the sustainable use of these areas with priority given to:

- (a) a preferred approach and priorities for the progressive establishment of a representative system of marine parks in the State of Victoria; and
- (b) areas suitable for marine aquaculture, which can be developed on an environmentally sustainable basis.

In making these recommendations the Council is to have regard to:

- (a) the matters to be taken into account in investigations as provided in Section 20 of the Environment Conservation Council Act 1997;
- (b) the work undertaken by the Land Conservation Council and the Victorian Coastal Council; and
- (c) the Prime Minister's announcement on 3 March 1997 of the development of an Australian Oceans Policy.

The Council is to provide an interim report by 31 January 1998² recommending options for the early establishment of at least one marine park and at least one area suitable for the priority development of marine aquaculture.

The Terms of Reference were amended on (31 May 1999) as follows:

The ECC is to take into account the recently announced voluntary buyback of commercial fishing licences and further development of Commonwealth/State processes related to Australia's Oceans Policy.

¹ Originally 30 June 1998

² Originally 30 November 1997

What is the ECC required to consider in its investigations?

Under section 20 of the *Environment Conservation Council Act 1997*, the Council must have regard to:

- the ability of any existing or proposed development or use of the land or resources to be ecologically sustainable and economically viable;
- the economic and social value of any existing or proposed development or use of the land or resources;
- the existence of and need to conserve and protect any areas of ecological, historical, cultural or recreational value or areas of landscape significance on the land;
- the need for the creation and preservation of a comprehensive, adequate and representative system of parks and reserves within the State;
- any international obligations entered into by the Commonwealth and any national agreements entered into with or obligations undertaken in conjunction with the Commonwealth and the other States and Territories which relate to the subject matter of the investigation; and
- the need to protect and conserve biodiversity.



1.2 Addressing the terms of reference

In this report the ECC addresses the two priorities established in its terms of reference, that is recommendations for a representative system of marine parks in Victoria, and for areas suitable for marine aquaculture.

Marine protected areas

The ECC recommends improving the protection of the marine environment through the establishment of a system of marine protected areas, supported by good environmental management practices over the whole of Victoria's marine area. These two elements are complementary, ensuring good overall management of our marine areas.

A cornerstone of the recommended system is the establishment of 13 highly protected marine national parks and 11 marine sanctuaries. Throughout the investigation, while some stakeholders have strongly supported the need for highly protected areas, others have argued that it is not necessary to establish areas of high protection, analogous to terrestrial national parks, in order to protect the marine environment.

The ECC strongly believes that, not only is it necessary, but that it would be highly irresponsible not to set aside some small proportion of Victoria's marine area to be maintained in as natural a state as possible. Protected area strategies are well accepted for the terrestrial environment, and also feature as a key component of every existing national and international strategy for protection and sustainable use of the marine environment.

In making these recommendations, the ECC acknowledges that there are social and economic implications arising from the establishment of highly protected areas. These potential impacts have been taken into account as far as possible, while still meeting the objectives for a comprehensive, adequate and representative system of marine protected areas.

The ECC is of the strong opinion that the environmental, social and economic implications of failing to set aside highly protected areas are significant and potentially irreversible, although less easily quantified than immediate financial costs.

About 6.2 % of Victoria's marine area is recommended to be set aside in highly protected areas and, while this is seen by some stakeholders as barely adequate, the ECC considers that it represents a balance that is acceptable to the broad community at this time.

Victoria's marine environment is managed for multiple uses. Marine protected areas are only one component of marine environmental management, and the ECC highlights existing and developing programs addressing critical environmental issues such as catchment management, fisheries management, introduced marine pests and marine pollution.

Marine aquaculture areas

In order to facilitate the development of marine aquaculture in Victoria, the ECC is recommending 12 marine aquaculture zones (including two previous recommendations) where aquaculture can be developed on an environmentally sustainable basis.

Preparing the recommendations for aquaculture areas has been a difficult task, for technical, environmental and social reasons. It is clear from community input throughout the investigation, that there is widespread concern about the development of aquaculture in open marine waters, although there is considerable support for land-based aquaculture. Competing uses are issues for some stakeholders, but the major concern is the environmental risk potentially associated with marine aquaculture. From an industry perspective relatively few areas in Victoria appear to be suitable for existing species and technologies and, of those few, several areas are ruled out because of their high conservation values or their environmental sensitivity; for example, Ramsar wetlands.

Accordingly the ECC is recommending 12 aquaculture zones, based largely on existing licence areas, and is further recommending that detailed monitoring programs are developed and implemented to clarify and document the nature and degree of the environmental impacts, including recovery times, prior to the consideration of any additional areas. Wide availability of the results of monitoring will assist in responsible management of marine aquaculture and may allay some of the community concerns in future.



The ECC believes that an environmentally sensitive aquaculture industry has the potential to contribute substantially to the Victorian economy, and encourages the further development of land-based aquaculture of marine species.

Major changes since the Draft Report

As a result of input received from the community and additional information available since the release of the Draft Report in December 1999, significant changes have been made to the recommendations.

The main changes are listed below and are summarised in tables at the end of the Executive Summary.

- In response to public input, an expanded discussion and recommendations relating to protection, use and management of Victoria's marine and coastal area.
- A number of changes to marine national park boundaries have been made to address user issues, to improve habitat representation and to provide for easier identification of boundaries.
- Commercial fishing estimates have been re-assessed, and a socio-economic assessment of impacts on coastal towns and the broader community has been completed.
- Minor changes have been made to marine sanctuaries and special management areas and additional special management areas have been proposed.
- Existing multiple-use parks will retain their current names and management arrangements.
- A number of changes have been made to aquaculture zone boundaries to address user issues.
- Aquaculture investigation areas have either been removed or a smaller zone identified.

Broad issues raised in submissions received on the Draft Report and Council's response are discussed in Appendix 2.

1.3 Policy context

The recommendations in this report have been developed in the context of international, national and State obligations and programs. Many strategies and plans, such as the Victorian Coastal Strategy, the Biodiversity Strategy and the Victorian Aquaculture Strategy, address aspects of marine, coastal and estuarine management in detail. A major initiative at the Commonwealth level is the development of Australia's Oceans Policy. Some of the key strategies and programs are outlined below.

National and State policy context

Victorian Coastal Strategy (1997)

The Victorian Coastal Council (VCC) was appointed under the *Coastal Management Act* 1995. One of the VCC's major tasks was to prepare a strategic plan for the whole of the Victorian coast. That plan, the Victorian Coastal Strategy, was released in November 1997.

The Victorian Coastal Strategy provides a framework to ensure the following outcomes for Victoria's coast:

- ensure the sustainable use of natural resources,
- ensure the protection of significant environmental features of the coast,
- provide clear direction for the future use of the coast including the marine environment, and
- identify suitable development areas and development opportunities on the coast.

When preparing the plan, the Victorian Coastal Council liaised closely with both the LCC and the ECC to ensure compatibility between the studies. Although there was some overlap, generally the VCC placed greatest emphasis on the land, whereas the LCC/ECC investigations are more strongly related to the marine environment. Another significant difference is that the LCC/ECC investigations are confined to public land whereas VCC planning relates to public and private land.

Victoria's Biodiversity Strategy (1997)

Victoria's strategy for the conservation of biodiversity was released in 1997, and included marine, coastal and estuarine environments. The strategy emphasises:

- systematic prevention or reduction of the causes of biodiversity decline or loss;



- ecologically sustainable management of public lands and waters by government agencies in association with resource based industries;
- cooperative management of biodiversity on private land, in partnership with landholders, the community, catchment management authorities and local government;
- every community and bioregion forming an integral part of our living wealth; and
- a reporting framework for monitoring progress.

Victorian Aquaculture Strategy (1998)

The purpose of this strategy, released in late 1998, is to develop a profitable, diverse, ecologically sustainable and well-managed aquaculture industry. The Victorian Aquaculture Strategy aims to provide a framework for the development of the Victorian aquaculture industry by (among other things):

- assisting in the identification and development of new areas for aquaculture;
- implementing effective environmental management performance standards; and
- establishing supportive legislative, policy and administrative frameworks.

State Environment Protection Policies (SEPPs)

SEPPs are key statutory instruments in Victoria for the protection of environmental quality, developed with extensive community and stakeholder consultation. SEPPs provide a statutory framework for the protection of beneficial uses identified, and a program of plans, works and activities which, when implemented will protect beneficial uses. *SEPP (Waters of Victoria)* (1988) is the overarching policy for Victoria's fresh and marine waters. Activities which affect or have the potential to affect the environment, must be planned and operated according to SEPP provisions. The policy provides for the control of point source discharges and diffuse sources of pollution, application of catchment management principles, monitoring, development of codes of practice, research and public education and participation.

Australia's Oceans Policy

The Commonwealth Government released Australia's Oceans Policy in December 1998, and announced the

allocation of \$50 million over three years for a range of actions associated with its implementation.

Central to the policy is ecosystem-based management of Australia's marine jurisdiction to be implemented through a regional marine planning process. Regional Marine Plans, based on large marine ecosystems, are intended to integrate sectoral commercial interests and conservation requirements. In developing Regional Marine Plans, the Commonwealth is seeking the participation of the relevant states and territories, to ensure, as far as possible, the integration of planning and management across State and Commonwealth waters.

The first Regional Marine Plan, to be prepared for the South-east Exclusive Economic Zone, was announced by the Federal Government in April 2000. The plan will cover an area of 2 million square kilometres of ocean off Victoria, Tasmania, southern New South Wales and eastern South Australia. A formal scoping paper is currently being prepared setting out details of the Government's intentions for the South-east Regional Marine Plan and the consultation process which will be used. State governments have not yet endorsed the Oceans Policy and the Regional Marine Planning process.

Commonwealth Environment Protection and Biodiversity Conservation Act 1999

This Act, which came into force on 16 July 2000, identifies six matters of national environmental significance (NES):

- World Heritage properties
- wetlands of international importance (Ramsar wetlands)
- nationally threatened species and ecological communities
- internationally listed migratory species
- nuclear actions
- Commonwealth marine areas.

Activities, or actions, which may have a significant impact on a matter of NES, will be subject to Commonwealth assessment and approval, unless State assessment processes have been accredited by the Commonwealth.

Major activities and actions in Victoria, with a potential significant impact on a matter of NES in



the marine and coastal environment, will be subject to assessment and approval under the Act. It is therefore possible that new developments, such as marine aquaculture operations, may require assessment and approval under the Act if, for example, the proposal is in a Ramsar listed area.

Fisheries management under the Offshore Constitutional Settlement

The Offshore Constitutional Settlement (OCS) allows for arrangements to be made between the States and the Commonwealth on resource and conservation matters for marine waters (except bays, inlets and estuaries). This simplifies the management of resources, particularly those that straddle the State/Commonwealth boundary. For the purposes of fisheries management the OCS provides for the Commonwealth to be given jurisdiction for specified fisheries within Victorian territorial waters, and vice versa. Victoria's territorial waters extend seawards to three nautical miles from high water mark. For example, Victoria manages some Commonwealth waters with respect to abalone, and the Commonwealth manages some Victorian waters with respect to royal red prawns.

Adjustments to Commonwealth fisheries arrangements may be necessary as a result of Victorian Government decisions on establishment and management of marine protected areas. The Memorandum of Understanding accompanying the OCS arrangements between Victoria and the Commonwealth ensures such decisions are able to be implemented.

International listings of important conservation areas

There are three ways in which areas in Australia may receive international recognition for their conservation values: under the World Heritage Convention, the Convention on Wetlands of International Importance (the Ramsar Convention), and the UNESCO Biosphere Reserves Program. Although these designations do not have a legal foundation, they act as 'overlays' for areas with a range of land tenures, not all of which may be recognised as protected areas.

There are currently no World Heritage Areas in Victoria.

Wetlands of International Importance

The Ramsar Convention aims to promote the conservation of wetlands and waterfowl, to establish nature reserves on wetlands, to provide adequately for their protection and management and to train personnel competent in the fields of wetland research and management. Four coastal marine areas in Victoria are designated as Wetlands of International Importance under the Ramsar Convention:

- Port Phillip Bay (western shoreline) and Bellarine Peninsula
- Western Port
- Corner Inlet (includes the Nooramunga area)
- Gippsland Lakes.

Two other international agreements that act to protect migratory birds are the Japan-Australia Migratory Birds Agreement (JAMBA) and the China-Australia Migratory Birds Agreement (CAMBA). The Agreements recognise that certain species of birds migrate between the two countries and that both countries will conserve the habitats of these species.

Biosphere Reserves

Biosphere Reserves are areas nominated by a UNESCO member state which, because of their characteristic plants and animals and the way they are used by humans, have been given international recognition by the Man and the Biosphere Programme of UNESCO. A Biosphere Reserve contains gradations of areas which have been modified by human activity, with a core area or areas devoted to long-term protection, and one or more surrounding buffer zones in which activities compatible with the conservation objectives may be carried out.

Two coastal areas in Victoria have been designated as Biosphere Reserves by UNESCO:

- Croajingolong National Park, and
- Wilsons Promontory National Park.



1.4 Consultation and information

Consultation program

During the preparation of the final recommendations, the ECC sought input from community and industry groups, government agencies and interested individuals. The recommendations in this report conclude a nine-year process which has included six formal periods for public comment and ongoing consultation with a broad range of stakeholders.

The ECC has taken into account about 4500 written submissions and letters made to both the former LCC and the present Council. This huge resource of information and informed comment has been enormously valuable in helping the ECC finalise its recommendations.

An Advisory Group was established by Council for the investigation to provide input and advice regarding technical issues associated with developing its recommendations. The ECC Chairman convened Advisory Group meetings. The Advisory Group is an expertise-based group (not a representative group), whose members include individuals from State and Federal Government agencies, and people with backgrounds in conservation, the aquaculture industry, recreational fishing, commercial fishing, research and rural communities.

In addition to inviting submissions, the ECC has been active in conducting public meetings and briefings. These have been undertaken for Aboriginal groups, industry organisations, conservation groups, user groups, local communities, concerned individuals and government agencies.

Prior to formulating its draft recommendations released for public comment in December 1999, the ECC and staff conducted meetings in coastal regions of Victoria to discuss the proposed content of the draft recommendations and to help resolve any outstanding issues.

Following the release of the Draft Report, a series of briefings was conducted, public meetings were held in 15 locations along the Victoria coast, and Council met with peak organisations to discuss their submissions. Council's response to major issues raised during the investigation can be found in Appendix 2.

Mirimbiak Nations Aboriginal Corporation was commissioned by the ECC to facilitate input from Aboriginal groups on the recommendations in the Draft Report. A summary of their report, prepared with the participation of all Victorian Aboriginal coastal communities, is included at Appendix 3.

Information sources

In addition to input provided through written submissions and the consultation program, the work of the ECC is based on the best available information, obtained through collation of existing data and specially commissioned research.

Several studies have been commissioned by the ECC or LCC, and other research projects have also provided valuable information. The key information sources which contributed to the development of the recommendations are referenced throughout the report. A full list of references is also provided commencing on page 135.

1.5 Economic and social assessments

As part of its task of making recommendations on the balanced use of public land and resources, the ECC must take into account economic and social values. The ECC must also balance local, regional, State and national interests as well as those of present and future generations.

Whilst there are a number of ways to assess the social and economic impacts of the ECC's recommendations, most methods have limitations. In particular, social and environmental impacts are very difficult to incorporate in most analyses, and there is a tendency to focus on readily identifiable impacts, which are more likely to be short-term financial losses or gains. For example, how costs and benefits of particular decisions are distributed amongst different groups within society is an important consideration, but is not easily assessed.

Most cost-benefit analyses also struggle with 'pricing' environmental values although there is no doubt that, as a society, we place a high value on them. While socio-economic analyses are useful ways of structuring the assessment of resource issues, no technique can express, aggregate, weigh and compare the values of all the costs and benefits associated with alternative uses of land, water or resources.



Although there is continual development of techniques to inform and assist policy-makers, there is no generally accepted methodology available at present that eliminates the need for governments to interpret community values and goals when making final judgements about resource use options.

Information on other social and economic impacts of the recommended marine protected areas has been gained through discussions with community groups and individuals, local government and other government agencies. This information, although generally qualitative rather than quantitative, has been extremely useful in developing and refining recommendations.

Both the ECC and the LCC have commissioned social and economic assessments throughout this investigation (see references 240, 241, 242, 254, 366). An overview of the social and economic implications of the final recommendations is provided in Appendix 4. More detailed information is provided for specific areas in the recommendations in Part Three.

Social and economic implications for coastal communities

Economic data available for the Victorian coast and marine areas comprises information on tourism, commercial and recreational fishing, and extraction of petroleum and minerals. Social data includes information on population, occupations, incomes, and preferences for various activities, but data specific to the coast cannot readily be extracted from the general Victorian information.

The social and economic characteristics of the major population centres along the Victorian coast vary greatly. Outside Melbourne and Geelong, major activities associated with coastal population centres include agriculture, fisheries (including mariculture), tourism, recreation, industry, commerce, and petroleum production. Other important activities include the provision of support services, such as schools, medical and other community facilities.

Many coastal towns and settlements across Victoria have undergone significant change in recent years in response to changing social and economic conditions. The relative significance of different economic activities to local, regional and State economies varies enormously. Large coastal towns

and cities, such as Warrnambool and Portland in western Victoria, have a broader economic base than smaller coastal towns such as Mallacoota and Marlo in east Gippsland. The socio-economic framework of many coastal towns and cities is complex with numerous links both within and beyond the coastal area.

Many of Victoria's coastal towns are relatively small in area and in population, with key economic activities closely linked to the marine-based assets as well as the servicing of local residents and visitors. The coast provides many opportunities for commercial fishing, recreational fishing, diving and numerous other recreational pursuits and general tourist activity. While these features are important to the underlying structure of the coastal townships, the global shift from primary industry to service economies has influenced the profile of many of these towns. As a result, there may be structural changes in particular sectors of a small town's economy (such as a reduction in farming activity in the surrounding area) yet the growth in other activities (such as tourism or retirement living) means that losses resulting from the structural change are more than remedied by the growth in 'new' areas.

Although it is difficult to assess the effects of the creation of a marine national park on local communities, positive social and economic outcomes are commonly associated with terrestrial national parks, largely through conservation and enhancement of the environmental resource, and in many areas, through stimulus to tourism and some forms of recreation.



Many coastal communities are relatively small, with key economic activities closely linked to the marine and coastal environment. Photo: Hania Bibrowska



In some areas creation of a park can provide a focus for attracting visitors and be used as a marketing tool to boost tourism in the area. There have certainly been major benefits to some local communities from the creation of terrestrial parks, but the extent to which this will occur for marine parks is less clear, although international, and some local experience, has been very positive. For example, the only existing fully protected marine area of any significant size in Victoria is within the Bunurong Marine Park. Despite some strong opposition prior to the creation of the park in 1991, the area now appears to be well supported locally and enhances the overall natural tourism assets of the region.

The independent consultants' report concludes that any net tourism benefits arising from the ECC's recommendations are likely to be very small in the short term and not measurable in terms of new jobs and incomes (see Appendix 4).

The consultants further conclude that the restrictions on recreational fishing resulting from the ECC's recommendations are unlikely to have any serious adverse effect on recreational fishing expenditures in the State. For local communities, there may be some isolated impacts where visits from fishers may decline and therefore their associated spending levels would be reduced. However these impacts should be limited as alternative fishing areas exist which are accessible. In some cases popular recreational fishing areas have been deliberately excluded from areas proposed for protection. In any event, most fishers are relatively mobile with cars and/or boats, and will tend to find alternative fishing locations. The economic impact is therefore likely to be small. Moreover, most towns do not rely heavily on recreational fishing spending, and they will continue to draw holiday-makers who are attracted by a range of factors.

The impact on commercial fishing (see following section) of the ECC's recommendations for marine protected areas may result in employment loss of around 0.3% in some coastal communities if the catch cannot be made up from other areas. The independent consultants concluded that the impacts on commercial fishing are unlikely to have lasting adverse impacts on coastal towns since the towns do not have a strong reliance on commercial fishing (except Mallacoota), and are generally reliant on a

wider servicing role for local and surrounding resident populations and for visitors. Although critically important for some individual fishers, the net effect on a town's economy is not expected to be significant.

Implications for commercial fisheries

An assessment of the value of fisheries resources in, and adjacent to, the recommended parks was undertaken by MAFRI prior to the release of the Draft Report, and summarised in that report. Some of these figures have been challenged by the commercial fishing industry and individual fishers. In discussion with the fishing industry, it is apparent that some of the concerns relate to the citation of a single year's catch estimates rather than estimates over a longer time period, the price used for values, and the absence of an estimate of the flow-on implications for regional communities and the State as a whole. The fisheries catch estimates have been reviewed and are presented in Appendix 5 to give a fuller picture of the fishery. A discussion of flow-on implications for coastal towns has been included in the independent socio-economic assessment in Appendix 4.

However, the consultants noted that there is no complete or consistent database of the numbers of people employed in the fishing industry, the numbers of boats and processing plants in particular locations, or seasonality factors etc. The absence of such an industry-wide database is a major limitation in assessing the flow-on impacts of policy decisions.

The annual value of commercial fisheries in the recommended marine national parks and marine sanctuaries in this report is estimated to be approximately \$7 million, being about \$5.4 million for abalone, about \$1 million for rock lobster and \$0.6 million for other fisheries. This is estimated to represent about 11% of the Victorian abalone fishery, 6–7% of the Victorian rock lobster fishery, and about 5% of the scalefish landed.

It is important to note that these figures are based on the estimated yield of the fishery in the recommended areas, and do not necessarily translate to a financial loss to the fishery. For example, some fish eg Australian Salmon, are not resident in a particular area and will continue to be caught outside the parks. For abalone, effort will need to be redirected to areas outside the



recommended parks. If this is not possible because all the areas outside the parks are fully exploited, adjustment to the Total Allowable Catch may be necessary. It is possible that, for the rock lobster fishery, marine national parks may lead in the longer term, to stock enhancement in adjacent areas. In some overseas cases 'no-take' marine reserves have been used as a management tool for this purpose.

Commercial fisheries in Victoria include both the wild fisheries (abalone, rock lobster and scalefish) and marine aquaculture. The ECC's recommendations for marine aquaculture areas will facilitate the development of a larger marine aquaculture industry with potentially large economic benefits.

Displacement effects, adjustment issues and compensation

Some submissions highlighted potential problems following the implementation of recommendations for highly protected marine parks, if commercial fishers responded to the imposition of restrictions by increasing catch and effort beyond sustainable limits in adjacent fished areas.

Fisheries structural adjustment is accelerated adjustment of a particular fishery's industry structure to achieve particular biological, economic or social outcomes (Metzner and Rawlinson 1998). The process may or may not involve the use of public or private funds. The primary biological impetus for adjustment programs has been stock depletion. Economic factors motivating adjustment include increasing overcapitalisation. An increasing number of adjustment programs have resulted from political decisions to reallocate fisheries resources from the commercial to the recreational sector or to the non-consumptive sector (the environment).

It is appropriate for the community to contribute to adjustment schemes on the grounds of broader environmental or social objectives. For example if such an adjustment process leaves a particular region or individual socially or economically disadvantaged, it is appropriate to use public funds for retraining or relocation of displaced industry participants in order to reduce the long-term costs.

The ECC believes that where implementation of recommendations for marine national parks and marine sanctuaries may result in displacement effects on adjoining fished areas as fishers shift effort to accommodate the new restrictions, or

where a sector of the industry or a local community is disproportionately affected and experiences hardship, industry adjustment may be required. As some fisheries, eg rock lobster, are already facing restructure for other reasons, it is not possible or appropriate at this time to determine the extent of adjustment required as a result of implementation of recommendations and whether the use of public funds is justified.

There are a number of methods to assist in structural adjustment, including existing social adjustment programs, and several ways of financing fisheries adjustment.

Recommendations

- R1** Government establish a process to evaluate the requirement for, possible mechanisms and level of adjustment that may be required where individuals or local communities are disproportionately affected as a result of the implementation of recommendations for marine national parks and marine sanctuaries.
- R2** Government encourage and assist the fishing industry to develop an industry database which includes the regular collection of sector and regional industry characteristics including employment data.

Implementation costs

Management costs associated with implementation of the ECC's recommendations for marine protected areas include the following major elements:

- infrastructure – establishment and maintenance (some of the costs are boats, onshore and offshore markers and so on);
- publicity, extension and interpretation;
- compliance – linked with publicity and extension, and includes surveillance and enforcement and visitor management;
- performance reporting – includes biological monitoring and visitor use monitoring; and
- park management planning.



Detailed costings are not provided for implementation, as discussions with management agencies suggest that there is a range of funding scenarios depending on how much integration can be achieved with existing programs.

Some infrastructure is already in place in some locations, and there is already some capacity in agencies for publicity, extension and management planning. There may be some ability to partially meet establishment costs of a performance monitoring system from within current statewide programs, although park monitoring would require additional funds. However although integration with existing programs should be explored, implementation of the recommendations will comprise a significant addition to Victoria's protected areas estate. Marine park planning and management is a relatively new area for park managers, requiring different infrastructure and expertise, and will require new funding.

Although resource requirements are not provided in detail, the ECC acknowledges the strong community feeling about the importance of resourcing marine compliance programs, and stresses again the need to provide adequate resources to effectively manage marine and coastal areas, both within and outside marine protected areas. It is also likely that more effective enforcement, particularly for abalone theft, would offset loss of fishing grounds resulting from creation of highly protected areas.

Some costs associated with implementation of recommendations for marine aquaculture areas may be partially absorbed from within existing statewide programs, and other costs will be partially or completely offset by industry contributions through aquaculture licence fees. Other costs, such as those associated with monitoring and preparation of management plans will require additional funding.



**Protection, use and management of Victoria's
marine and coastal environment**



2.1 Aboriginal interests

Background

The relationship of Australia's indigenous people to the coastal zone is different to that of other Australians (RAC 1993). It is a relationship based on a long tradition of ownership, stewardship, utilisation and cultural significance, a tradition that continues in many parts of Australia.

The cultural associations and concerns of coastal Aboriginal peoples for the sea and its resources remain strong, even in areas where they have been historically dispossessed. The contemporary cultural importance of the coast to Australia's indigenous people stems from their strong, continuing sense of belonging to and responsibility for particular tracts of country, including both land and sea areas within their traditional estates.

Aboriginal associations with the Victorian marine, coastal and estuarine investigation area are strong, and Aboriginal communities continue to assert their association with all of their ancestral areas. For Aboriginal people, their cultural heritage is enmeshed with their spiritual, ecological and economic connection with the land and sea. There are several Aboriginal groups who associate with the Victorian coast, including the:

- Gunditjmarra
- Kirrae-Whurrong
- Kerrup-Jmara
- Wathaurong
- Wurundjeri
- Boonerwrung
- Gunai-Kurnai
- Bidawal.

Evidence of earlier Aboriginal occupation of the coast can be found in middens, quarries and burial grounds throughout coastal Australia. Aboriginal shell middens as old as the present coastline (around 5-6000 years) are found in many coastal areas.

In Western Victoria, sites have been dated many thousands of years earlier than the stabilisation of sea levels. For example, Bridgewater Cave west of Portland was first occupied around 11 000 years ago. Most sites are more recent than this however, probably as a result of rising sea levels and coastal erosion destroying earlier sites.

Chapter 5 in the LCC's Descriptive Report (1993) summarises the history and surviving evidence of human association with the coast, including coastal resources, coastal archaeological sites, and accounts of the pre- and post-contact periods.

Native title

Native title is a title based on the laws and customs of indigenous people which is recognised by the common law of Australia.

Under the Commonwealth *Native Title Act* 1993 indigenous people can claim native title on Crown lands and waters in their traditional lands. Several Aboriginal groups have lodged claims with the National Native Title Tribunal related to land and waters within the investigation area.

In Victoria, Mirimbiak Nations Aboriginal Corporation is the native title representative body; it coordinates native title and acts for native title holders and claimants in relation to matters that may affect their rights and interests in land.

The existence of native title is not dependent on a claim being lodged. A recent High Court decision effectively confirmed the right of traditional use by claimants.

Under the future act provisions of the Native Title Act, there are obligations to notify, receive and consider comments and in some cases negotiate with groups in relation to acts which may affect native title. The obligations may vary according to the type of activity proposed, whether the area to be affected is land or sea, and the tenure of the area to be affected, but the basic thrust of the provisions is that indigenous groups must be consulted about activities proposed to be undertaken on their traditional lands and waters. In the event that obligations are not observed, activities are invalid to the extent that they affect native title. Section 24HA of the Native Title Act is the major provision relating to management of water and living aquatic resources.

The Victorian Government recently announced that an approach of negotiation and mediation would be taken in relation to native title claims in Victoria. Outcomes, in the form of Indigenous Land Use Agreements, would not necessarily involve formal recognition of native title.



Through consultation with Aboriginal groups and communities, the ECC has sought to take into account indigenous interests in marine and coastal issues regardless of what title indigenous people may have to the land, sea and resources. Nevertheless, the ECC notes that native title may exist in regard to some areas and that indigenous people are concerned to ensure that these rights are not inadvertently extinguished or impaired as a result of their own actions or actions by government agencies. In view of these concerns, the ECC stresses that nothing in the recommendations in this report should be taken to prejudice or diminish any native title rights to land, sea and resources as may exist.

Legislative framework

In addition to the Native Title Act, key legislation includes the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Commonwealth) and the *Archaeological and Aboriginal Relics Preservation Act 1972* (Victoria).

The Aboriginal and Torres Strait Islander Heritage Protection Act was developed to increase the decision-making role of Aboriginal communities in the protection and management of their cultural heritage (including archaeological sites and objects, traditional places of significance and intellectual property).

The purposes of the Act are the preservation and protection from injury or desecration of areas and objects in Australia and Australian waters, being areas and objects that are of cultural significance to Aboriginal people in accordance with Aboriginal tradition.

The regulations made under the Act define the boundaries of the 'local Aboriginal communities' which have standing under the legislation.

Under the Archaeological and Aboriginal Relics Preservation Act, all archaeological relics and sites are protected. Damage or disturbance without a permit is prohibited. Significant penalties also apply to anyone wilfully defacing, damaging or interfering with an Aboriginal object or place.

These Acts provide regimes whereby Aboriginal people can take part in the preservation of their cultural heritage by being members of committees that advise Ministers, as inspectors with wide-ranging powers, and as members of community organisations that are responsible for managing cultural heritage issues within their areas.



Victoria's indigenous people have a strong relationship to marine and coastal areas. A coastal site is being assessed by an Aboriginal cultural heritage officer.

Photo: Aboriginal Affairs Victoria.

Aboriginal communities believe that the requirements of these Acts and the spirit of the legislation are often ignored by land and water management agencies. Aboriginal people want to be consulted and involved in planning, decision-making and implementation processes at the beginning of these processes, rather than invoking the provisions in the legislation when a problem arises.

Consultation with Aboriginal groups and communities

As part of its consultative processes for the investigation, both the LCC and the ECC consulted with Aboriginal groups and communities. There have been six formal periods of public consultation throughout the course of the investigation.

In addition, the LCC appointed an Aboriginal liaison officer to consult with the various coastal communities regarding their interests. The liaison officer consulted with communities and prepared two reports for the LCC in 1994 and 1995 following the publication of the Descriptive Report and the Proposed Recommendations.

In order to ensure Aboriginal participation in the public consultation process following the release of the ECC's Draft Report, the ECC commissioned Mirimbiak Nations Aboriginal Corporation to facilitate consultation with Aboriginal groups along the Victorian coast. Mirimbiak is recognised as being a central contact point as it is the native title representative body for Victoria and the peak advocacy group for Aboriginal people. Appendix 3 is Mirimbiak's report to the ECC on the outcomes of consultation with Aboriginal claimant groups and coastal communities.



Major issues

Major issues and concerns raised by Victorian Aboriginal coastal communities are similar to those consistently raised by coastal indigenous peoples around Australia in relation to management of the coast and sea. There are five main areas of concern.

- Dispossession from their traditional land and sea estates, and loss of ancient fishing and hunting rights.
- Concerns about environmental degradation through development, pollution and resource use, and injury to culturally sensitive sites.
- Lack of opportunities for genuine participation in decision making about land and resource management.
- Inadequate responses from governments when administrative or legislative mechanisms are established for involvement in decision making and management.
- Lack of economic and social benefits flowing to indigenous people from projects that commercially exploit resources.

Comments made by Victorian Aboriginal coastal communities and specific issues raised in relation to marine protected areas and aquaculture areas are addressed in the relevant area recommendations in Parts Three and Four of this report.

The Law Reform Commission (1986) and the Resource Assessment Commission (1993) strongly recommended that indigenous interests in environmental management be accommodated. The special rights of indigenous peoples, including recognition of their traditional rights relating to environmental management, are recognised under international agreements such as:

- Agenda 21 (the United Nations Conference on Environment and Sustainable Development 1992)
- Convention on Biological Diversity ILO 169 (Convention Concerning Indigenous and Tribal Peoples in Independent Countries)
- UN Declaration on the Rights of Indigenous Peoples.

Western cultures make a fundamental distinction between the land and the sea. While the land is seen

as layered with proprietary rights, use rights and cultural symbols, the water is seen as empty (Jackson 1995). Most non-indigenous Australians would subscribe to the ethos of unfettered recreational access to the beach, and the western traditions of the freedom of the seas and the common property nature of marine resources.

Generally Aboriginal people do not make the elemental distinction between the land and sea made by European culture. Traditional estates are integrated geographically in that boundaries embrace land, river, estuary, beach, reef, seabed and sea property (Smyth 1993). Recognition and respect for indigenous relationships to the sea is challenging dominant social values even more than has been the experience on land.

Recommendations

- R3** Planning and management relating to traditional interests and uses in coastal and marine areas be based on recognition and respect for the traditional relationship of Aboriginal people with the land and sea.
- R4** Prior to the implementation of recommendations for marine protected areas and aquaculture zones Government consult with Aboriginal communities regarding their interests.
- R5** Government establish mechanisms to improve indigenous land and water management including:
- development of principles and consultation protocols to improve the policy and planning processes of public land and water management agencies and the involvement of Aboriginal communities in these processes;
 - in consultation with Aboriginal groups, preparation of a strategy to improve the involvement of Aboriginal communities in land and resource use decision-making and day-to-day management;
 - provision of information to assist the facilitation of land and water use agreements between agencies and local Aboriginal communities;



- facilitation of surveys and site visits necessary for planning and development purposes; and
- liaison with Aboriginal people and groups on the above.

R6 A study be undertaken jointly by NRE (including Aboriginal Affairs Victoria) and Aboriginal communities into the nature of traditional interests and uses in Victorian coastal and marine areas.

R7 NRE (including Aboriginal Affairs Victoria), together with Aboriginal communities, the Fisheries Co-Management Council and the Victorian Coastal Council, review legislation and policies restricting or inhibiting traditional cultural use of public land in coastal and marine areas with a view to removing unnecessary restrictions.

R8 A review of procedures be undertaken to ensure obligations (eg under the Native Title Act) to notify Aboriginal people of changes in management or regulation of marine waters and living marine resources are being effectively met.

R9 NRE (including Aboriginal Affairs Victoria) in consultation with Aboriginal groups prepare a report on indigenous fisheries including:

- an assessment of the nature and extent of Aboriginal interests in fisheries;
- current level of participation in fisheries and any impediments;
- level of representation and involvement in fisheries management and any impediments; and
- measures to improve economic and employment opportunities for Aboriginal communities in fisheries and marine aquaculture.

R10 Cross-cultural awareness programs be developed for land and natural resource agency staff to improve knowledge and understanding of, and communication with, Aboriginal communities.

2.2 Objectives for use

Management of the marine and coastal environment should focus on providing an appropriate overall balance of uses, optimising social and economic benefits to the whole community, including future generations, while ensuring long-term sustainability of these activities and protection of biodiversity and other environmental values. Highly protected areas are a cornerstone of strategies to protect biodiversity and to ensure ecologically sustainable use.

Activities in parks and protected areas and other sectors such as fishing, tourism, aquaculture, shipping, coastal development and petroleum must be planned for and managed together so they are compatible with each other and the environment. Integrated planning is essential across the whole of Victoria's marine and coastal environment, including the bays, inlets and estuaries, as well as the adjacent foreshore land and catchments that drain to the coast.

In the ECC's Interim Report published in February 1998, objectives were established that were aimed at achieving the sustainable use of resources, protecting significant environmental values, and maximising social and economic benefits in marine, coastal and estuarine areas. Management objectives for coastal land are established in the Victorian Coastal Strategy (see section 2.8).

At present, most of Victoria's seabed and associated waters are unreserved Crown land. This is a stark contrast with the terrestrial environment, where very little public land remains unreserved. Reservation under the *Crown Land (Reserves) Act* 1978 assists planning and management by providing a clear legislative framework, specifying objectives for use and management, and clearly nominating a land manager.



Recommendations

R11 The objectives for use and management of Victoria's marine waters are to:

- conserve natural ecosystems and associated biota;
- maintain the water and sediment characteristics of natural ecosystems and, where these are degraded, progressively improve them;
- protect significant natural and cultural heritage features;
- provide for traditional use and cultural activity by Aboriginal people;
- provide for some areas of minimal disturbance which can be used for scientific study;
- provide opportunities for recreation, education, and tourism;
- provide opportunities for ecologically sustainable harvesting of fish and other biota from wild stock;
- provide opportunities for ecologically sustainable marine aquaculture;
- provide for the exploration and extraction of earth resources, including oil and gas;
- provide for the development of renewable energy resources;
- provide for shipping operations and associated port infrastructure and navigation aids; and
- provide for sea-floor pipelines and communication lines.

R12 A Coastal Waters Reserve be established for the major portion of Victoria's marine area that is not otherwise designated for a particular purpose (eg marine protected area, aquaculture area). The primary objectives for the reserve be:

- (i) to provide for a diverse range of activities (as in R11 above) that are compatible with long-term sustainable use, and
- (ii) to provide for the integrated management of Victoria's marine, estuarine and coastal area.

The area be reserved under *the Crown Land (Reserves) Act 1978* and managed by the Department of Natural Resources and Environment.

2.3 Protection of biodiversity

Victoria has responsibilities and obligations for the protection of marine biodiversity and ecosystems under a number of national and international strategies and conventions to which it is a signatory, such as:

- the Convention on Wetlands of International Importance (the Ramsar Convention 1971),
- the Convention on Biological Diversity (UNEP 1994),
- the National Strategy for Ecologically Sustainable Development (1992),
- the National Strategy for the Conservation of Australia's Biodiversity (1996),
- the Intergovernmental Agreement on the Environment (1992), and
- Japan Australia and China Australia Migratory Birds Agreements (JAMBA 1974 and CAMBA 1986).

Victoria's Biodiversity Strategy was released in 1997. The *Environment Conservation Council Act 1997* states, amongst other things, that the Council must have regard to 'the need to protect and conserve biodiversity'.

Biodiversity means the natural diversity of all life: the sum of all our native species of flora and fauna, the genetic variation within them, their habitats, and the ecosystems of which they are an integral part.

Animals and plants are closely associated with their habitat; and survival of individual species and communities depends directly on habitat protection. It is generally accepted that protection of biodiversity is best achieved by protecting natural habitats.

In addition, some species may need targeted protection, because of their vulnerability, rarity or special needs, eg seagrass beds, giant kelp (*Macrocystis*) forests, sea-dragons, certain species of sharks and marine mammals are such examples. Appendix 6 includes a summary of Victorian marine invertebrate species of conservation concern. There are a number of mechanisms available to provide protection to such species outside parks and conservation reserves, including the 'protected aquatic biota' provisions of the *Fisheries Act 1995*, and the *Flora and Fauna Guarantee Act 1988*.



The removal of biomass from the ecosystem by harvesting can affect the functioning of the ecosystem by changing predator–prey relationships, and other ecological associations. Establishment of highly protected marine national parks will provide opportunities to study the impacts of harvesting on target and associated species and to compare the community structure and ecological relationships in harvested and unharvested areas.

Many submissions to the ECC's Draft Report expressed concern about the impact of harvesting on Victoria's intertidal areas (see page 27).

Recommendations

R13 Further research be undertaken on biological community composition and structure, both within and external to marine protected areas, with an emphasis on assessing the impacts of harvesting marine fauna.

R14 An assessment be made and strategies developed for protection of vulnerable or threatened marine species and communities, using the provisions of the *Flora and Fauna Guarantee Act* 1988 as appropriate.

2.4 Catchment management

The Senate Inquiry into Marine and Coastal Pollution (1997) concluded that the most serious threats to Australia's marine environment stem from catchment activities.

Diffuse sources of sediments, nutrients and toxicants from catchments draining to the coast pose significant risk to the environmental quality of estuaries and shallow embayments in particular.

Catchment management authorities are responsible for the coordination and management of floodplains, rural drainage including regional drainage schemes, water quality, Crown frontages and heritage rivers outside national parks. They are also the major advisory body to Government regarding funding priorities for catchment management. During 1997, ten regional catchment strategies were prepared by Catchment and Land Management Boards (CaLP) boards. Catchment management authorities (CMAs) have now replaced the previous CaLP Boards and

Waterway Management Authorities in nine of the ten CaLP regions. The CaLP Board has remained in place in the Port Phillip and Westernport Region.

Why is catchment management important?

The most serious issues in Australia's marine environment stem from poor catchment use, and therefore declining water quality. Increased levels of nutrients and sediments are the major problems.

The major causes are soil erosion and declining inland water quality, two of our greatest problems on land. The crisis in Australia's inland waters is well accepted. Elevated nutrients from soil erosion, agricultural fertilisers, live stock, sewage and urban run-off has resulted in regular blooms of toxic algae. Not so well accepted is that this then becomes a problem in estuaries, coastal lakes, bays and coastal waters. Degradation of estuaries and die-back of seagrass cause declines in coastal fisheries.

The key issues in Australia are thus interrelated. Because the major source of marine environmental threats lie inland in the catchments, strategic, integrated planning and management in the coastal zone is of paramount importance. Integrated catchment management is probably almost as important to the sea as it is to the land.

Source: *State of the Marine Environment Report for Australia* 1995.

The Victorian Coastal Strategy states that the regional catchment strategies will be the primary mechanism to coordinate and improve catchment based activities which impact on the coastal and marine environment. State Environment Protection Policies (SEPPs) will establish the basis for maintaining environmental quality of marine waters. Regional catchment strategies have been prepared for the five catchment regions draining to the Victorian coast:

- Glenelg – Hopkins
- Corangamite
- Port Phillip
- West Gippsland
- East Gippsland.

Catchment activities which affect marine waters are not strongly highlighted in these strategies, although many of the priority programs and actions will lead to an improvement in marine and estuarine water quality.



Regional Coastal Boards also have a role in addressing the effect of catchment activities on coastal waters. For example the Gippsland Regional Coastal Board has prepared a *Coastal Action Plan for Gippsland Coastal Waters* which highlights catchment issues. In general however the Coastal Board identifies CMAs and other agencies as being the responsible authorities.

Many submissions to the ECC's Draft Report commented on the need to address catchment issues as critical for marine environmental management.

Recommendation

R15 Catchment management authorities and boards ensure that reviews of regional catchment strategies specifically address the impacts of land use and management on the marine and estuarine environment, particularly where important physical or biological features may be affected.



Pollution from catchments makes its way to the sea. Litter traps, such as this one on Elwood Canal can help reduce the impact of litter on marine animals and communities.

Photo: Melbourne Water

2.5 Threats

Many activities have the potential to degrade the quality of the marine environment, particularly its water quality. A high standard of water quality is essential for recreation, fish harvesting, aquaculture and nature conservation. In the past the sea has been seen by many as a convenient and free dumping ground for a wide variety of wastes. It is now recognised that there is only a limited capacity to absorb most forms of waste, particularly in estuaries. In a recent national public survey during scoping for a national oceans policy, water quality was the most important concern of respondents.

The quality of discharges to the marine environment has progressively improved. All coastal sewage discharges in Victoria now receive at least secondary treatment.

The Victorian Environment Protection Authority (EPA) licence conditions now require the discharger of wastes to the marine environment under certain circumstances to monitor not only the quality of wastes but also the condition of the receiving environment.

The Victorian Government has recently announced its new Victorian Stormwater Action Program. The program will improve the management of urban stormwater in metropolitan and regional areas, reducing adverse impacts on the environment.

Introduced plants and animals can become pests and greatly alter marine, coastal and estuarine environments, affecting habitats, displacing indigenous species and disrupting ecosystems. Substantial and irreversible economic and social impacts may result if, for example, fisheries are affected and species become less abundant or unsafe to eat. Some 99 exotic organisms are known to have become established in Victorian waters.

Ship ballast water and hull fouling are major sources of introduced organisms in the marine environment, and effective management of ballast water and hull fouling requires a coordinated response involving agencies beyond Victorian waters.

An Action Statement has been prepared under the *Fauna and Flora Guarantee Act 1988* following the listing of the 'Introduction of exotic organisms into



Victorian marine waters' as a potentially threatening process (NRE 1999), and outlines the actions to be taken to ameliorate the adverse effects of this process. The objectives of the Action Statement are to minimise further introductions, and to manage the spread and minimise the adverse impacts of current and future incursions of exotic organisms. An Interim Victorian Protocol for Managing Exotic Marine Organism Incursions has been prepared (NRE 2000) to minimise the adverse impacts of incursions in Victorian marine waters.

Recommendations

- R16** A strategy (including targets) be developed by the EPA in consultation with relevant local authorities to phase out the disposal of waste to estuarine waters.
- R17** The EPA, together with the Department of Natural Resources and Environment (NRE) and other responsible agencies, ensure that the results of water quality and sediment monitoring, as well as audits of licensed point source discharges, are regularly reported and readily available to the public.
- R18** Measures be implemented by responsible agencies to reduce the risk of marine pest species arriving in Victoria, and to ensure a rapid and effective response in the event of an introduction.
- R19** NRE assess and coordinate management and reporting of risks to the conservation and sustainable use of marine and coastal resources within Victoria's marine, coastal and estuarine area.

2.6 Use of marine resources

Harvesting of living marine resources

A wide range of resources are harvested along the Victorian coast, including many types of fish, molluscs and crustaceans, and some seaweed and seagrass. In these recommendations 'fish' includes scale and cartilaginous fish, aquatic molluscs, crustaceans and echinoderms.

Commercial fishing is an important part of Victoria's food industry and supplies both domestic and export markets. The commercial sector is dynamic; changes to practices include the introduction of total allowable catch or quotas for some sectors, closure of some fisheries, and the modification of gear to reduce by-catch or to reduce pressure on juvenile fish.

Commercial fishing techniques have different seabed and by-catch impacts. Four main fishing techniques affect the seabed: otter-board trawling, Danish seining, haul seining (if nets are dragged across the sea-floor), and scallop or other dredging. In most cases, these techniques also have potentially significant by-catches.

Commercial fishers must provide catch and effort data to Fisheries Victoria. Catch and effort data are systematically collected, but are sometimes unreliable and are not systematically validated. Illegal catch and the largely unknown recreational catch together mean it is difficult to estimate total catch. The resolution of catch data is often too coarse to use for management of smaller areas.

Under the *Fisheries Act* 1995, the Fisheries Co-Management Council oversees the preparation of fisheries management plans. The development of these plans includes community consultation and consideration of biological and ecological factors. Although draft plans have been prepared for some major fisheries such as abalone, no final plans have yet been approved for marine fisheries.

In relation to the marine environment, commercial fishing is the second most important concern of the Australian public, after water quality. Development of new fisheries ahead of any understanding of the fish stocks and the habitat involved has generated a lot of publicity, and has influenced negative public perceptions of commercial fisheries. Recreational and commercial fishing sectors may also be competing for the same, sometimes dwindling, stocks, generating conflict expressed in allegations and counter-allegations about the contribution of each sector to declining fish stocks.

Fisheries Victoria conduct regular stock assessments for the major fisheries, involving scientists and the industry. Although the reports are publicly available, they are technical documents which are not easily accessible by the general public.



Recreational fishing, mostly in the major bays and inlets, is a widespread leisure activity of considerable social and economic importance. It forms a significant part of the pressure on the total fishery resources. The activity is subject to regulation, by way of controls on gear, size limits, bag limits and length of season. The introduction of the Recreational Fishing Licence in Victoria in 1999 improves the accuracy of previous estimates of the number of recreational fishers in marine waters. Up to the end of June 2000 about 240 000 licences had been sold. (This figure includes those who only fish in fresh waters, but does not include fishers under 18 or over 70 or in other exempt categories).

Fish harvesting has implications for ecosystem, habitat and species conservation, and some fishing techniques and current catch levels may be unsustainable.

The collection of intertidal or shallow subtidal organisms for food or bait can have lasting impacts on benthic communities where collection pressure is high. Over-collection of intertidal organisms was one of the major concerns raised by the public during the consultation period, especially for areas of coastline within easy access of major metropolitan centres.

Tourism and recreation

Victoria's coastal waters offer outstanding opportunities for an extensive range of recreational and tourist activities. In some areas, particular high-profile attractions make a very significant contribution to the tourism industry at the local, State and national levels; for example, the spectacular scenery along the Great Ocean Road, the penguins and seals at Phillip Island, the exceptional whale watching opportunities at Warrnambool, the dolphins in Port Phillip Bay, and historic features, such as lighthouses and historic towns.

For both local communities and Victoria as a whole, the economic benefits of existing recreation and tourism industries are substantial, and there is considerable potential for further benefits from future development. While benefits from tourist attractions should be maximised, care must be taken to protect environmental and cultural heritage values on which these attractions are based.



Diving and snorkelling with seals is a popular ecotourism activity in Victoria. Photo: Peter Kinchington.

Recommendations

- R20** Fisheries management plans for all major fisheries, as required under the *Fisheries Act* 1995, be completed within three years.
- R21** Fisheries management plans should address the impacts of techniques that involve towing or dragging gear along the sea floor, including consideration of alternatives and establishment of control sites. Note that in some cases marine national parks or marine sanctuaries could act as controls.
- R22** The coverage of the Fisheries Regulations restricting the recreational take of intertidal molluscs and other intertidal invertebrates (formerly the Shellfish Protection Regulations) be reviewed and the restrictions extended to additional areas in Victoria if necessary.
- R23** The accuracy and resolution of fisheries catch and effort data be progressively improved to provide information required for both sustainable resource use and biodiversity protection.
- R24** Non-technical State of the Fisheries reports be prepared on a biennial basis and made widely available. These reports should be based on stock assessment reports and the assessments required to be prepared annually by the Fisheries Co-Management Council, and should also include an assessment of existing knowledge, and how factors other than fishing may be influencing sustainability.



R25 Commercial harvesting proposals for new or developing fisheries (including live reef fish) or for harvesting of marine resources such as seaweed, be subject to:

- declaration as developing fisheries under the Fisheries Act 1995 and relevant Regulations;
- adequate stock assessment; and
- an environmental assessment that considers physical, environmental and ecological processes and involves community consultation.

R26 Public land and waters continue to be available for a wide range of tourism and recreational uses. Development should not preclude public access to foreshore or offshore areas, other than to meet safety and security requirements that cannot be achieved in other ways.

R27 Codes of practice be developed with relevant tourism and recreation organisations to encourage responsible use of vulnerable marine and coastal areas and resources.

R28 Consistent with the approach for some national parks and reserves on land, where it is appropriate and practicable, and where tourism activity occurs on public land (including waters), a contribution be made by the tourist operator or individual visitor, through appropriate fees or licences, which can be applied to the protection and maintenance of the area or relevant values.

2.7 Implementation and management

Background

Disquiet was expressed in many submissions about the implementation and ongoing management of marine protected areas resulting from ECC recommendations. In particular, there were concerns about whether adequate funding would be provided to manage areas effectively. Many submissions referred to existing levels of resourcing for marine-based management which were widely

perceived to be inadequate. The ECC stresses the importance of adequate resourcing and effective management for protection of Victoria's marine, coastal and estuarine area. Four key areas are highlighted in relation to management of marine and coastal areas: community involvement, compliance, legislation, and research and monitoring. Also see section 2.1 in relation to Aboriginal involvement in management.

Community participation

Community education and involvement are vital for the sustainable management of the marine and coastal areas.

An informed community that appreciates and understands the values, diversity and sensitivity of these environments and the impacts of uses will enjoy these areas more, and facilitate management goals. Active participation in planning and implementation enhances a sense of community responsibility and stewardship, to the benefit of all concerned.

Community, recreational club and school education programs play an important part in increasing community awareness. Other programs, notably Landcare and the Coast Action program, enable people to be directly involved in local planning and management. The Fish for the Future and Fishcare programs aim at sustainable fish populations. The national Coastcare program builds on existing community activities and management arrangements. The ECC considers it important that such community programs are supported.

Compliance

A high level of compliance with laws and regulations is essential to ensure sustainable use of fish stocks, protection of habitats, maintenance of environmental quality and protection of cultural resources.

Illegal harvesting of marine resources is a significant problem, and in some fisheries (eg abalone) is a major threat to sustainable management of the stock. Sound, implementable and adequately funded compliance programs are essential to address fish theft and non-compliance with regulations for protecting and managing marine resources and marine areas.



Enforcement is difficult in isolated or remote areas. It is hard to identify and retrieve evidence at sea, or detect offences underwater. People who use marine and coastal areas can assist official surveillance and enforcement. A variety of education and enforcement approaches tailored to particular situations are needed.

The success of any compliance strategy will at least partly depend on whether affected users have a clear understanding of the areas to which regulations apply, with boundaries clearly identifiable. Approaches currently used include use of markers on the land, buoys and markers in the sea, and the distribution of maps and charts. Strong visual landscape features, north-south or east-west boundaries, depths, longitude and latitude references and distances from shore all assist users. Electronic navigation aids such as global positioning systems (GPS) are increasingly being used and enable boat-based commercial and recreational fishers to accurately determine their position.

Legislation

The numerous acts, regulations and other statutory instruments applying to different aspects of management of coastal and marine areas have been documented many times (eg RAC 1993). Effective coordination of responsibilities and programs is critical. Key legislation includes the *Coastal Management Act* 1995 which establishes a coastal planning and management system, which covers Victoria's coastal and marine environment to its territorial limit at three nautical miles offshore.

The Fisheries Act 1995 provides for the ecologically sustainable management of Victoria's fisheries, and the reservation of fisheries reserves for specific purposes such as aquaculture and protection of fish habitat.

The Catchment and Land Protection Act 1994 provides for the preparation of regional catchment strategies and the coordination and monitoring of their implementation.

The Environment Protection Act 1970 provides for the declaration of State Environment Protection Policies for specified segments of the environment such as surface waters.

At present marine, coastal and estuarine environments can be reserved in a number of ways,

including the *National Parks Act* 1975, the *Crown Land (Reserves) Act* 1978 and the *Fisheries Act* 1995. In order to address deficiencies, overlaps and ambiguities in the present legislation when used to regulate activities, new legislation or amendments to existing legislation will be required for marine protected areas.

Research, inventory and monitoring

The responsible use and management of marine resources depends upon the collection of reliable and relevant data, and its prompt and effective assimilation into the decision-making process.

At present, there is a shortage of environmental data, particularly biological data, on southern Australian marine waters, and the collection of data to overcome these deficiencies is a priority. However, marine scientists consider that the Victorian marine environment is well known by world standards. There has been substantial progress made in the last decade to improve both the coverage and resolution of marine environmental data for Victorian waters. However, it is also critical that both new and current data collections are carefully targeted, and integrated into a broader research and monitoring program to maximise its utility. A good example of such an approach is the recent study which consolidated and synthesised data from previous studies spanning 17 years into a comprehensive description of the biology and ecological processes at Bunurong Marine Park in Gippsland (Edmunds 2000). The report described and compared the habitats, flora and fauna, and integrated the data (where possible) to assess temporal and spatial changes.

Recommendations

R29 Agencies responsible for protection and management of Victoria's marine, coastal and estuarine area be allocated the necessary resources for the task, including sufficient resources to ensure effective marine compliance.

R30 NRE, with local government, catchment management authorities, regional coastal boards and the community, develop an approach to improve coordination between coastal and marine-oriented community programs and catchment-oriented programs.



R31 Compliance strategies should contain provisions to encourage community involvement.

R32 Marine national parks and marine sanctuaries be permanently reserved through appropriate amended or new protected area legislation.

R33 Changes to management regimes and regulations should be well publicised, apply to clearly defined areas, and be accompanied by an appropriate level of education and enforcement.

R34 Priority be given to establishing monitoring programs:

- for marine national parks to determine the extent to which these areas are meeting their objectives, and
- for areas of resource use to help assess whether the use is sustainable.

R35 Where data collection, research and monitoring is associated with resource use, the user-pays principle be applied as appropriate.

R36 That the Government, in consultation with research, community and industry organisations, establish a framework for the acquisition of data relating to Victoria's marine, estuarine and coastal resources and ensure co-ordination of a program of integrated data collection.

2.8 Coastal reserves and coastal land use

In Victoria most of our coastline, the beach and foreshore remains in public ownership and available for public use. This is a priceless asset not enjoyed in many other parts of the world.

The Victorian Coastal Strategy, a strategic plan for the whole of the Victorian coast, was prepared by the Victorian Coastal Council (VCC) and released in November 1997.

During the preparation of the Strategy, the VCC liaised closely with the LCC and the ECC, to ensure compatibility between the two planning processes. Although there is some overlap, generally the VCC placed greater emphasis on the land, while the LCC/ECC investigations have been more strongly focused on the marine and estuarine environments.

Another significant difference is that the LCC/ECC investigations are confined to public land whereas the Victorian Coastal Strategy covers both public and private land.

The Victorian Coastal Strategy identified 23 activity nodes along Victoria's coastline which are areas with identified strategic priorities for improved facilities or structures or, where there is a need for detailed planning to control or direct future development in a particular area. These activity nodes could be subject to future review and amendment through coastal planning processes. The Strategy also identified, at a broad scale, General Recreation and General Protection Zones, for coastal public land outside parks and conservation reserves, based on earlier work by the LCC.

Coastal Recreation and Coastal Protection Zones

Consistent with the Victorian Coastal Strategy, the Coastal Recreation Zones are areas capable of sustaining recreational opportunities for large numbers of people. These zones should be managed for appropriate recreational use whilst minimising impacts on remnant values and the coastal environment. The Coastal Protection Zones are areas in relatively natural condition or with significant natural or cultural values, including sites or fragile environments which are sensitive to modification. These zones should be managed to provide for low impact recreation, consistent with protection of the natural values of the area.

The ECC has adopted the terms Coastal Recreation Zone and Coastal Protection Zone, and has identified these zones at a finer scale in conjunction with the VCC.

During the public consultation period following release of the ECC's Draft Report it was apparent that there was widespread community concern about the implications of the coastal zoning outlined above.



The VCC and the ECC have avoided detailed prescriptive statements on activities that would be permissible or not permissible in these zones to provide for flexibility in on-ground management, and acknowledging the wide variety of local circumstances that are experienced in these coastal locations. However, the broad nature of the guidelines has given rise to uncertainty and anxiety in some local communities, and the following points are made to clarify the purpose of the coastal zoning.

- The coastal zoning applies to coastal public land outside parks and conservation reserves, and will not prevent fishing in adjacent waters.
- Recreation is an appropriate use in both Coastal Recreation and Coastal Protection Zones – it is the capacity for, and scale of associated development that will vary. For example, development of an intensive use such as a camping ground and associated facilities would not be normally be appropriate in a Coastal Protection Zone. Development of any new facilities in a area zoned for Coastal Protection would need to be consistent with protection of the natural values of the area. In most cases this would already occur.
- Detailed local planning for individual coastal reserves, taking into account the broad directions of the coastal zoning, will be undertaken by local managers and will involve public consultation.

Coastal zoning is mapped at a scale of 1:350 000 in Map A accompanying this report. More detailed maps at approximately 1:100 000 are available upon request from the ECC, or for inspection at local government offices, NRE offices and regional coastal boards.



Coastal Protection Zones are areas in a relatively natural condition or have significant cultural values.

Photo: Hania Bibrowska

Recommendations

- R37** That the Coastal Recreation and Coastal Protection Zones shown on Map A be incorporated into the Victorian Coastal Strategy.
- R38** Detailed planning for individual coastal reserves, including determination of uses to be permitted and guidelines for development of facilities, be undertaken through existing mechanisms as appropriate, including coastal action plans and reserve management plans. Such planning at the local level would involve public consultation.





Marine protected areas



3. Marine protected areas

The ECC's terms of reference require it to investigate and make recommendations on a preferred approach and priorities for the progressive establishment of a representative system of marine parks in Victoria.

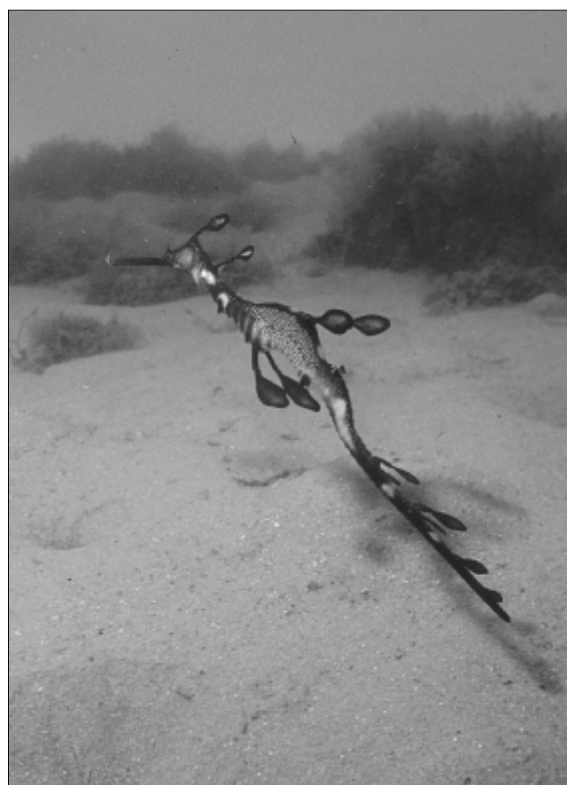
Protected areas on land, such as national parks, have long been accepted by the community as a key component in the overall good management of the environment. In Victoria, approximately 15% of land is in highly protected parks or conservation reserves. By contrast, at present less than 0.05% of Victoria's marine environment is highly protected.

3.1 Victoria's marine biodiversity

Victoria's underwater environments are special, often containing spectacular landscapes, a rich flora and fauna, and many species which are found only in south-eastern and southern Australia. In recent years many Victorians have increased their awareness of the special values of their marine environment. In terms of spectacle, our waters are magnificent, if less easily observed than tropical waters. Features such as kelp forests towering 30 metres from the sea floor are unique to temperate waters, and there are many reef environments where the colour and variety of flora and fauna and the numbers of fish create an underwater landscape that is comparable to tropical coral reefs.

The southern coast of Australia is the only major south-facing coastline in the southern hemisphere. It has been relatively isolated for some 65 million years, and as a result Australia's southern waters are unique. They support the world's highest diversity of red and brown seaweeds, sea mosses, crabs and shrimps, and sea squirts. A remarkable feature is that 90–95% of species in most groups occur only in southern waters and nowhere else on earth. Our southern marine communities are as distinctively Australian as our terrestrial marsupials and other flora and fauna.

Highly protected areas are established especially for the conservation of biodiversity. These areas are a critical component of integrated ecosystem management of the whole marine environment.



Weedy seadragons are close relatives of seahorses and are found only in southern Australia. Photo: Peter Kinchington.

Biodiversity refers to the natural variety of life on earth, the sum of all our native species of plants and animals, the genetic variation within them, their habitats, and the ecosystems of which they are a part. Animals and plants are closely associated with their habitat. Survival of individual species and communities depends directly on habitat protection, and is best achieved in the natural environment, rather than in zoos or aquariums.

Despite considerable research interest in Victoria's marine environment and a relatively high level of knowledge by world standards, there are areas in which information is lacking or even completely unavailable. Several reports summarise the state of knowledge of the natural values of the State's marine and estuarine environments. Appendix 6 provides more details of available data for marine ecosystems in Victoria.

Scientists have concluded that a complete inventory of biodiversity is not a realistic goal for terrestrial and much less, for marine environments. In the first place, many species have not been described and named. Secondly, even if they were known it would be an impossibly demanding task



to determine patterns of distribution. As a result, many scientific forums have concluded that habitats and ecosystems can appropriately serve as the basic units of biodiversity for most purposes.

In the long term, information about species and genetic varieties will undoubtedly be improved. In the short term, it is important for the protection of biodiversity that decisions are based on the best possible information available. One widely adopted approach is to generalise the available information on species into categories, such as communities, habitats or ecosystems. NRE's Environmental Inventory Program and related initiatives have provided a comprehensive statewide coverage of Victoria's major marine habitats at a scale of 1:100 000 for the open coast and at scales of 1:25 000 for all major bays and inlets (see Appendix 6 for a summary of ecosystem mapping).

The recommendations in this report take into account a nationally agreed regional ecosystem-based classification for the Australian marine environment that recognises five biophysical regions in Victoria:

- Western region: South Australian border to Cape Otway
- Central region: Cape Otway to west of Wilsons Promontory
- Wilsons Promontory region: the Promontory itself to the western extent of the Ninety Mile Beach
- Eastern region: Ninety Mile Beach to the NSW border
- Embayments region: all bays, inlets and estuaries.

This framework, the Interim Marine and Coastal Regionalisation for Australia (IMCRA), was developed using both a qualitative expert approach and quantitative analytical methods, reflecting the range of available methodologies and the highly variable quality and quantity of data available.

How does fishing affect biodiversity?

Fishing causes changes at the three levels of organisation of biodiversity. At the genetic level, fishing increases mortality and acts as an agent of directional selection, affecting age distribution, age and length at maturity, growth rates and other life history characteristics.

At the species level, fishing affects species composition in fished ecosystems and consequently interactions among fished species and their prey.

Long-term fishing can lead to systems dominance by species with certain life history characteristics such as early maturation or high fecundity. Decreased populations of large predators which are the subject of major fisheries may lead to increased abundance of prey species.

Finally through effects on by-catch or habitat alteration (particularly damage caused by fishing techniques such as bottom trawling and dredging), fishing affects the diversity of marine habitats and the function of ecosystems.

Scientists have identified recreational fishing and commercial fishing as the probable cause of major declines in populations of popularly targeted fish species, especially in waters close to major population centres.

3.2 Recommended approach to marine conservation

The ECC is recommending improving marine environmental conservation through the progressive development of a system of protected areas supported by good environmental management practices over the whole of Victoria's marine area.

Systems of protected areas have been established in most countries to preserve in perpetuity representative samples of ecological, geological and scenic values of many regions. While well established as a land management practice, the concept of parks is yet to be applied in any significant way to the marine environment.



However considerable attention is now being given worldwide to marine conservation. Initially the conservation approach that was urged for the marine environment was similar to that for terrestrial areas, with areas of special value being established and defended against impacts from outside, as far as they could be identified and ameliorated. This approach for the land was born out of a desire to protect structural fragments of ecosystems that were being rapidly (and visibly) depleted. It gave way in the 1980s and 1990s to the multiple-use approach to marine conservation, exemplified by the Great Barrier Reef Marine Park.

The multiple-use approach was partly an acknowledgment of the different scale of marine processes, the indistinct and shifting character of ecological boundaries, and the highly connected nature of the sea. In the vast area of the Great Barrier Reef Marine Park, highly protected areas are established within a context of conservation management of the whole Great Barrier Reef.

Similarly, the ECC's current recommendations for a system of highly protected areas within a framework of sustainable management are an expression of multiple-use management of the marine environment.

Because almost all the coastline and seafloor is publicly owned, there is an opportunity to develop a coordinated planning approach for the area. Many recent studies and reports have emphasised the need to adopt an integrated approach to marine management, employing a range of mechanisms for the best possible protection of Australia's marine environment. One of these mechanisms, firmly established in international and national strategies such as the Convention on Biological Diversity (UNEP 1994) and the National Strategy for Ecologically Sustainable Development (1992), is the establishment of a representative system of protected areas. This approach is strongly advocated by the ECC.

Several strategies such as Victoria's Biodiversity Strategy and the Victorian Coastal Strategy have specific objectives relating to the establishment of a representative system of marine protected areas.

One of the lessons learned from what we now regard as poor land management practices over the last century, is that we need to be cautious in the

management of our marine resources and ensure that some areas are maintained in as natural a state as possible, as a benchmark against which to measure impacts of use.

3.3 A comprehensive, adequate and representative system of marine protected areas

If Victoria is to adequately protect its valuable marine environments, the system of parks and conservation reserves we put in place must be comprehensive, adequate and representative.

Goals and principles for systems of protected areas have been established in other areas; for example the goal of a comprehensive, adequate and representative system of reserves for Australia is recognised by all Commonwealth and State/Territory signatories to the National Strategy for Conservation of Australia's Biodiversity (1992) and the National Forest Policy Statement (Commonwealth of Australia 1992).

The description below of the recommended system of marine protected areas is consistent with the principles for developing the National Representative System of Marine Protected Areas as recently endorsed by the relevant Ministerial Council, the Australian and New Zealand Environment and Conservation Council.

Establishing a comprehensive, adequate and representative system

Comprehensive means a system which protects examples of the full range of habitats and biological communities within each of Victoria's marine biophysical regions.

Adequate means parks and other conservation reserves that have practical boundaries, are of a sufficient size to ensure that physical and biological values can be protected and the impact of adjacent activities minimised, and that more than one example of each environment is protected.

Representative means that parks and other conservation reserves reflect the diversity of the flora and fauna within each of the protected habitats and biological communities.



3.4 Community views

Most public submissions throughout the investigation supported the goal of protecting the marine environment. However opinion was polarised on the creation of highly protected areas as one of the strategies to achieve protection.

Conservation groups, scientists, and some community and recreational organisations were strongly supportive of the recommendations for marine protected areas.

Although recreational and commercial fishers did not generally oppose in principle the establishment of marine national parks, most areas recommended in the various reports of the LCC and the ECC were not supported by these sectors.

Fishers were focused on the fisheries implications of the recommendations, and it is a significant challenge to communicate the broader function of marine protected areas in the protection of marine biodiversity.

The main issues from the fishing sectors are:

- opposition to any restrictions on current patterns of use and access;
- a belief that recreational line fishing and some commercial fishing activities have no ecological impacts, and that there should be no restrictions on access unless it is demonstrated that damage is occurring or has occurred; and
- concern about socio-economic implications of restricting access for fishing.

Experience from other parts of the world, and in Victoria in relation to the Bunurong Marine Park, suggests that acceptance increases within a few years of establishment of the area. Prior to the establishment of the Bunurong Marine Park, local opinion appeared to be polarised regarding the park, and large attendances at public meetings opposed the creation of the park. It is apparent from recent public consultation that the park is now well accepted by the local community.

Concerns were expressed by some groups and individuals about the adequacy of the recommendations for highly protected areas, with some submissions highlighting habitats and communities they believe to be unrepresented or

under-represented, for example estuaries, and others commenting that 6% of Victoria's marine area in marine national parks and sanctuaries is insufficient.

Several submissions commented that the category of Marine Conservation Parks, picking up existing multiple-use parks, was inappropriate, as coastal land was included in several parks, and the level of protection of marine environments was low.

Many other issues and views were raised following the release of the Draft Report and they are discussed in Parts Three and Four and Appendix 2.

3.5 Principles for the selection and management of marine protected areas

As previously stated, the terms of reference for this investigation required the ECC to make recommendations on a preferred approach and priorities for the progressive establishment of a representative system of marine parks in the State of Victoria.

In the Interim Report (1998) and Draft Report (1999) the ECC sought input on draft principles for the selection and management of marine parks. The Council has adopted the following revised principles for the selection and management of marine protected areas.

- ❑ There will be a system of protected areas within the marine, coastal and estuarine areas of Victoria which will be comprehensive, adequate and representative.
- ❑ Marine national parks are established to provide the highest level of protection for biodiversity and to maintain representative examples of natural ecosystems in perpetuity.
- ❑ Marine national parks must be sufficiently large to achieve their objectives.
- ❑ Marine sanctuaries and marine special management areas will be identified to protect sites of special conservation, recreation or education value and to complement marine national parks.



- ❑ Marine national parks and marine sanctuaries should provide for a range of non-extractive and non-damaging activities, compatible with the primary aim of conserving biodiversity and ecological processes, and protection of special values.
- ❑ Marine protected areas should generally be located to minimise threats, such as pollution and introduced pests, from surrounding areas.
- ❑ A system of marine protected areas should include some spectacular areas, and should provide opportunities for recreation, tourism, education and enjoyment of the natural environment.
- ❑ Planning for Victoria's marine protected areas will take a long-term view and will provide ongoing protection of the resource.
- ❑ Community education and involvement are vital factors in the successful management of marine protected areas.
- ❑ Management of marine protected areas must be effective, efficient and accountable.

The following arguments were taken into account in recommending a system of highly protected marine national parks as the cornerstone of the system of marine protected areas.

- Highly protected areas are part of an overall framework for sustainable multiple-use management of Victoria's marine waters.
- The objectives of highly protected areas are clear and easily communicated.
- Highly protected areas will provide a scientific reference area against which to assess the impacts of human activities.
- Highly protected areas, although they will occupy only a small percentage of Victoria's marine area, will contribute to improving the balance of uses in the marine environment. Currently 99.95% of the Victorian marine environment is available for commercial or recreational fish and shellfish harvesting; only 0.05% is highly protected.
- Highly protected areas may act as a source of replenishment for certain species for adjacent fished areas.
- Highly protected areas act as an insurance measure in the event of there being a fisheries collapse due to natural or human causes in fished areas.
- Monitoring programs to demonstrate the biological effects of establishing highly protected areas are more effective in performance assessment than monitoring programs for general use areas where fishing is permitted.
- There is no discrimination between the commercial and recreational fishing sectors.
- Highly protected areas are valuable as education areas.
- Ensuring compliance with regulations is simpler in highly protected areas.

3.6 Identification and selection of candidate areas for marine national parks

Aside from the principles for selection and management of marine protected areas, the following factors were considered in identifying and selecting areas for inclusion in the marine national parks system.

Biophysical regions. The range of habitats within each of the five biophysical regions in Victoria (detailed in section 3.1) is represented in a system of marine national parks.

Biogeographic classification of selected fauna correspond well with the biophysical regions. A recent study (O'Hara 2000) of the distribution of Victorian decapod crustaceans (includes crabs) and echinoderms (includes seastars) on rocky reefs resulted in the description of the following groups:

- a 'common' group that occurs throughout Victoria;
- a 'western' group that has an eastern distribution limit within Victoria;
- an 'eastern' group that has a western distribution limit within Victoria; and
- a 'central' group that occurs in central Victoria but not at the eastern or western limits of the State.



However, there are also considerable spatial variations within a region. For example another recent study documented several distinct assemblages in the Bunurong area, Port Phillip Heads and Phillip Island, all within the Central biophysical region (Edmunds 2000).

Marine habitats. The level of available biological data for the whole Victorian marine environment allowed a general description of eight broad marine habitats, defined primarily by tidal level, substrate type, exposure to wave energy, and dominant flora. They are:

- intertidal rocky shores
- subtidal rocky reefs
- seagrass beds
- sheltered intertidal flats
- mangroves
- intertidal sandy beaches
- subtidal soft substrates
- pelagic (open water) environments.

Recently a more detailed framework for a systematic classification of intertidal and subtidal habitats along the open coast has been developed (Ferns & Hough 1999, 2000). A large number of Marine Habitat Classes (MHCs), based on dominant habitat attributes (see Appendix 6), have been identified for intertidal and subtidal areas in Victoria. In general the attributes describe the dominant physical and biological structure of marine habitats. These MHCs will be used initially for completing a consistent habitat description for marine national parks, and eventually for the entire Victorian marine environment.

At yet a further level of detail MHCs can be defined by their constituent species (Ferns & Hough 2000). A quantitative assessment of species within MHCs yields an additional level in the hierarchical marine classification – marine ecological communities (MECs). Currently MECs for macrophytes, invertebrates and fish have been delineated for the Central and Wilsons Promontory biophysical regions and for Port Phillip Heads (see Edmunds *et al.* 2000, and Appendix 6).



The Victorian coastline contains a wide variety of habitats, including shallow rocky reef covered in bull kelp.
Photo: Peter Kinchington

Data were generally unavailable to apply all of the Marine Habitat Classes attributes consistently for the whole Victorian coast, although whenever known they are included in descriptions of recommended areas in the following sections. It is clear that there is a great deal of variety within each broad habitat type. For example, *Posidonia* seagrass communities are different from *Amphibolus* seagrass communities; soft sediment communities are known to vary depending on sediment composition, distance offshore and depth (Coleman *et al.* 2000); and intertidal reef fauna varies with rock type.

It has also been demonstrated that a suite of physical factors have a major influence on the composition of subtidal biological communities on Victorian rocky reefs. Physical factors such as exposure, depth, substratum structure (ie topography/complexity as determined by seafloor geology) and longitude (ie biogeographic region) appear to be the most useful surrogates for selecting areas to maximise the representation of reef biodiversity.

Replication. More than one example of major habitats in each biophysical region is included to:

- incorporate the variability within each habitat type, and
- to guard against loss due to unforeseen or catastrophic events.



Significant biological and ecological values.

In addition to representative values, special values have been taken into account such as:

- high diversity of habitats;
- high diversity of species;
- habitats for rare, endangered, uncommon or depleted species (see Appendix 6);
- nursery, feeding, breeding or rest areas; and
- rare or unique habitats.

Where there is a choice between candidate areas which both equally represent habitats within a region, and other factors being equal, the ECC has generally recommended an area which also includes additional special values as above.

Variation in orientation and wave energy. It is known that variation in shoreline orientation and wave energy climate (exposure) can have a major influence on biological communities. Where possible this variation in each habitat type is represented.

Size and position. Parks must be of a sufficient area to ensure that ecological, physical and biological processes are maintained in a natural state, and activities adjacent to the park do not have a significant impact. Scientists agree that larger areas will function more effectively than small areas in protecting marine biodiversity, but there is only limited information available on optimum sizes for marine parks.

Recent scientific monitoring of four highly protected reserves in temperate waters in Tasmania confirmed that effectiveness of marine reserves corresponded with reserve size, and found that only the largest reserve, with 7 km of coastline, proved to be effective at achieving species conservation and resource enhancement (Edgar & Barrett 1999). The ECC's approach has therefore been to recommend a range of sizes for marine national parks, with a minimum of 5–7 km of coastline. Research and monitoring in these different areas will contribute to information on effective sizes and designs of parks.



A representative park system should include habitats with a range of wave energies such as this high energy intertidal rock platform. Photo: Peter Kinchington.

There is currently sufficient information to demonstrate that communities of plants and animals change with depth and distance offshore (eg Coleman *et al.* 1997, 2000). This is true for both rocky reef and soft sediment habitats. Therefore, where possible parks extend from the shoreline to the limit of State waters at three nautical miles (approximately 5.5 km) to include the variability associated with water depth and distance offshore.

Condition. Where there is a choice between candidate areas, and other things being equal, the ECC has generally recommended areas where the environment and catchment is relatively undisturbed. For example, recommended marine national parks are often adjacent to national parks on land and, where possible, away from discharges and areas of marine pest infestation.

Buffers. Buffers are often used to separate areas zoned for incompatible activities, as a means of reducing the impact of an activity on the adjacent area. In previous LCC recommendations the general use areas of large multiple-use parks acted as buffers around the highly protected sanctuary areas. The ECC has decided against recommending buffers external to the proposed marine national parks, on the basis that the parks are intended to be sufficiently large so as to be viable in maintaining populations, species, communities and ecological processes. Proper management of the whole marine environment, underpinned by the principles of ecologically sustainable use, should ensure appropriate buffers are maintained for different activities adjacent to the parks.



Social and economic factors. Where there is a choice between candidate areas, the ECC has recommended areas where the impact on industry, users and local communities is minimised.

3.7 The proposed system

The ECC is recommending the following system.

Marine National Parks are highly protected areas which contribute to a system representing the range of marine environments in Victoria, and in which no fishing, extractive or damaging activities are allowed. There are no restrictions on access, and activities such as recreation, tourism, education and research are encouraged. Recommendation A on page 43 gives details of activities that are allowed, restricted or prohibited.

Marine Sanctuaries are smaller highly protected areas designated for protection of their special natural values, in which no fishing, extractive or damaging activities are allowed. These areas also complement the larger marine national parks. See Recommendation B on page 45 for details on activities that are allowed, restricted or prohibited.

Special Management Areas are areas designated (formally through legislation or through other management arrangements) for protection of their special natural values, in which fishing and other uses are generally allowed. See Recommendation C on page 47 for details on activities that are allowed, restricted or prohibited.

These areas are consistent with IUCN categories for marine protected areas adopted by the IUCN in 1994. Marine national parks and marine sanctuaries correspond to IUCN categories I or II, and special management areas generally to IUCN category IV.



Recommended Marine National Parks

The basis for recommending marine national parks has been outlined in detail in the preceding sections.

Recommendation

A The recommended areas shown on Map A (numbered A1 to A13), to a depth of 200 metres below the seabed, be used to:

- (i) conserve and protect biodiversity and natural processes;
- (ii) maintain natural ecosystems as a reference against which other areas may be compared;
- (iii) provide opportunities for recreation and education associated with the enjoyment and understanding of natural environments, where consistent with (i) and (ii);

that the following activities be permitted:

- (iv) nature observation, scuba-diving, snorkelling, surfing, swimming, boating, and wind-surfing;
(Note- boating using motorised craft subject to conditions to be determined by the manager; restrictions on motorised boating would only be appropriate if the activity is in conflict with (i), (ii) or (iii) above.)
- (v) research, subject to permit;
- (vi) oil and gas exploration from an aircraft or vessel that does not cause disturbance to the seabed or biota;
- (vii) maintenance and replacement of existing structures;

that the following activities not be permitted:

- (viii) the removal or disturbance of marine biota;
- (ix) marine aquaculture;
- (x) exploratory drilling for oil and gas;
- (xi) oil and gas extraction;
- (xii) exploration and extraction of minerals and stone;
- (xiii) other activities that cause disturbance to the seabed or biota (such as blasting, dredging and spoil disposal, seaweed harvesting);
- (xiv) point source waste discharges;

that:

- (xv) new seafloor cables and pipelines be permitted, subject to:
 - (a) an Environment Effects Statement, and
 - (b) the consent of the Minister responsible for management of the park, and only after the Minister is satisfied that no reasonable alternative outside the park is available;

and that:

- (xvi) the parks be permanently reserved under new or amended legislation and be managed by the Department of Natural Resources and Environment;
- (xvii) a management plan be prepared for each park by the manager, after public consultation, outlining the strategies to be taken to achieve the objectives of the park, and be in place within three years of the Government's acceptance of these recommendations;
- (xviii) that boundaries of the areas, if they have not been precisely surveyed, be subject to minor modifications and other adjustments that may be deemed necessary.



Full descriptions and maps of the recommended marine national parks below can be found on the following pages.

- | | |
|--|--|
| A1 Discovery Bay Marine National Park
(see pages 52–54) | A7 Churchill Island Marine National Park
(see pages 110–111) |
| A2 Twelve Apostles Marine National Park
(see pages 55–57) | A8 Bunurong Marine National Park
(see pages 69–70) |
| A3 Point Addis Marine National Park
(see pages 66–68) | A9 Wilsons Promontory Marine National Park
(see pages 71–73) |
| A4 Port Phillip Heads Marine National Park
(see pages 96–99) | A10 Corner Inlet Marine National Park
(see pages 117–118) |
| A5 Yaringa Marine National Park
(see pages 106–107) | A11 Ninety Mile Beach Marine National Park
(see pages 82–83) |
| A6 French Island Marine National Park
(see pages 108–109) | A12 Point Hicks Marine National Park
(see pages 84–86) |
| | A13 Cape Howe Marine National Park
(see pages 87–89) |



Recommended Marine Sanctuaries

Marine sanctuaries complement the recommended marine national parks, and contribute to providing a comprehensive, adequate and representative system of marine protected areas. The recommended areas have a range of values, including:

- typical or outstanding examples of habitats not otherwise represented in the recommended system of marine protected areas;
- areas of special scientific significance; and
- areas that provide important opportunities for recreation and education associated with the enjoyment and understanding of the natural environment, such as easy access, interesting or spectacular underwater scenery, clear water or varied and colourful marine life.

These sites, as for marine national parks, are given the highest level of protection.

Recommendation

B The recommended areas shown on Map A (numbered B1 to B11) be used to:

- (i) conserve and protect the biodiversity and natural processes within the sanctuary;
- (ii) provide opportunities for recreation and education associated with the enjoyment and understanding of natural environments, where consistent with (i);

that the following activities be permitted:

- (iii) nature observation, scuba diving, snorkelling, swimming, boating and wind-surfing;
(Note- boating using motorised craft subject to conditions to be determined by the manager; restrictions on motorised boating would only be appropriate if the activity is in conflict with (i) or (ii) above.)
- (iv) research, subject to permit;
- (v) oil and gas exploration from an aircraft or vessel that does not cause disturbance to the seabed or biota;
- (vi) maintenance and replacement of existing structures;

that the following activities not be permitted:

- (vii) the removal or disturbance of marine biota;
- (viii) marine aquaculture;
- (ix) exploratory drilling for oil and gas;
- (x) oil and gas extraction;
- (xi) exploration and extraction of minerals and stone;
- (xii) other activities that cause disturbance to the seabed or biota (such as blasting, dredging and spoil disposal, seaweed harvesting);
- (xiii) point source waste discharges;

and that:

- (xiv) the marine sanctuaries be permanently reserved under new or amended legislation and be managed by the Department of Natural Resources and Environment;
- (xv) a management plan be prepared for each marine sanctuary by the manager, after public consultation, outlining the strategies to be taken to achieve the objectives of the park, and be in place within three years of the Government's acceptance of these recommendations;
- (xvi) that boundaries of the areas, if they have not been precisely surveyed, be subject to minor modifications and other adjustments that may be deemed necessary.



Full descriptions and maps of the recommended marine sanctuaries can be found on the following pages.

- | | | | |
|-----------|---|------------|---|
| B1 | Merri Marine Sanctuary
(see page 58) | B6 | Barwon Bluff Marine Sanctuary
(see page 77) |
| B3 | The Arches Marine Sanctuary
(see page 59) | B7 | Point Cook Marine Sanctuary
(see page 100) |
| B3 | Marengo Reefs Marine Sanctuary
(see page 74) | B8 | Jawbone Marine Sanctuary
(see page 101) |
| B4 | Eagle Rock Marine Sanctuary
(see page 75) | B9 | Ricketts Point Marine Sanctuary
(see page 102) |
| B5 | Point Danger Marine Sanctuary
(see page 76) | B10 | Mushroom Reef Marine Sanctuary
(see page 78) |
| | | B11 | Beware Reef Marine Sanctuary
(see page 90) |



Recommended Special Management Areas

Special management areas are recommended in order to ensure that areas of special value are identified and that they are managed appropriately.

The areas recommended as special management areas have a range of special values, including:

- breeding, nursery and haul-out areas for marine mammals such as seals and whales;
- breeding and roosting areas for seabirds and shorebirds;
- areas of special value for recreational or commercial fisheries, such as nursery areas;

- intertidal and shallow subtidal areas with a high diversity of marine invertebrates; and
- areas of special biological, geomorphological or palaeontological value.

In certain instances the boundary of an area has been left undefined due to the spatially dynamic nature of the special value, eg seagrass beds or whale calving areas.

Each site has different management requirements, and many areas have management regimes already in place that address potential threats and incorporate specific measures to protect the identified values.

Recommendation

C The recommended areas shown on Map A (numbered C1 to C18) be used to:

- (i) protect the identified special values for the site;
- (ii) unless otherwise specified, provide for recreational and commercial fishing activities, passive recreation, education and scientific study, to be carried out in ways that minimally affect the area and the particular values requiring protection;

and that:

- (iii) each special management area be subject to a management plan which identifies specific measures for protection of the special value or values. Such management plans may be prepared as part of another planning process, such as coastal action plans, park or reserve management plans or fisheries management plans;
- (iv) mineral, stone, oil and gas exploration or extraction be permitted subject to an environmental assessment being undertaken and considered by the Minister responsible for the area.

Full descriptions and maps of the recommended Special Management Areas can be found on the following pages.

C1 Cape Bridgewater (see page 60)

C2 Lawrence Rocks (see page 60)

C3 Portland Bay (see page 61)

C4 Deen Maar (Lady Julia Percy Island)
(see page 62)

C5 Logans Beach (see page 63)

C6 Dinosaur Cove (see page 63)

C7 Clifton Springs (see page 103)

C8 Werribee River estuary
(see page 104)

C9 Capel Sound (see page 104)

C10 Honeysuckle Reef (see page 112)

C11 Crawfish Rock (see page 112)

C12 Bass River delta (see page 113)

C13 San Remo (see page 113)

C14 Rhyll (see page 114)

C15 Summerland Peninsula (Phillip Island)
(see page 79)

C16 The Skerries (see page 91)

C17 Mallacoota Inlet (parts) (see page 119)

C18 Gabo Island harbour
(see page 91)



3.8 Existing parks and other areas

There are several pre-existing marine parks with high environmental values currently managed for a variety of uses including recreational and commercial fishing. The ECC is not recommending any new multiple-use parks. The existing multiple-use parks have a variety of names, including Marine Park, Marine and Coastal Park and Marine Reserve. In the Draft Report, a change in terminology was proposed to Marine Conservation Park to distinguish these areas from the highly protected Marine National Parks. However there was little support for this change, and there are some advantages in maintaining the existing names which are well established in the community, and in some cases better reflect the character of the park. For example there are three Marine and Coastal Parks in South Gippsland which include coastal land as well as marine waters.

Victoria has 12 existing marine parks and reserves, established between 1979 and 1991. Without exception the existing marine parks have very significant environmental values, and make a substantial contribution to the representative and comprehensive nature of the marine protected areas system. The ECC recommended in its Interim Report (1998) that the existing five Harold Holt Marine Reserves in southern Port Phillip Bay be incorporated into the Port Phillip Heads Marine Park, and has since reviewed its recommendation to the Port Phillip Heads Marine National Park (see Recommendation A4).

Other than the highly protected Popes Eye Marine Reserve, just two other areas within existing marine parks currently have the highest level of protection where extractive activities and disturbance are not allowed: part of the Point Cook Marine Reserve, and part of the Bunurong Marine Park. Both of these areas are recommended to be incorporated in expanded highly protected areas (see Recommendations B7 and A8).

Most of the existing Wilsons Promontory Marine Reserve and part of the Corner Inlet Marine and Coastal Park are also recommended to be incorporated in highly protected Marine National Parks (see Recommendations A9 and A10).

Community understanding and acceptance of many of the existing parks is high. Other than the recommendations outlined above, the existing parks and reserves are recommended to be retained to be managed for a variety of uses which do not impact on the values and objectives of the park.

Draft management plans have been prepared for each of these parks over the last ten years. For some parks, a considerable amount of additional data has been collected since the parks were declared, or baseline ecological studies are currently being planned or implemented; for example, for Nooramunga Marine and Coastal Park. Several submissions commented on the absence of highly protected reference areas within some of the existing large multiple-use parks. It is important that future reviews of management utilise new information as it becomes available, and the ECC believes it would be appropriate to identify some representative areas as long-term monitoring sites.

The ECC has made no recommendations with respect to changing the current management practices in these parks, except where all or part has been recommended as a marine national park or marine sanctuary or as noted in Recommendation D below. The current practices should however be subject to reviews resulting from new information and the usual reviews of management which take place from time to time.

Coastal national parks usually include in the park the intertidal area between high and low water mark. Several estuaries are also reserved within national parks. A number of submissions drew attention to the fact that few estuaries or intertidal areas in national parks enjoy the highest level of protection. Although there is some capacity within the park management framework to increase protection for zones or areas within parks, the ECC believes that there is a strong argument for highlighting some areas in this report because of their high conservation significance.



Other areas

In making recommendations for marine protected areas, the ECC is conscious that it has highlighted only a small sample of Victoria's diverse and significant marine ecosystems. Many specific areas were drawn to the attention of the ECC throughout the investigation, and their omission from the recommended system of marine protected areas should not be construed as reflecting a lack of importance.

Other areas which should be mentioned because of their special significance or vulnerability (or both) include the following:

- **Intertidal areas.** The intertidal zone is the most accessible marine environment to humans, and is the most likely to experience the direct physical disturbances of trampling and removal of biota. Changes to invertebrate and seaweed communities on intertidal rocky shores through such activity has been well documented in scientific studies. These pressures are particularly great close to the major population centres of Melbourne and Geelong.
- **Coastal wetlands listed under the Ramsar Convention.** See section 1.3 for more information on Ramsar wetlands occurring within Victoria's marine, coastal and estuarine area.
- **Estuaries.** Most of Victoria's inlets, lagoons and larger estuaries have been heavily modified. Very few of their catchments are essentially natural. See pages 115 for more information.
- **Areas of particular value for marine education.** Awareness of the marine environment is growing in Victoria through programs offered by groups such as Coast Care, the Gould League, the Marine Discovery Centre at Queenscliff, and the Marine Education Society of Australasia. Establishment of highly protected marine parks will facilitate education and interpretation. However the opportunities for marine education and interpretation are not restricted to marine protected areas. Victoria's marine waters offer other locations for viewing its unique and diverse habitats; for example, the waters around and beneath Portsea Pier abound with fauna and flora.
- **Areas of particular significance for wildlife.** Many coastal locations and offshore islands and their surrounding waters have high values for wildlife such as seabirds and marine mammals. Several of these sites have been highlighted as special management areas. For example, all Victorian breeding colonies of the Australian fur seal are recommended as special management areas or are in existing marine reserves. However other sites may also be important for wildlife, and may require special management measures from time to time. For example, Seal Islands east of Wilsons Promontory is not a breeding colony, but is an important haul-out site for juvenile Australian fur seals.

There is a range of existing tools available to plan for and manage special values such as those outlined above.



Recommendations relating to existing parks

The basis for the recommendations relating to existing parks and other reserves has been outlined in detail above.

Recommendation

- D** The recommended areas shown on Map A (numbered D1 to D4) be used as follows:
- D1** That existing regulations be amended to allow recreational harvesting in those areas of the existing Wilsons Promontory marine parks where commercial harvesting is recommended to be allowed.
- D2** That the harvesting of flora and fauna be excluded from the intertidal area of the Wilsons Promontory National Park adjacent to the proposed Corner Inlet Marine National Park and west to Millers Landing.
- D3** That following the completion of ecological baseline studies of the Nooramunga Marine and Coastal Park representative sites be set aside as highly protected reference areas for mangroves, saltmarsh and shallow subtidal habitats.
- D4** That the harvesting of flora and fauna be excluded from the Easby, Red and Benedore estuaries in the Croajingolong National Park.

3.9 Biosphere Reserves

Biosphere Reserves are an initiative of the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and are internationally recognised within the statutory framework of UNESCO's Program on Man and the Biosphere. The aim of the program is to help reconcile conservation of biodiversity with sustainable use. Their effectiveness is dependent on management authorities and local communities working closely together to achieve this outcome. Since the launch of the program in the 1960s, 324 reserves have been designated in 82 countries, 12 of them in Australia (two in Victoria at Wilsons Promontory and Croajingolong).

Western Port is an area of great environmental significance and its marine ecosystems are widely recognised as having regional, national and international significance. Because of the unique tidal characteristics that exist in Western Port, and the vulnerability of its habitats and associated biota, damage at one site may have widespread impacts in other parts of the bay. The biological sensitivity of Western Port requires integrated management of its catchments, water quality and natural resources.

A Biosphere Reserve may facilitate such an integration of effort. Western Port has been identified as a potential area for inclusion in the Biosphere Program, in the French Island National Park Management Plan. There is also significant community support for the proposal. The values of Western Port have also been recognised in its listing as an internationally significant wetland under the Ramsar convention.

Recommendation

- R39** The Government investigate the establishment of a Biosphere Reserve incorporating French Island, Phillip Island and the surrounding waters of Western Port, and also including portions of the catchment if appropriate.



Recommendations

Part Three

Recommendations for the Western biophysical region

This part sets out the recommendations for marine protected areas for the area from the South Australian border to Cape Otway.

Victoria's Western biophysical region is incorporated into the IMCRA Otway Region which includes King Island environs and extends to Cape Jaffa in South Australia. The marine environment along this coastline encompasses the deep colder waters of the Southern Ocean to the west and shallower Bass Strait closer to Cape Otway. The coastline includes the remote dune systems of the Discovery Bay area near Portland, and the spectacular limestone formations of the Port Campbell area. The marine flora and fauna are typically cold temperate species.

Main regional centres include Portland, Warrnambool, and the smaller townships such as Port Fairy and Port Campbell. Agriculture, tourism and fishing, manufacturing and consumer services are major economic activities. Portland, as the only deepwater port between Port Phillip Bay and Adelaide, is important for shipping.

This part of the report gives descriptions of the recommended marine national parks, marine sanctuaries and special management areas in Victoria's

Western biophysical region. See the Executive Summary for a table of changes to the recommendations since the Draft Report.

See section 3.7 of this report for an overview of the recommendations for marine protected areas including recommendations for permitted uses and activities.

Recommended areas

Marine National Parks

- A1** Discovery Bay Marine National Park
- A2** Twelve Apostles Marine National Park

Marine Sanctuaries

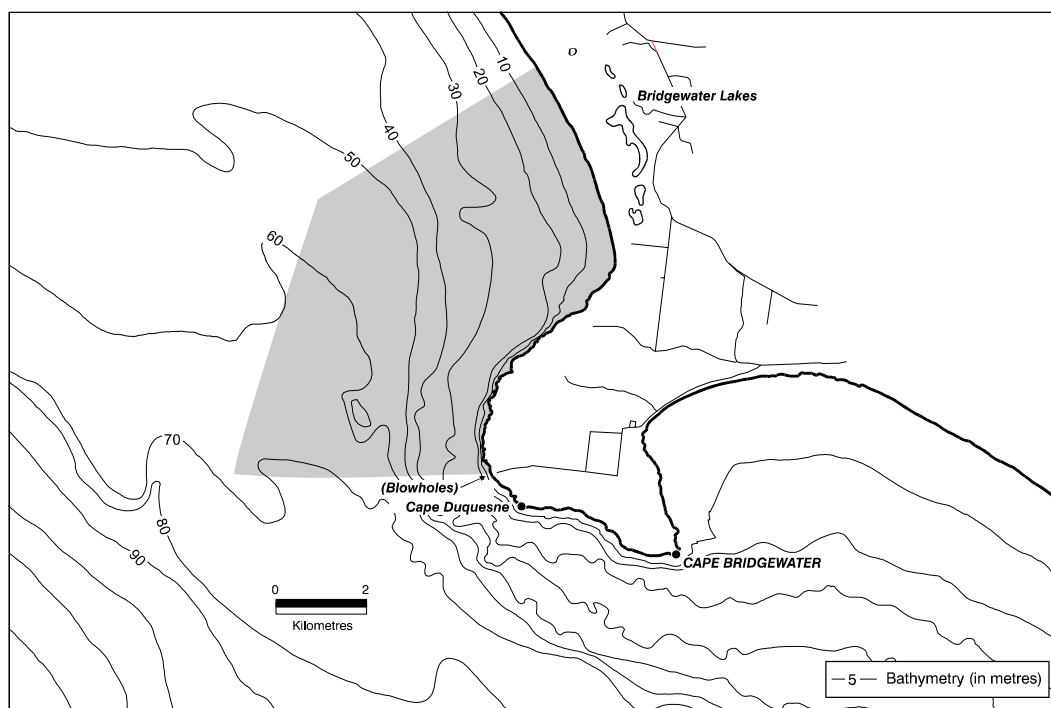
- B1** Merri Marine Sanctuary
- B2** The Arches Marine Sanctuary

Special Management Areas

- C1** Cape Bridgewater
- C2** Lawrence Rocks
- C3** Portland Bay
- C4** Deen Maar (Lady Julia Percy Island)
- C5** Logans Beach
- C6** Dinosaur Cove



A1 Discovery Bay Marine National Park



This recommended park in the far west of the State adjoins some of Victoria's most wild and remote coastline, fully exposed to the prevailing westerly seas and weather.

Description of the park

- One of two marine national parks, with Twelve Apostles, proposed for Victoria's Western biophysical region.
- Located about 20 km west of Portland, and adjacent to Discovery Bay Coastal Park.
- Extends along approximately 11 km of coastline north of the Blowholes at Cape Duquesne to 1.5 km north-west of Bridgewater Lakes, and offshore approximately for three nautical miles to the limit of Victorian waters.
- Approximately 4 600 hectares.

Environmental values

- The proposed park is part of the largest coastal basalt formation in Western Victoria and is amongst the highest wave energy environments in the State.
- The following habitats are represented in the park: sandy beaches, intertidal and subtidal rocky reefs, subtidal soft sediments.
- The rocky habitats of this area have complex forms, including low profile calcarenite platforms with gutters and sunken pits, isolated flat low

calcarenite reefs, extending one metre above the sand surface, shell grit, calcarenite rubble, gravel, and heavy, sloping, 2-3 m high basalt walls with small round boulders embedded at their base.

- Subtidal soft sediments consist of predominantly fine sand with some coarse to very coarse sand, with a carbonate content of around 80%.
- Calcarenite reefs with thick growths of sessile invertebrates between 33 and 55 metres depth. These encrusting communities contain many species of sponges, ascidians, bryozoa and gorgonians.
- Basaltic reefs at 18 metres depth covered by kelps including the large brown kelp *Ecklonia radiata*.
- High diversity of intertidal and shallow subtidal invertebrates, including rock lobster and abalone.
- Blue whales and great white sharks are regular visitors to the area.
- Adjoining coastline with geomorphologically significant basaltic sea caves, and significant sites for a number of flora and fauna species, including a largely unvegetated extensive dune system with dune lakes that support wetland vegetation.



Aboriginal interests

- Sites on Cape Bridgewater provide the earliest date for shell midden sites on the eastern Australian coastline. Together with the Bridgewater Bay dunes these sites are rated as highly significant on the basis of their scientific and archaeological value.
- Local Aboriginal community groups are actively involved in some aspects of coastal park management.
- An application for a native title determination has been lodged including the recommended marine national park area.

Community views

Input from the local community centred on loss of shore-based recreational fishing at Whites Beach. Commercial fishers generally did not support the proposal, although some sectors indicated that they would support a much smaller park in this locality. Other submissions called for the addition of Cape Bridgewater to improve the representation of habitats in the park.

The ECC has not made substantial changes to this recommended park, other than straightening part of the seaward boundary for easier identification at sea. Changes to the recommended park would not be possible without significantly reducing the ecological viability of the park.

Other nearby areas that were reconsidered during public consultation on this proposal include Cape Nelson and Lady Julia Percy Island, but input from earlier consultation indicated that they were less acceptable on balance than this location due to the impacts on users.

Social and economic implications

Impacts on coastal communities

The nearest coastal town to this park is Portland with an estimated population of 9 300 residents.

Compared to many regional towns, Portland has significant economic diversity. Portland's economy relies mainly on manufacturing and retail trade with 24% and 14% of employed residents respectively. The main manufacturing activities include the aluminium smelter and fish processing. The agriculture, forestry and fishing industry sector employs only 3% of residents. The recently privatised Port of Portland is Victoria's only deep ocean port. The Discovery Bay

Marine National Park will have some flow-on effects for some of the five seafood processing plants.

The economy of Portland is relatively independent of the tourism industry, and consequently from potential impacts of the Discovery Bay Marine National Park on recreational activities. The employment in the accommodation, cafes and restaurant; and the culture and recreation sectors is respectively 4.6% and 1.8% only.

Portland is likely to benefit from aquaculture development, through additional direct and indirect employment. A level of commercial interest in the site is already evident.

In summary, the impact on Portland's economy from the establishment of the Discovery Bay Marine National Park is likely to be minor, offset by the potential benefits of aquaculture industry. (See Appendix 4 for more details.)

Recreation and tourism

Whites Beach in Descartes Bay and Blacks Beach further north are the only locations within the proposed park that are readily accessible. Blacks Beach is on the boundary of the park. They are currently used for shore-based fishing and Whites Beach is also used for shore-based diving.

The management plan for the Discovery Bay parks confirms that local access to the coast for fishing is prized by residents, although access has sometimes been gained illegally, and inappropriate vehicle tracks developed through local use are a significant management issue in the coastal park. The ECC recommends that park managers review access to the coast, to ensure that reasonable access is available to alternative fishing locations.

There will be no restrictions on boating, diving, and other non-harvesting activities. In the longer term, these forms of recreation may be enhanced and developed to complement promotion of the Discovery Bay Coastal Park as a major tourist resource. Visitors to the adjacent Great South West Walk and other attractions such as the Blowholes provide potential for combined marine and land based interpretation programs.

Commercial fishing

Major commercial fishing activities are fishing for rock lobster, abalone and wrasse. The following estimates of fisheries catch and value were provided by MAFRI and are based on the 1996/97 year to allow consistent comparisons between areas. However average catches



over a number of years are also a useful measure in some situations and, where appropriate, additional comments are made about average catches. Values are based on 1999 prices for abalone, and 1998/99 for rock lobster. See Appendix 5 for a fuller discussion of fisheries estimates.

Abalone harvested within the area of the proposed park was estimated to be 14.2 tonnes in 1996/97 or a little over 5% of the Western Zone catch quota, valued at approximately \$481 000. This compares with catch averages since 1988 of 18 tonnes.

Rock lobster catches were estimated to be approximately 14.5 tonnes in 1996/97, or 3.4% of the Western Zone rock lobster catch, valued at \$453 000. This estimate had a high random standard error associated with it, and the ECC believes that the actual catch may be higher (see Appendix 5 for details).

Fishing for wrasse is the other significant commercial fishing activity within this area, estimated to be worth approximately \$10 000 for 1996/97. The wrasse fishery is relatively new and catches have been rising steadily since the early 90s, from 28 tonnes across the State in 1992/93 to 81 tonnes in 1997/98 (Fisheries Victoria data). The current catches in the area of the proposed park are likely to be greater than that estimated for 1996/97.

Implementation and management

- The proposed park is not readily accessible and is remote from vehicle access.
- Monitoring and assessment of the effectiveness of the park will be assisted by comparison with similar areas where activities such as fishing take place. Areas which could be included in a monitoring program are Discovery Bay north of the park, Cape Duquesne to Cape Bridgewater, and Cape Nelson.

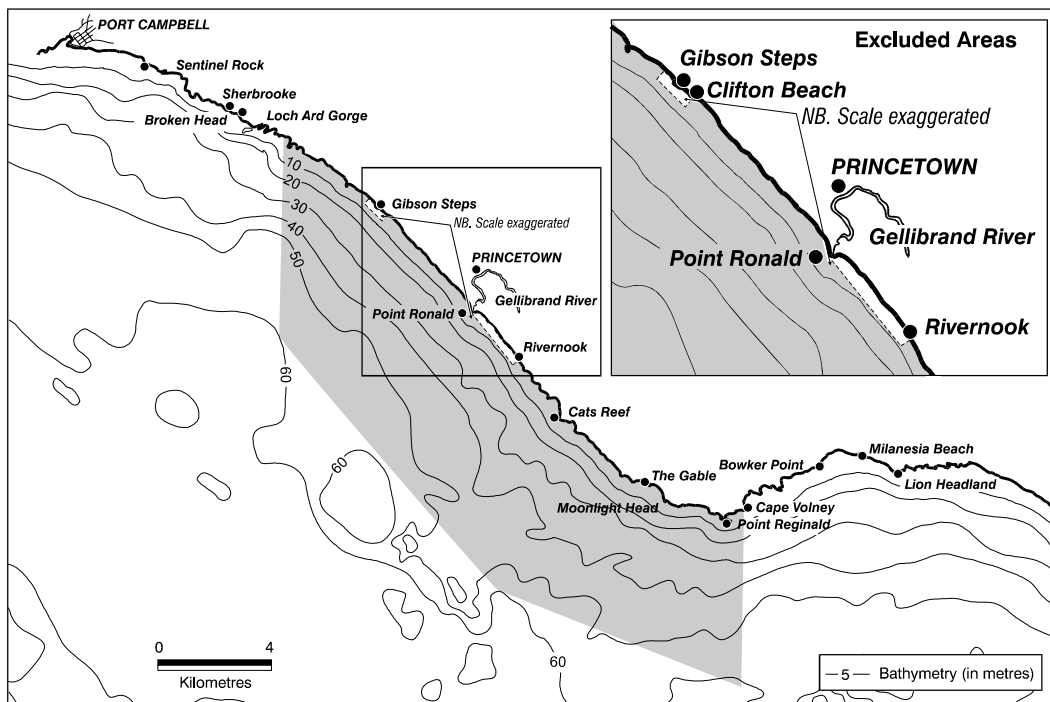
Recommendation

- A1** (i) That the Discovery Bay Marine National Park of 4 600 ha shown on Map A be used in accordance with the general recommendations for marine national parks outlined on page 43; and
- (ii) that park managers review access to the coast, and ensure reasonable access is available to alternative fishing locations.

References: 40, 242, 258, 297, 332, 334.



A2 Twelve Apostles Marine National Park



Twelve Apostles, along with Wilsons Promontory, is one of two major new marine national parks recommended for Victorian waters. The park includes spectacular underwater scenery that is a continuation of the famous coastal limestone cliffs and stacks of the Port Campbell area.

Description of the park

- One of two marine national parks, with Discovery Bay, proposed for Victoria's Western biophysical region.
- Located about 7 km east of Port Campbell, and adjacent to Port Campbell and Otway National Parks.
- Extends along approximately 23 km of coastline from east of Broken Head to Cape Volney, and offshore approximately for three nautical miles to the limit of Victorian waters.
- Approximately 11 700 hectares.

Environmental values

- The underwater extension of the well-known and spectacular terrestrial limestone cliffs, including dramatic underwater arches and canyons with marine life that is striking in colour and shape.
- Imposing, deep (16 to 55 metres) sloping reefs occur 4 to 5 kilometres offshore from Moonlight Head.
- The proposed park contains various geological rock types, including limestone, calcarenite,

mudstone and sandstone, adding to the total substrate complexity of the area.

- The following habitat types are represented in the park: intertidal and subtidal rocky reefs, sandy beaches and subtidal soft sediments.
- The rocky habitats of this area are complex in form and include platforms with shallow (< 1m) fissures and gutters; small rounded boulders; and heavy reef with sharp, steeply sloping ridges > 2 metres in height, some with narrow crevasses, others with wide sand filled gutters.
- Subtidal soft sediments consist of predominantly fine sand with some medium and coarse sand, and coarse shell rubble, with a carbonate content from 45 to 90%.
- Characteristic of a larger area from Childers Cove (east of Warrnambool) to Gibson Steps which has the highest diversity of intertidal and shallow subtidal invertebrates on limestone in Victoria.
- The sandstone intertidal rocky platforms around Moonlight Head are extensive and contain a range of coastal orientations and microhabitats. These platforms are characterised by rich intertidal and shallow subtidal invertebrate communities (eg Cats Reef).



- Shoreline, rock stacks and islands provide breeding colonies for seabirds.
- Adjacent coastline has sites of significance for flora and fauna, and sites of geological and geomorphological significance including karst (ie cave) topography.

Aboriginal interests

- Aboriginal groups are concerned about the increase in tourism in the area, especially along the shoreline, and the increased risk of impact on cultural and environmental values.
- The Aboriginal community seeks a role in the process of authorising tourism, scientific and commercial activities.

Community views

There is strong support for two large marine national parks. Input from the local community centred on concern about the flow-on impacts on Port Campbell of the restrictions on commercial fishing, particularly on rock lobster fishers based in the town; and loss of shore-based recreational fishing at a number of sites between Clifton Beach and Gibsons Steps, and Princetown and Rivernook.

Local government indicated that they would support a smaller park in this locality. Commercial abalone and rock lobster fishers based at Apollo Bay also opposed the proposal, because of the impact on their fishing activities particularly in the eastern section of the park.

Two changes have been made to this recommended park: excluding additional areas to reduce the impact on recreational fishing, and straightening the seaward boundary for easier identification at sea. Both shoreline areas previously excluded from the park have been extended, at Gellibrand River mouth at Princetown to Rivernook, and Gibsons Steps to Clifton Beach. Other changes to the recommended park would significantly reduce the range of habitats represented in the park, and reduce its ecological viability.

Other nearby areas that were reconsidered during public consultation on this proposal include areas around or near Lake Gilleard, Glenaire, and areas closer to Port Campbell.

Social and economic implications

Impacts on coastal communities

The nearest coastal towns to this park are Port Campbell with an estimated population of 325 and Apollo Bay with an estimated 1 050 residents.

Tourism and leisure services, predominantly linked to Port Campbell National Park, are key business activities in Port Campbell with 30% of employed residents. The area's diverse coastline and the nature-based experiences it provides are key strengths for the future development of the town. The establishment of the marine national park would enhance this trend. The Port Campbell jetty was recently rebuilt with Government funds to provide for a range of uses into the future. Agriculture, forestry and fishing represents about 9% of employed residents.

The majority of employed residents in Apollo Bay (74%) are engaged in tertiary industry, including consumer services (34%), and only 7% are employed in the agriculture, forestry and fishing industry. It is not clear how many of these are actually working in Apollo Bay – although it is known that 32 (out of 126) Apollo Bay based businesses provide accommodation and there is a seafood processing plant employing about 5 full time employees. Apollo Bay is promoted as beachside resort, offering a range of water-based activities. Tourism is a key industry for the town, with most visitors to the Great Ocean Road region undertaking a range of passive recreational activities such as going to the beach, driving for pleasure, sightseeing and eating out at restaurants.

However, the Twelve Apostles Marine National Park will have an impact on commercial fishers (see below) based in Port Campbell and Apollo Bay. Although unlikely to affect noticeably Port Campbell or Apollo Bay economies, there may be social impacts on the Port Campbell community. Port Campbell is a small coastal community, and impacts on even a small number of individual fishers, especially where new employment is difficult to find, is an important social issue. (See Appendix 4 for more details.)

Recreation and tourism

The area is growing in popularity for diving, cliff top sightseeing, nature study, and limited shore and boat-based fishing. Although recreational fishing is limited by the generally difficult boat and land access, a few locations are accessible and popular for recreational fishing.



The impact of the recommended park on recreational fishing will be small, as most of the park is relatively inaccessible. Two areas at Gellibrand River mouth at Princetown and Gibson Steps, that are readily accessible and particularly popular with local residents for recreational beach fishing are not included in the park. Similar alternative areas are not available nearby.

There will be no restrictions on boating, diving, and other non-harvesting activities. The recommended park is adjacent to the Otway and Port Campbell National Parks, providing opportunities to develop complementary visitor information and education materials.

Commercial fishing

Major commercial fishing activities are fishing for rock lobster and abalone. The following estimates of fisheries catch and value were provided by MAFRI and are based on the 1996/97 year to allow consistent comparisons between areas. However average catches over a number of years are also a useful measure in some situations and, where appropriate, additional comments are made about average catches. Values are based on 1999 prices for abalone, and 1998/99 for rock lobster. See Appendix 5 for a fuller discussion of fisheries estimates.

Abalone harvested within the area of the proposed park was estimated to be 22.8 tonnes or a little over 3.3% of the Central Zone catch quota, valued at approximately \$773 000.

Rock lobster catches were estimated to be approximately 12.9 tonnes, or 3.0% of the Western Zone rock lobster catch valued at \$403 000. This estimate had a high random standard error associated with it, and the ECC believes that the actual catch may be higher (see Appendix 5 for details).

Other fishing was estimated to amount to about \$39 000 for 1996/97.

To reduce the impact on commercial fishing, the park no longer includes fishing grounds close to the township of Port Campbell. The ECC recommends that where individuals or local communities are disproportionately affected as a result of implementation of this park, appropriate adjustment measures should be considered (see Recommendation R1 on page 15).

Petroleum exploration and extraction

Oil and gas exploration that does not disturb the seabed and biota will be allowed, but exploratory drilling and extraction will not be permitted in marine national parks.

Oil and gas pipelines will be allowed subject to an Environment Effects Statement process, as for terrestrial national parks.

Implementation and management

- Parts of the proposed park are readily accessible from the shore through the extensive road network associated with Port Campbell National Park. Other areas are more remote and difficult to access. Boat access to most of the proposed park is difficult.
- The increased number of visitors to Port Campbell National Park, is likely to increase visitor numbers to some shoreline sections of the park.
- Monitoring and assessment of the effectiveness of the park will be assisted by comparison with similar areas where activities such as fishing take place. Areas which could be included in a monitoring program are between the Bay of Islands and Port Campbell, and between Cape Volney and Cape Otway.

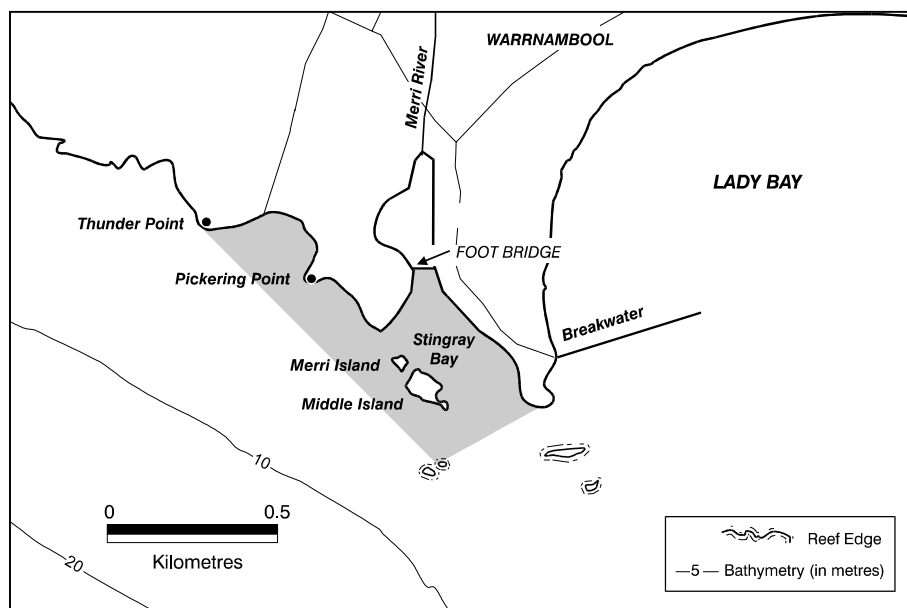
Recommendation

- A2** That the Twelve Apostles Marine National Park of 11 700 ha shown on Map A be used in accordance with the general recommendations for marine national parks outlined on page 43.

References: 40, 176, 242, 258, 289, 298, 332, 333.



B1 Merri Marine Sanctuary



The Merri Marine Sanctuary is located at Warrnambool offshore from the mouth of the Merri River.

It is approximately 25 ha and is recommended for its ecological significance and value for public appreciation and education.

Environmental values

- The seabed at the river mouth is a mixture of reef and sand, with different seaweeds, providing a range of habitats and diverse marine life.
- Between Merri and Middle Islands rocky overhangs and 8 to 10 metre deep canyons support a variety of fish, including parrotfish, blue-throated wrasse, bastard trumpeters, magpie perch, and dusky and banded morwong.
- There are penguin colonies on Merri and Middle Islands.
- Dolphins are frequent visitors to the sheltered site.

Aboriginal interests

- ‘Merri’ is an Aboriginal word meaning ‘stony water’.
- Aboriginal groups have concerns regarding the increasing pressure to commercially exploit resources for tourism.
- The Aboriginal community seeks a role in the process of authorising tourism, scientific and commercial activities.
- Local Aboriginal groups are concerned that the sanctuary may prevent traditional access to flora and fauna.

Implications for users

- There are currently a variety of restrictions on commercial fishing, but parts of the area are used for limited abalone and rock lobster harvesting.
- Some shore-based recreational fishing currently occurs, but the popular breakwater is excluded from the proposed sanctuary.
- Following public consultation on the proposal, the area has been reduced in size, to exclude some reefs used for commercial abalone harvesting.

Implementation and management

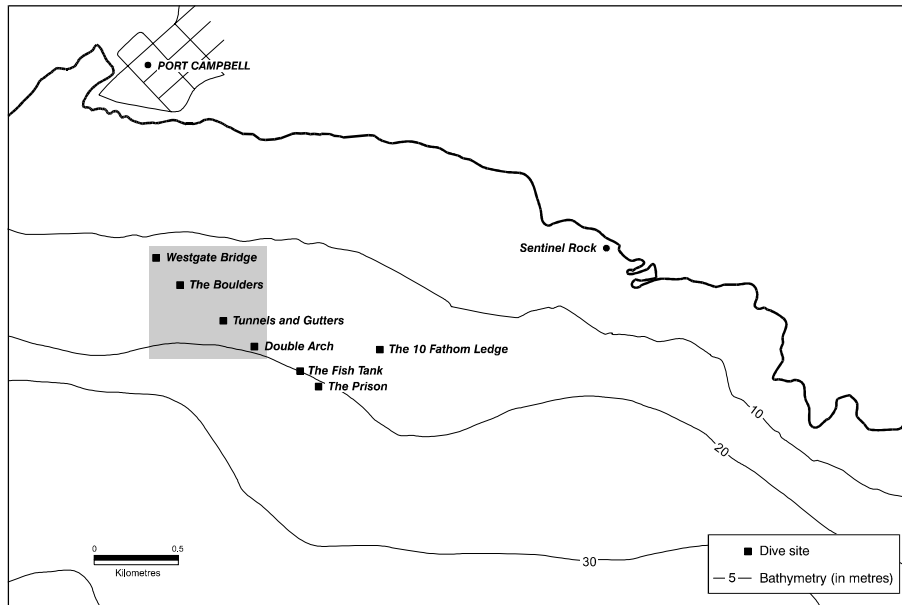
- Management of this sanctuary should involve the Aboriginal community and local government.

Recommendation

- B1** That the Merri Marine Sanctuary of approximately 25 ha shown on Map A be used in accordance with the general recommendations for marine sanctuaries outlined on page 45.



B2 The Arches Marine Sanctuary



The Arches Marine Sanctuary is located off Port Campbell.

It is approximately 45 ha and is recommended for its ecological, scenic and tourism values.

Environmental values

- The site contains some of Victoria's most spectacular limestone formations with rocky arches and canyons in 19 to 25 metres of water.
- The upper surfaces of the arches are covered in kelp, and an understorey of red seaweeds. The shaded undersides of the arches and canyon walls are carpeted with invertebrates characteristic of deeper Bass Strait waters, including sponges, bryozoans, gorgonians, hydroids and an abundance of colourful seastars.
- Giant kelp forests provide important habitat for a suite of marine animals.

Aboriginal interests

- An application for a native title determination has been lodged including the recommended marine sanctuary area.
- Aboriginal groups are concerned about the increasing popularity of the area for dive tourism, and the increased risk to cultural and environmental values.
- The Aboriginal community seeks a role in the process of authorising tourism, scientific and commercial activities.

Implications for users

- Some rock lobster fishing currently occurs within this area.
- Popular destination for dive charters, because of the spectacular underwater scenery.

Recommendation

B2 That The Arches Marine Sanctuary of approximately 45 ha shown on Map A be used in accordance with the general recommendations for marine sanctuaries outlined on page 45.



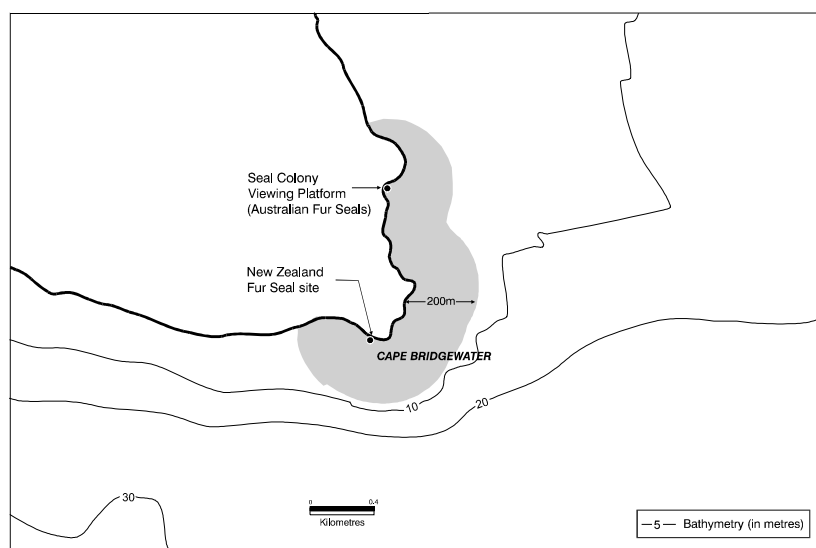
Special Management Areas

C1 Cape Bridgewater

Values

This 23 ha area west of Portland includes the waters around one of only two mainland Australian fur seal colonies. There are reports of breeding seals that would make it the only mainland breeding colony in Australia.

A viewing platform constructed above this site in the adjoining Discovery Bay Coastal Park attracts many visitors. A small number of New Zealand fur seals are also reported to come ashore at Cape Bridgewater. Local dive operators offer diving and snorkelling excursions where, in addition to observing seals in their environment, divers can admire diverse and abundant marine flora and fauna. The seals can also be viewed from the sea with a charter-boat operating throughout the year.



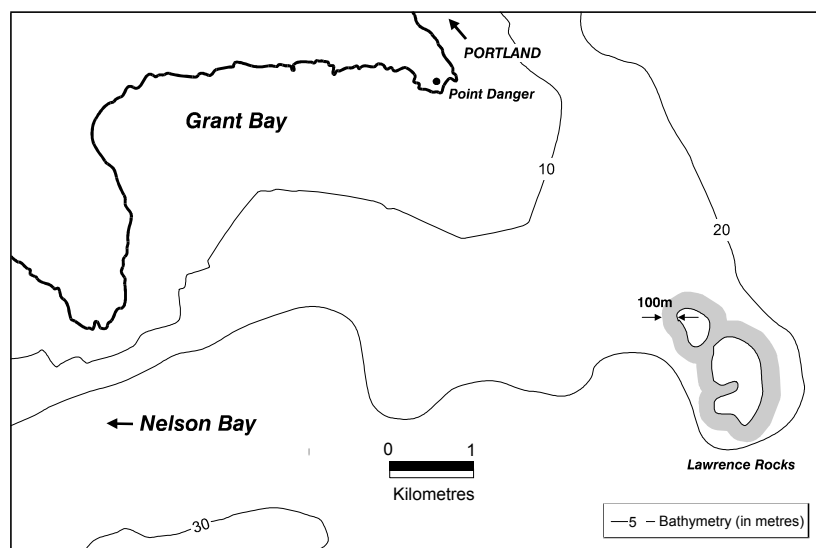
Management issues

Managers should ensure that an appropriate distance is kept between boats and the rock platforms used by seals, to avoid unnecessary disturbance. Though mortality of seals in nets is generally low, netting is a potentially threatening activity, and restrictions should be placed on netting near the colony to minimise seal injury and mortality through entanglement in mesh and gill nets.

C2 Lawrence Rocks

Values

This 24 ha area near Portland consists of waters around the islands of volcanic rock which make up Lawrence Rocks. A kelp forest up to 12 metres high is intermittently found in waters on the northern side of Lawrence Rocks. The western side offers diving and snorkelling opportunities within a natural harbour noted for its calm conditions and abundant marine life. The rocks themselves are of State geological and geomorphological significance. They are the highest offshore point of a largely submerged volcanic caldera beneath Nelson Bay.



Management issues

The waters for 100 metres offshore from the boundary of the wildlife reserve should be managed to complement management of the seabird colonies, and to ensure protection of the linked terrestrial and marine values.



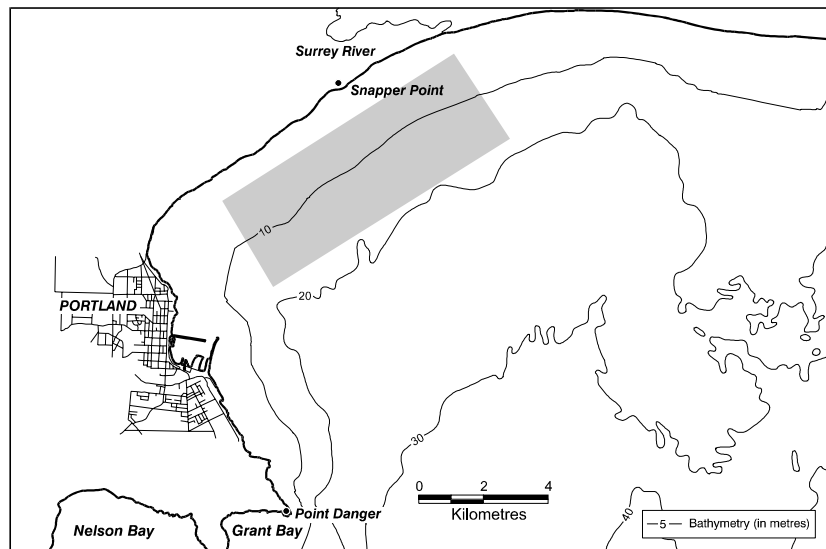
Special Management Areas

C3 Portland Bay

Values

This 2 675 ha area situated about 1 km offshore near Portland, contains the most extensive known beds of *Amphibolis antarctica* seagrass on the open coast in Victoria. The highly productive seagrass ecosystem supports a diverse invertebrate community and is a nursery ground for juvenile fish such as King George whiting, and occasionally snapper and shark. The site is also one of very few locations where the rare brown alga *Cystophora cymodocea* occurs, growing attached to the seagrass.

Low and high profile rocky reefs at this site also provide habitats for a range of reef species. This site is visually attractive for diving and snorkelling and is popular with recreational fishers who target a number of fish species.



Management issues

Under the provisions of the *Fisheries Act* 1995, seining operations are prohibited from the area from Point Danger to the mouth of the Surrey River, and the port managers in cooperation with the aluminium smelter have put in place a dredge spoil disposal program that avoids impact on the seagrass. These existing management arrangements should be maintained, and reviewed periodically, to ensure protection of the seagrass ecosystem.



Special Management Areas

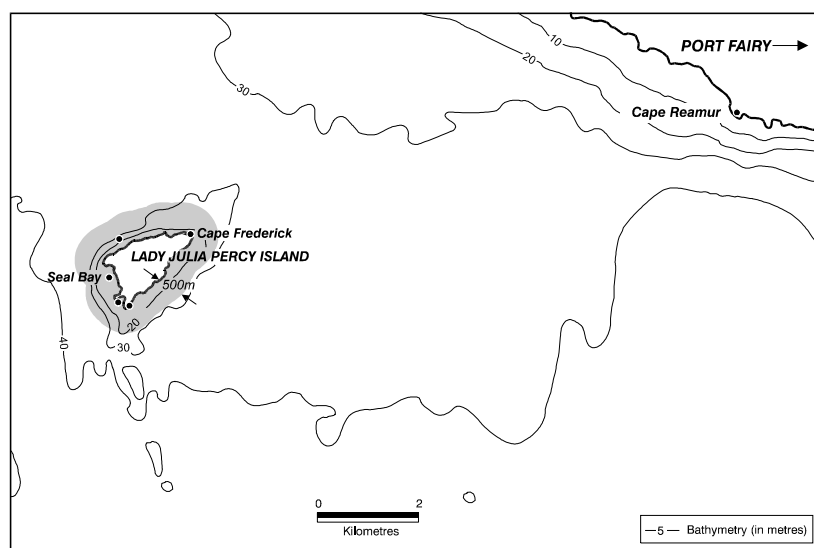
C4 Deen Maar (Lady Julia Percy Island)

Values

The local Gunditjmara people have a spiritual, traditional physical and contemporary connection to Deen Maar. Deen Maar means Bunjil – ‘The Creator’ or ‘The Man’. Deen Maar is the resting place of Bunjil, and it is where he departed this world. The adjoining mainland and wetlands are of great spiritual significance to the Gunditjmara people and, in late 1999, about 400 ha of land between the Eumarella River estuary, the Yambuk Lakes system and the Southern Ocean, was declared Victoria’s first Indigenous Protected Area.

The island is home to one of Victoria’s two largest Australian fur seal breeding colonies, and is also a breeding ground for numerous species of birds some of which are threatened (fairy prion, common diving petrel, white-bellied sea eagle). It is of national geological and geomorphological importance. The island is a wildlife reserve.

The sharply sloping reefs of the southern and eastern sides of the island are covered by a dense kelp canopy, which provides habitat for other marine life, while at the northern end the island drops into a sandy seabed. The subtidal area around Deen Maar is considered to be some of the most spectacular underwater environments in Victoria. The endangered great white shark frequents this area.



Management issues

Management of the waters for 500 metres around the island (430 ha) should complement management of the cultural and biological values of the island. Future management should involve the local Aboriginal communities, and addition of the area to the Deen Maar Indigenous Protected Area should be explored in consultation with the Gunditjmara people.

Commercial harvesting of abalone and rock lobster takes place within the site with occasional mesh netting and long lining. As with Cape Bridgewater (C1 above) netting is a potentially threatening activity, and restrictions should be placed on netting near the colony to minimise seal injury and mortality through entanglement in mesh and gill nets.

Rock lobster pots placed near seal breeding grounds can cause death of juvenile seals. Monitoring of juvenile seal mortality should be carried out and the use of seal-resistant pots explored. Disturbance to the colony during the breeding season should be avoided, and managers should ensure that vessel access is appropriately regulated during this time.



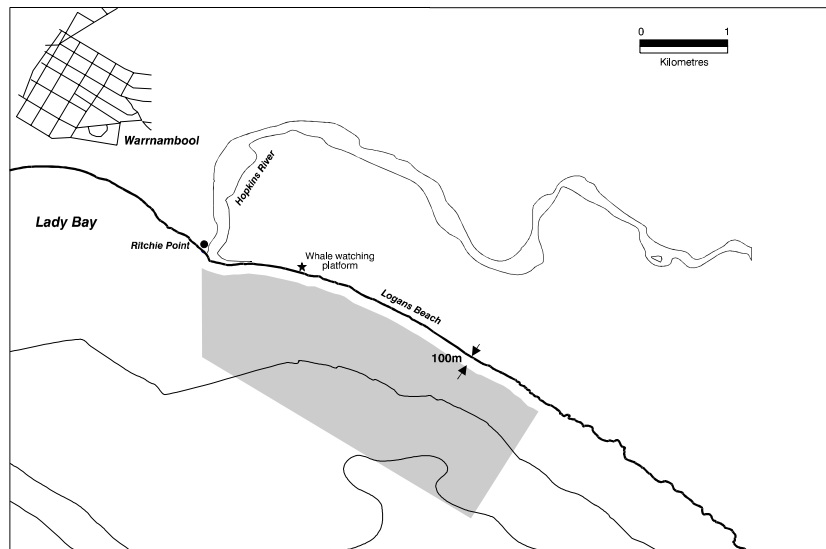
Special Management Areas

C5 Logans Beach

Values

This 550 ha area near Warrnambool is a calving and nursery ground for the southern right whale. This whale is listed as an endangered species both at a national and a State level. It was listed under Victoria's *Flora and Fauna Guarantee Act* 1988 in 1990. The whales congregate in the general area every year from about May to October and breed approximately every three years. The exact boundaries of the breeding ground are not known, but whales with their young are often seen at Logans Beach. The whales move along the shore between a point 2 km east of Warrnambool (south of Lake Gilliear) and Port Fairy, up to 1.5 km offshore.

The Whale Dreaming is significant for the local Aboriginal people.



Management issues

Management of commercial fishing, recreational boating and tourism while the whales are present is currently undertaken through a combination of voluntary agreements and regulations. All vessels are excluded from Logans Beach in the shaded area from June to October each year to prevent disturbance of the whales and to enhance the remote scenic aspect for thousands of cliff top whale watchers.

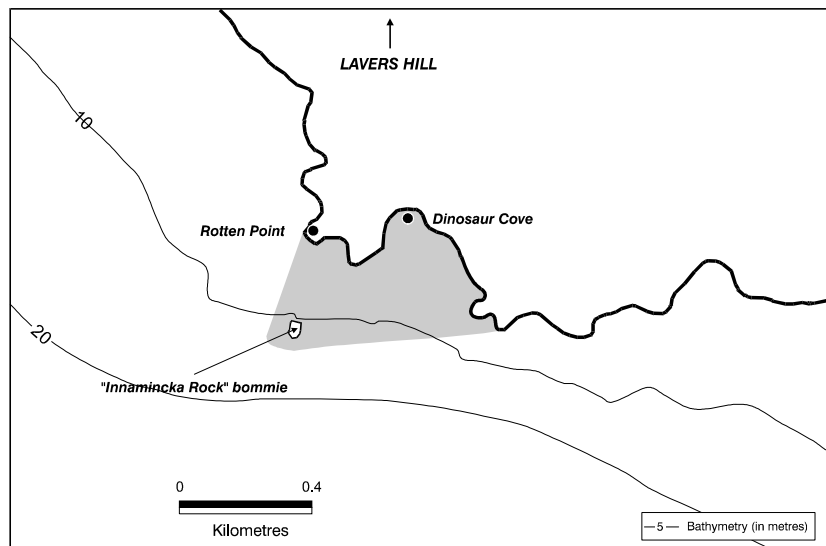
C6 Dinosaur Cove

Values

This 20 ha area contains spectacular underwater scenery with sheer underwater cliffs, massive boulders and a unique feature for this part of the coast, a large bommie, 'Innamincka Rock'.

The complexity of the seabed is enriched with rock ledges, gutters and shallow sand/reef. Surveys have shown that areas as small as two square metres include 15 species of sponges, 10 ascidians, 27 bryozoans, and four hydroids (O'Hara 2000).

The coastline offers spectacular views of the ocean, steep cliffs, sea caves and magnificent rock platforms. The site has major palaeontological significance with the renowned dig site, Dinosaur Cove. Although access is difficult, the site is popular with a small number of keen shore-based anglers.



Management issues

Management of the area should ensure protection of the diverse natural values of the area, while retaining access for recreational fishing.

The local Aboriginal people are concerned about possible disturbance to archaeological sites, and areas of cultural significance. Involvement of the local Aboriginal community in management of this area is encouraged.





Recommendations

Part Three

Recommendations for the Central and Wilsons Promontory biophysical regions

This part sets out the recommendations for marine protected areas for the open coast from Cape Otway to Wilsons Promontory.

Victoria's Central and Wilsons Promontory biophysical regions are incorporated into IMCRA's Central Victoria and Flinders regions respectively. The Flinders Region extends into Bass Strait and includes Tasmania's Flinders Island and other islands.

The marine environment along this part of the Victorian coastline varies from the heavily visited rocky shore and surf coast environments close to the major population centres of Melbourne and Geelong, to the more remote but much loved granite landscapes of Wilsons Promontory.

The marine flora and fauna are typically cool temperate, with warm temperate species commonly found in New South Wales also present in low numbers. Many western species have their eastern distributional limit between Bunurong and Wilsons Promontory. A recent study (Edmunds *et al.* 2000) described this part of the Victorian coast at the most detailed level of hierarchical marine classification – marine ecological communities (see section 3.6 for more details). Distinct macrophyte, invertebrate and fish marine ecological communities were found within Wilsons Promontory and Bunurong Marine National Parks.

This is the most accessible section of open coastline for the majority of Victoria's population. Outside the metropolitan areas of Melbourne and Geelong, there are few large regional centres. West of Melbourne the townships of Apollo Bay, Lorne, Anglesea, Torquay and Ocean Grove along the Great Ocean Road are important for tourism, and some also act as dormitory suburbs for people working in the nearby city of Geelong. East of Melbourne along the west and south Gippsland coast, there are few major towns situated on the coast. However there are a number of small towns such as Inverloch and other smaller coastal settlements where tourism is a

significant economic activity. The largest existing highly protected area in Victoria – the sanctuary zone of the Bunurong Marine Park – was established near Inverloch in 1991.

Wilsons Promontory is Victoria's oldest national park, first established more than 100 years ago. The waters surrounding Wilsons Promontory were declared as marine protected areas in 1986. The predominantly granite coastline plunges steeply onto sandy seafloor, a marine environment unique in Victoria.

This part of the report gives descriptions of the recommended marine national parks, marine sanctuaries and special management areas in Victoria's Central and Wilsons Promontory biophysical regions. Recommendations regarding existing marine parks can also be found in this section on page 50. See the Executive Summary for a table of changes to the recommendations since the Draft Report.

See section 3.7 of this report for an overview of the recommendations for marine protected areas including recommendations for permitted uses and activities.

Recommended Areas

Marine National Parks

- A3** Point Addis Marine National Park
- A8** Bunurong Marine National Park
- A9** Wilsons Promontory Marine National Park

Marine Sanctuaries

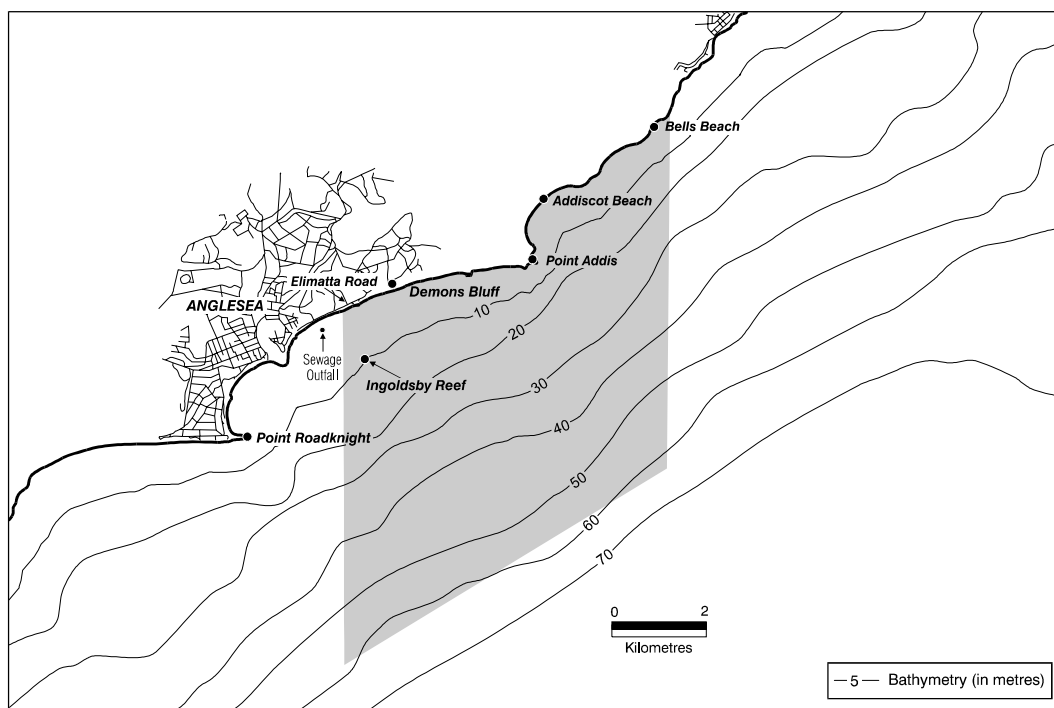
- B3** Marengo Reefs Marine Sanctuary
- B4** Eagle Rock Marine Sanctuary
- B5** Point Danger Marine Sanctuary
- B6** Barwon Bluff Marine Sanctuary
- B10** Mushroom Reef Marine Sanctuary

Special Management Area

- C15** Summerland Peninsula (Phillip Island)



A3 Point Addis Marine National Park



This recommended park adjoins rugged cliffs for much of its length, but also includes the world famous Bells Beach.

Description of the park

- One of two marine national parks, with Bunurong, proposed for Victoria's Central biophysical region.
- Extends along approximately 10 km of coastline east of Angelsea to (and including) Bells Beach, and offshore approximately for three nautical miles to the limit of Victorian waters.
- Approximately 4 750 hectares in size.

Environmental values

- The following habitat types are represented in the park: sandy beaches, intertidal and subtidal rocky reefs, and subtidal soft sediments.
- The rocky habitats of this area have varied forms, including low profile reef about half to one metre high, low profile broken reef, and rounded cobbles.
- Subtidal soft sediments consist of a mixture of fine and medium sand with some coarse sand, and silt, shell and coral rubble, with a carbonate content of 75 to 90%.

- Ingoldsby Reef with a range of marine life, including the leafy sea-dragon.
- *Amphibolis* seagrass off Point Addis.
- Adjoining coastline with rugged cliffs and bluffs with species-rich heathlands and coastal scrub, wide sandy beach systems to the east and west of the Point Addis headland, and an extensive area of remnant vegetation known as the Iron Bark Basin, a municipal reserve.
- The Point Addis Limestone is of State geological significance.

Aboriginal interests

- This area is used for traditional practices of fishing and food collection by the local Aboriginal people.
- Middens are located along the shoreline. There has been no archaeological survey of this area, and further development should not be carried out without a cultural assessment and survey. Point Addis is likely to be a burial area.
- Aboriginal people are concerned about threats to flora and fauna, from the high numbers of visitors to this part of the coast.



Community views

There is strong local support for establishing a park in this area, but loss of shore-based and boat-based recreational fishing was a major issue in many submissions. The proximity of the Anglesea sewage outfall to the western boundary of the park was raised as a concern during public consultation (see below in *Implementation and management*).

The ECC has not made changes to this recommended park, other than straightening part of the seaward boundary for easier identification at sea. Changes to the recommended park would significantly reduce the ecological viability of the park, and would reduce the broad level of community support for the proposal.

Other nearby areas that were reconsidered during public consultation on this proposal include the area from Anglesea to Eastern View, an area west of the recommended area to Point Impossible, and Point Nepean.

Social and economic implications

Impacts on coastal communities

The nearest major coastal towns to this park are Torquay and Anglesea with an estimated combined population of 9 000 permanent residents.

The Torquay/Anglesea area is a very popular holiday destination, promoted for its beaches and access to surfing and swimming, with a high level of holiday home ownership and provision of visitor accommodation. Around 35% of employed residents are engaged in services such as retailing, education and visitor accommodation, while around 22% are employed in the manufacturing and construction industries, and only 0.9% in the agriculture, forestry and fishing industry sector. Many residents commute to employment in nearby Geelong. The establishment of the Point Addis Marine National Park is likely to have a long-term positive, although difficult to quantify, impact on the tourism economy of Torquay and Anglesea. (See Appendix 4 for more details.)

Recreation and tourism

Bells Beach is one of the world's best known surfing beaches and home to a number of major surfing competitions. There will be no restrictions on the major surf tournaments held at Bells Beach. Establishment of the recommended park could further enhance the status of Bells Beach, and assist in communicating environmental messages to the surfing community and general public.

The proposed park is currently used for surf fishing, particularly between Black Rock and Point Addis, and boat-based fishing. In addition to Bells Beach, Addiscot Beach is also popular for surfing, and diving and nature study are popular at Ingoldsby Reef. On balance, the ECC considers that the impact of the restriction on recreational fishing is likely to be fairly low, as much of the park is not readily accessible and alternative areas are available within a reasonable distance.

There will be no restrictions on boating, diving, and other non-harvesting activities.

Commercial fishing

Major commercial fishing activities are fishing for rock lobster and abalone, and mesh netting. The following estimates of fisheries catch and value were provided by MAFRI and are based on the 1996/97 year to allow consistent comparisons between areas. However average catches over a number of years are also a useful measure in some situations and, where appropriate, additional comments are made about average catches. Values are based on 1999 prices for abalone, and 1998/99 for rock lobster. See Appendix 5 for a fuller discussion of fisheries estimates.

Abalone harvested within the area of the proposed park was estimated to be 1.6 tonnes or a little over 0.2% of the Central Zone catch, valued at approximately \$56 000. Catch and effort records suggest that the importance of this area is diminishing.

Rock lobster catches were estimated to be approximately 1.8 tonnes, or 2.6% of the Eastern Zone rock lobster catch valued at \$55 000. The ECC believes that the average catch is likely to be higher as the catch in 1996/97 was one of the lowest in the past seven years.

Other fishing activities include mesh netting, with small quantities from other fishing methods, amounting to about \$52 000.

Implementation and management

- The outlet from the Anglesea sewage treatment plant is located 600 metres from the western boundary of the park. The outflows have undergone high quality secondary treatment. Dye dispersion studies have shown that the dilution factor 600 metres from the outlet ranges from 190 to 1000. The outflows would therefore have negligible impact on the proposed park.
- The proposed park is not readily accessible, except at Bells Beach - the area with the highest visitor numbers.



- Community support for the proposal is likely to facilitate compliance.
- Monitoring and assessment of the effectiveness of the park will be assisted by comparison with similar areas where activities such as fishing take place. Areas which could be included in a monitoring program are from Anglesea to Eastern View, west of the proposed area to Point Impossible, and Point Nepean.

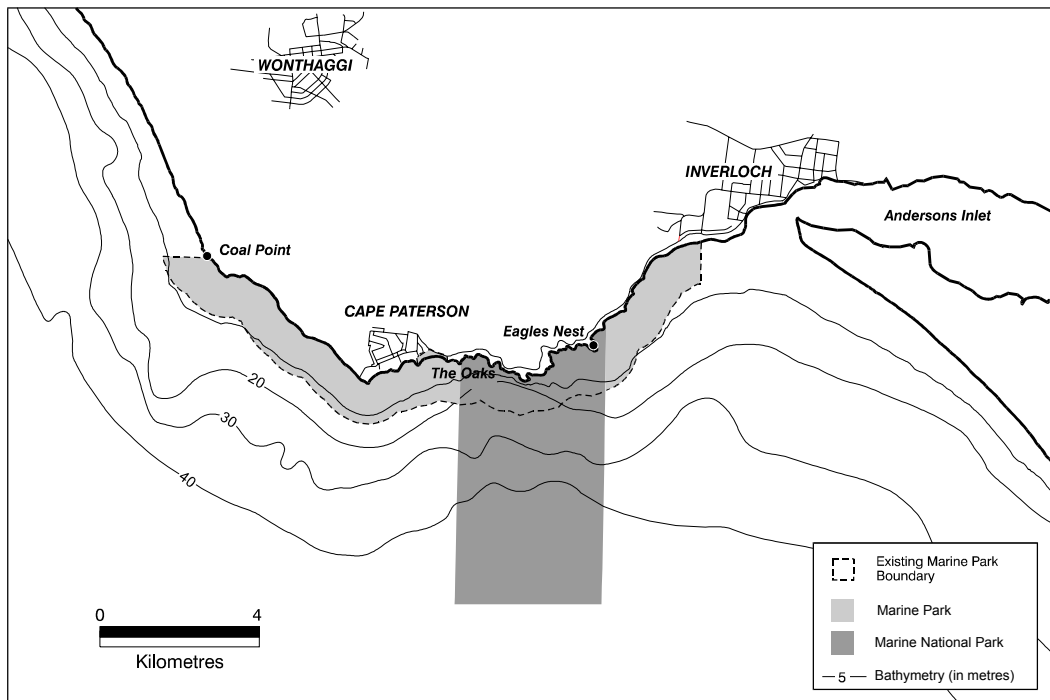
Recommendation

A3 That the Point Addis Marine National Park of 4 750 ha shown on Map A be used in accordance with the general recommendations for marine national parks outlined on page 43.

References: 40, 176, 242, 258, 289, 312, 332.



A8 Bunurong Marine National Park



This recommended park is an extension of the existing well-known and popular Bunurong sanctuary zone. It is one of the most accessible parks, its striking rock formations admired and its beaches used by high numbers of visitors. A favourite activity is exploring the diverse marine life on the intertidal platforms and rockpools.

Description of the park

- One of two marine national parks, with Point Addis, proposed for Victoria's Central biophysical region.
- Located about 6 km south-west of Inverloch, includes the sanctuary zone of the existing Bunurong Marine Park.
- Extends along approximately 5 km of coastline from 2.5 km east of Cape Paterson to the eastern end of Eagles Nest Beach, and offshore approximately for three nautical miles to the limit of Victorian waters.
- Approximately 2 150 hectares.

Environmental values

- The following habitats are represented in the park: sandy beaches, intertidal and subtidal rocky reefs, subtidal soft sediments.
- Extensive intertidal rock platforms, and subtidal rocky reefs, uncommon along the Victorian coast, which extend several kilometres from shore but which are in relatively shallow water. These platforms and reefs include numerous microhabitats.
- Marine flora and fauna, including subtidal flora, characterised by a mixed assemblage of brown algae consisting predominantly of *Acrocarpia paniculata*, *Seirococcus axillaris*, *Cystophora retorta*, *Cystophora platylobium* and *Cystophora moniliformis*. The seagrass *Amphibolis antarctica* is also an important component.
- The species richness of the Bunurong flora is among the highest for communities that have been examined so far, and diversity is also reasonably high.
- A number of marine ecological communities have been identified recently for the proposed Bunurong Marine National Park. The marine ecological communities at Bunurong were quite different from those at Wilsons Promontory, but had similarities with communities at Phillip Island and Port Phillip Heads further west (see Appendix 6 for details).
- Highest diversity of intertidal and shallow subtidal invertebrate fauna recorded in Victoria on sandstone. A high proportion of the common invertebrates occurring along Victorian coast: for example, seven of eight species of brittle stars, nine of 11 sea-cucumbers, 8 of 11 barnacles, all 5 sea anemones, and 15 of 20 chitons.



- Eagles Nest provides habitat for breeding peregrine falcons and hooded plovers, and is a fossil dinosaur locality.
- The park adjoins a foreshore area consisting of dunes (in the west) and high cliffs (to the east) which support important remnant coastal and dune vegetation.

Aboriginal interests

Gippsland and East Gippsland Aboriginal coastal communities strongly expressed the need for Government to consult their communities prior to decision-making and implementation.

Community views

Input from the local community was supportive of the park, but critical of perceived lack of monitoring of the existing area.

The ECC has not made any changes to this recommended park. Other nearby areas that were reconsidered during public consultation on this proposal include Point Nepean, The Nobbies and Cape Liptrap. The recommended Bunurong Marine National Park has a lower impact on the fishing industry and other users than do the alternatives.

Social and economic implications

Recreation and tourism

This area is popular for diving, cliff top sightseeing, and beach activities. One of the most popular recreational activities is exploring rockpools. Shore access is excellent with roads and car parks at many sites.

All fishing is currently prohibited, from the shore to 1 km offshore, in the sanctuary zone of the Bunurong Marine Park. Offshore boat-based recreational fishing is limited. The effect on recreational fishing of the recommended extension to the sanctuary zone will be minimal.

There will be no restrictions on boating, diving, and other non-harvesting activities.

Commercial fishing

This park will have a relatively minor impact on commercial fishing as fishing has been excluded from part of the area, to 1 km offshore, since 1991. The main commercial fishing activity is for rock lobster outside the boundary of the existing Sanctuary Zone.

The following estimates of fisheries catch and value were provided by MAFRI and are based on the 1996/97 year to allow consistent comparisons between areas. Values are based on 1999 prices. See Appendix 5 for a fuller discussion of fisheries estimates.

Rock lobster catches were estimated to be approximately 0.9 tonnes, or 1.3% of the Eastern Zone rock lobster catch, valued at about \$28 000.

Other fishing activities are minor with an estimated value of \$6 000.

Implementation and management

- Shore access to the park is excellent and a number of platforms have been constructed to allow viewing of the picturesque beaches, cliffs and extensive rock platforms. The high visitor numbers require continuous management effort.
- There have been repeated claims that the existing sanctuary zone has been stripped of abalone by illegal poaching. A recent review of biological information enabled quantitative assessments of spatial and temporal changes between 1991 and 1999. Fished populations were compared inside and outside the existing sanctuary zone. Analyses indicated the sanctuary was acting as a reserve for male blue throated wrasse, which are targeted for the live-fish market. No differences were detected in abalone population structure inside and outside the sanctuary. However, the Bunurong populations are not subject to strong commercial harvesting pressure.
- The existing marine park is well accepted and supported by the community, thereby facilitating compliance.
- Monitoring and assessment of the effectiveness of the park will be assisted by comparison with similar areas where activities such as fishing take place. Areas of the existing marine park adjacent to the sanctuary zone are already included in a monitoring program.

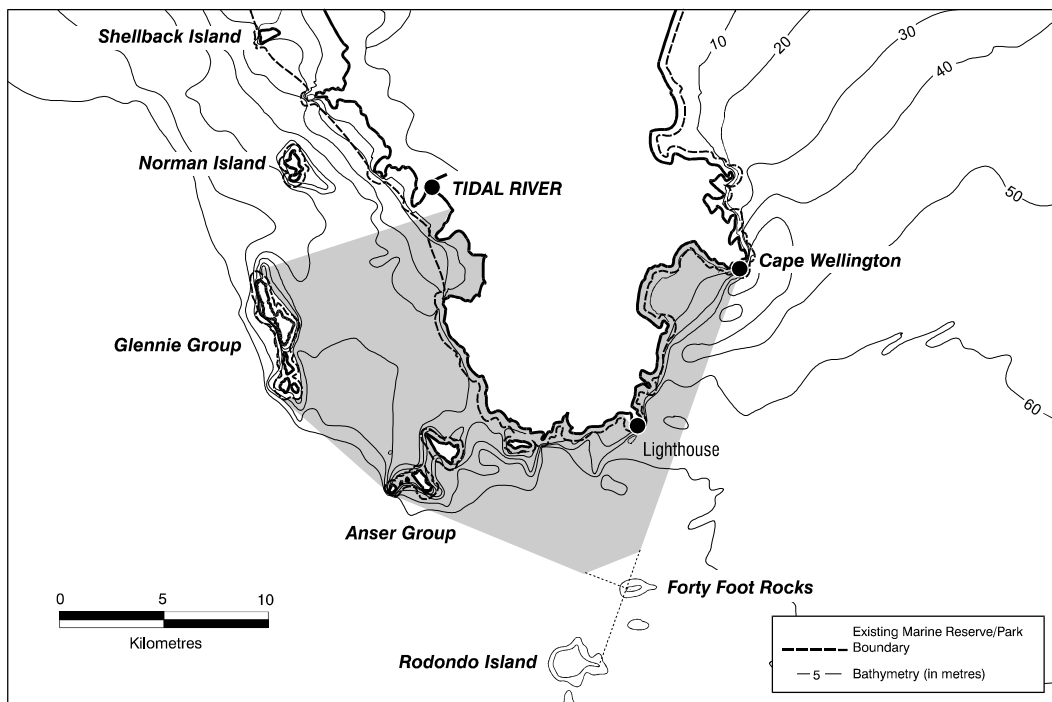
Recommendation

- A8** That the Bunurong Marine National Park of 2 150 ha shown on Map A be used in accordance with the general recommendations for marine national parks outlined on page 43.

References: 40, 126, 144, 147, 176, 242, 258, 289, 312, 393.



A9 Wilsons Promontory Marine National Park



This park, along with the Twelve Apostles, is one of two major new marine national parks recommended for Victorian waters, and is an extension of the existing marine reserve. It adjoins Wilsons Promontory National Park, including a number of the rugged and remote offshore granite islands.

Description of the park

- The only marine national park proposed for Victoria's Wilsons Promontory biophysical region.
- Located around the southern tip of Wilsons Promontory adjoining Wilsons Promontory National Park, and including the existing Wilsons Promontory Marine Reserve.
- Extends along the coastline from Norman Point in the west to Cape Wellington in the east, and offshore, encompassing several islands.
- Approximately 16 600 hectares.

Environmental values

- The following open coast habitat types are represented in the park: sandy beaches, intertidal and subtidal rocky reefs, and subtidal soft sediments.
- The granite habitats of this area are unusual in Victorian marine waters, including extensive heavy reefs with smooth surfaces, boulders and rubble and low profile reefs.

- Smooth walled granite cliffs plunging abruptly to the sea-floor, and sandy beaches sloping gradually to depths of 30 to 50 metres within 3 km offshore.
- Significant seagrass beds in some sheltered bays. Three species of seagrass: *Amphibolis antarctica* (eg Waterloo Bay), *Heterozostera tasmanica* (eg Oberon Bay), and *Halophila ovalis* (eg Waterloo Bay).
- Subtidal soft sediments consists of predominantly fine sand with some medium and coarse sand, silt and flat shell rubble, with a carbonate content of 2 to 60%.
- Deep heavy reefs have a dense cover of epifauna, especially sponges, stalked ascidians and sea wips, and are abundant in fish, including butterfly and magpie perches, leatherjackets and morid cods.
- Soft sediment areas among offshore reefs with diverse biotic assemblages, eg at 80 metres depth, off South East Point, extensive sponge gardens on flat shell rubble.
- A number of marine ecological communities have been identified recently for the proposed Wilsons Promontory Marine National Park. They were distinct from marine ecological communities at Bunurong (see Appendix 6 for details).



- The Wilsons Promontory area forms the distribution limit for a number of species. It is possible that these distributional patterns are due to dramatic sea-level fluctuations in the Pleistocene era that, at times of low sea level, kept Bass Strait above sea level. For example,
 - seagrass *Amphibolis antarctica* has its eastern distribution limit on the east side of the Promontory;
 - intertidal molluscs *Notoacmea mayi* and *Austrocochlea odontis* are common in western and central Victoria, but absent east of the Promontory;
 - a brittle star *Ophionthrix spongicola* is absent west of the Promontory;
 - there is a floristic discontinuity of some green algae such as *Caulerpa* spp, and brown algae including *Cystophora*; and
 - a number of fish species have their limits here.
- A number of islands are used for breeding by Australian fur seals and many oceanic birds, including little penguins, short-tailed shearwaters, fairy prions, silver gulls and Pacific gulls. Kanowna Island is one of the four breeding colonies of Australian fur seal in Victoria.
- Some of Victoria's most spectacular underwater scenery is documented in the descriptions of 29 diving sites, due largely to the near vertical granite 'dropoffs', and the frequent high clarity of water, particularly on the western coastline.

Aboriginal interests

- An application for a native title determination has been lodged including the recommended marine national park area.
- Gippsland and East Gippsland Aboriginal coastal communities strongly expressed the need for Government to consult their communities prior to decision-making and implementation.

Community views

There is strong support for a large marine national park off Wilsons Promontory. An issue that arose during public consultation was the impact on commercial fishing, especially abalone, but also rock lobster and finfish. Commercial fishers generally did not support the proposal, although some sectors indicated that they would support a much smaller park in this locality.

The ECC has made a major change to this recommended park by excluding the Glennies group of islands to reduce impact on commercial abalone harvesting.

Nearby areas that have been reconsidered during public consultation on this proposal include Shellback Island, Cape Liptrap and two small areas submitted to Council by a Working Group made up of commercial and recreational fishers, business and tourism interests. These areas were Leonard Point at Wilsons Promontory, and an area near the Hogan Group about 40 km ESE of the southern tip of the Promontory. These areas were not considered to adequately represent the habitats and biological communities of the region.

Social and economic implications

Recreation and tourism

The area is popular for diving. Part of the coastline adjacent to the proposed park is used for sightseeing, general beach activities and coastal bushwalking. There will be no restrictions on boating, diving, and other non-harvesting activities.

All forms of recreational fishing are currently prohibited to 300 metres offshore. Limited boat-based recreational fishing occurs outside this area. The effect of the recommended park on recreational fishing is likely to be limited due to the current restrictions, the remoteness of the area, and the availability of alternative areas.

Commercial fishing

Current commercial fishing activities include fishing for rock lobster, abalone and mesh netting. The following estimates of fisheries catch and value were provided by MAFRI and are based on the 1996/97 year to allow consistent comparisons between areas. However average catches over a number of years are also a useful measure in some situations and, where appropriate, additional comments are made about average catches. Values are based on 1999 prices for abalone, and 1998/99 for rock lobster. See Appendix 5 for a fuller discussion of fisheries estimates.

Abalone harvested within the area of the proposed park was estimated by MAFRI to be 23.3 tonnes or 3.3% of the Central Zone catch quota, valued at approximately \$791 000. The ECC in consultation with industry, has reviewed the figures for a number of years



and believes that the area's contribution to the Central Zone catch may be up to an additional 1.5%.

Rock lobster catches were estimated to be approximately 1.0 tonne, or 1.6% of the Eastern Zone rock lobster catch, valued at \$31 700. The ECC believes that the catch, although disputed by commercial rock lobster fishers, is a reasonable estimate.

Finfish taken using Danish seines, board trawls and mesh nets had an estimated value of \$138 000.

Implementation and management

- The proposed park is not readily accessible, although relative to its location has a large number of visitors. Abalone theft is a serious issue.
- The existing marine reserve and marine park at Wilsons Promontory are managed together with the terrestrial national park. Education and visitor materials about the existing parks are available through the interpretation centre at Tidal River.

- Monitoring and assessment of the effectiveness of the park will be assisted by comparison with similar areas where activities such as fishing take place. Areas which could be included in a monitoring program are the Glennies Group of islands and any sections of the Wilsons Promontory coast north of the proposed area.

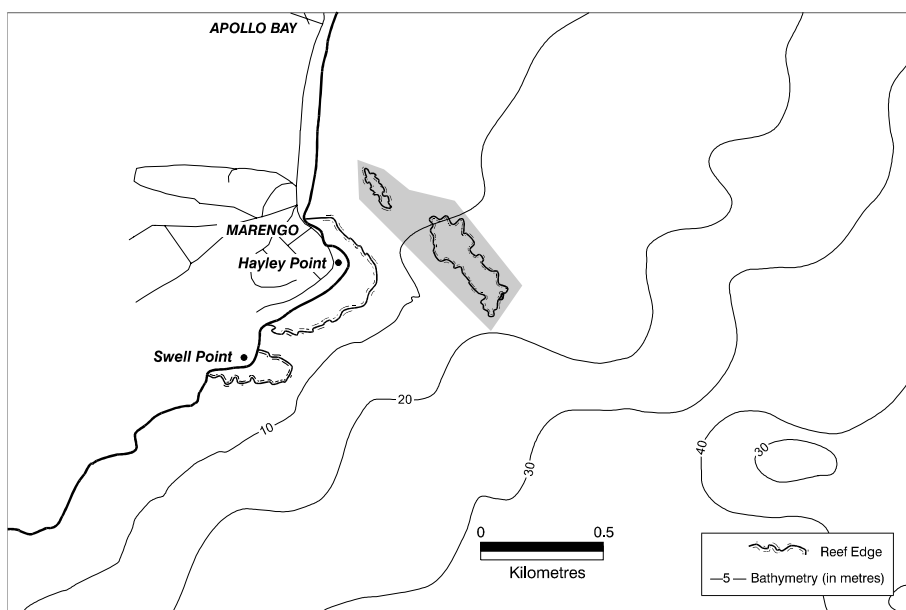
Recommendation

- A9** That the Wilsons Promontory Marine National Park of 16 600 ha shown on Map A be used in accordance with the general recommendations for marine national parks outlined on page 43.

References: 40, 125, 147, 176, 242, 289, 292, 334, 372, 393.



B3 Marengo Reefs Marine Sanctuary



Marengo Reefs Marine Sanctuary is located close to shore at Marengo, near Apollo Bay.

It is approximately 18 ha and is recommended for its value for public education and underwater recreation.

Environmental values

- Due to their location and configuration, these two small reefs provide a wide variety of microhabitats in a very small area.
- The leeward side of the reefs has protected conditions unusual for reefs on this high wave-energy coastline.
- Bull kelps and other seaweeds grow densely on the reefs, with an abundance of soft corals, sponges and other marine invertebrates.

Aboriginal interests

- The Aboriginal community seeks a role in the process of authorising tourism, scientific and commercial activities.
- Local Aboriginal groups are concerned that the sanctuary may prevent traditional access to flora and fauna.

Implications for users

- In suitable weather the reefs are readily accessible by boat from the harbour at Apollo Bay, or by swimming from shore.
- There are excellent snorkelling opportunities close to shore.
- Recreational boat-based fishing is popular over the sandy bottom in the shelter of the reefs. The recommended boundary will allow this to continue.

- The fringes of the reef are currently used sporadically for commercial rock lobster and abalone fishing. Estimates are difficult to establish with certainty, but industry indicates that the total reef complex of which the recommended sanctuary is a part has significant abalone catches of up to 15 tonnes per annum.

Implementation and management

- The proposed boundary follows the outer perimeter of the reefs plus a 20 metre buffer.

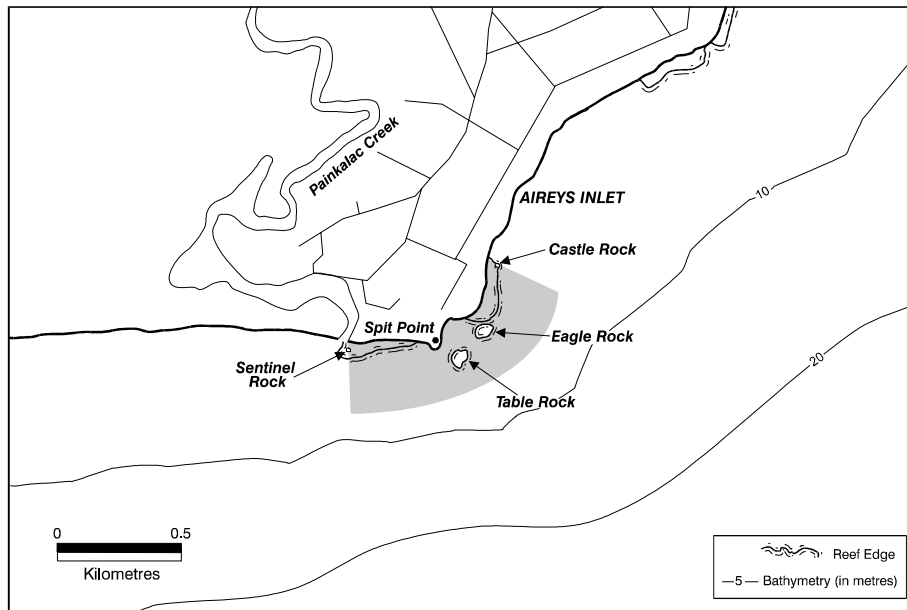
Note that the recommended area includes only the two major reefs as indicated on the above map.

Recommendation

B3 That the Marengo Reefs Marine Sanctuary of approximately 18 ha shown on Map A be used in accordance with the general recommendations for marine sanctuaries outlined on page 45.



B4 Eagle Rock Marine Sanctuary



Eagle Rock Marine Sanctuary is located at Airey's Inlet.

The area is approximately 25 ha between the Painkalac Creek mouth and Cattle Rock extending about 300 metres offshore, and is recommended for the opportunities it provides to observe marine life.

Environmental values

- The varied geology of Eagle Rock (sandstone and basalt), with its associated range of shore platforms, pools, subtidal fissures and boulder fields, provides a variety of habitats.
- Diversity of invertebrates on the rock platforms remains high, despite some evidence of subtidal depletions due to harvesting.
- Sponges, subtidal kelp forests and invertebrate assemblages, including seastars, crabs and sea anemones are found in this area.

Aboriginal interests

- Aboriginal groups suggest that a survey needs to be conducted relating to access to the area, and query whether cultural heritage requirements have been met relating to the location of paths.
- This area is inter-related with Painkalac Creek, which is a highly significant cultural place.
- Eastwards of Painkalac Creek is soft sand, which Aboriginal groups indicate means an extremely high possibility of burial sites.

Implications for users

- The reefs are good locations for snorkelling and diving when conditions are calm.
- The area is currently used for recreational rock lobster and abalone harvesting.
- The reefs within the recommended sanctuary are a part of a larger reef complex used for commercial abalone harvesting.

Implementation and management

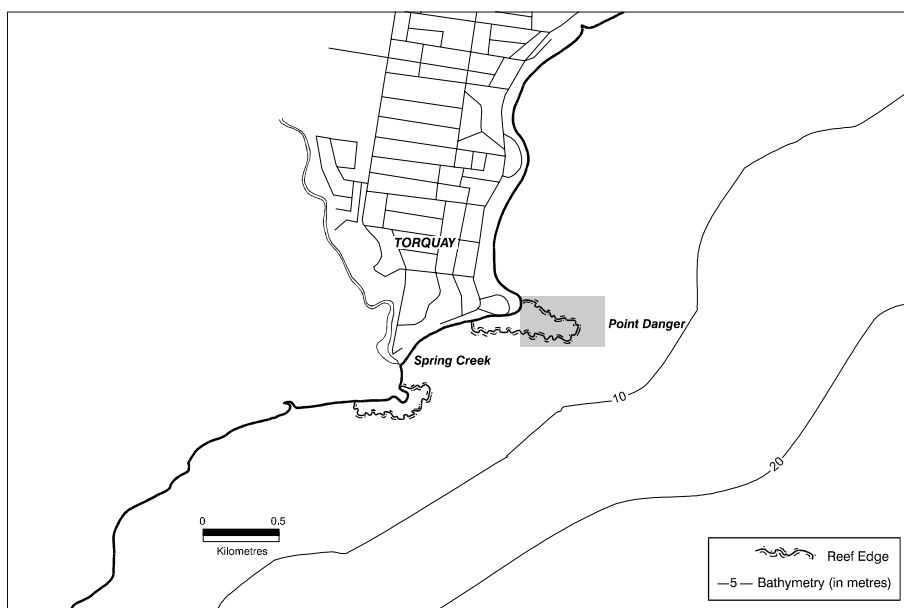
- Following public consultation on the proposal, the area has been altered to provide for clear identification of onshore boundaries, and to ensure that adequate subtidal reef habitats are included in the sanctuary.

Recommendation

B4 That the Eagle Rock Marine Sanctuary of approximately 25 ha shown on Map A be used in accordance with the general recommendations for marine sanctuaries outlined on page 45.



B5 Point Danger Marine Sanctuary



Point Danger Marine Sanctuary is located at Torquay.

It is approximately 20 ha, extending to the east for about 600 metres and to the south for 300 metres. It is recommended for the ecological values of the intertidal area, particularly the diversity of seaslugs (opisthobranchs).

Environmental values

- As well as the typically high invertebrate diversity associated with limestone substrates in Victoria, about 20% of the 96 species of opisthobranchs recorded from this site have yet to be scientifically described.

Aboriginal interests

- Aboriginal groups suggest that a survey needs to be conducted relating to access to the area, and query whether cultural heritage requirements have been met relating to the location of paths.
- Aboriginal groups indicate that there is a high possibility of middens, archaeological sites and burials.
- Concern has been expressed about the threat to cultural heritage sites and the environment resulting from high numbers of visitors.

Implications for users

- Point Danger is very popular for sightseeing and shore walks, and is visited by large numbers of people.
- There is currently some recreational fishing for King George whiting and snapper; and a small amount of commercial fishing, mainly for abalone.

Recommendation

B5 That the Point Danger Marine Sanctuary of approximately 20 ha shown on Map A be used in accordance with the general recommendations for marine sanctuaries outlined on page 45.



B6 Barwon Bluff Marine Sanctuary



Barwon Bluff Marine Sanctuary is located at Barwon Heads.

It is approximately 18 ha and is recommended for its values for marine education.

Environmental values

- Sandstone and basalt reefs with thick patches of giant and bull kelp.
- The wrecks of two ships are located on the outer edges of the reef.

Aboriginal interests

- The area is listed under the *Archaeological and Aboriginal Relics Preservation Act 1972* (Vic).
- Middens are located along the shore. Sites located in this area require further investigation.
- The local Aboriginal community is concerned about increased visitor pressure on cultural values.

Implications for users

- The shore platforms and shallow reefs of Barwon Bluff are used extensively for marine education and interpretation by schools, universities and the Marine Discovery Centre at Queenscliff.
- Popular area for activities including swimming, rock pool rambling and snorkelling.
- Commercial abalone harvesting and recreational fishing currently take place in parts of the recommended sanctuary. The abalone industry indicates catches from this area of about 4 tonnes per annum.

Implementation and management

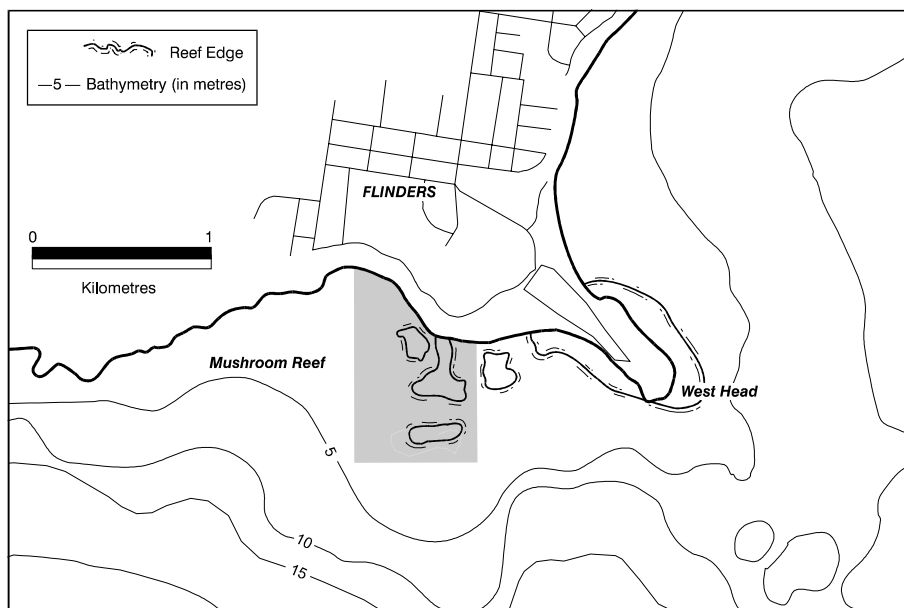
- Visitor pressure is a potential threat to this site, and must be managed to maintain the natural, cultural and educational values.

Recommendation

B6 That the Barwon Bluff Marine Sanctuary of approximately 18 ha shown on Map A be used in accordance with the general recommendations for marine sanctuaries outlined on page 45.



B10 Mushroom Reef Marine Sanctuary



Mushroom Reef Marine Sanctuary is located on the open coast at Flinders on the Mornington Peninsula.

The area of approximately 80 ha and is recommended for its ecological values, and for its values for underwater recreation and potentially for marine education.

Environmental values

- Together with Honeysuckle Reef at Shoreham, this site supports the most diverse intertidal rocky reef communities in Victoria (Handreck & O'Hara 1994).
- Mushroom Reef is an exposed ocean area containing numerous subtidal pools and boulders in the intertidal area. The high complexity of the intertidal basalt substrates provides a rich variety of microhabitats.

Implications for users

- The subtidal reefs are popular for diving, snorkelling and novice spearfishing.
- There is some commercial diving for abalone on the reef immediately south of Mushroom Reef, known as Bismarck Reef, but this is often difficult to access due to high wave action. Bismarck Reef is not included in the proposed sanctuary.
- Recreational anglers often fish the 'lagoon' between the Mushroom and Bismarck reefs.
- This area is a popular area for recreational collection of abalone, though anecdotal reports indicate that stocks have suffered greatly as a result of over-harvesting.

Implementation and management

- Following public consultation on this proposal, the boundary of the sanctuary has been modified, to better capture the values associated with Mushroom Reef and avoid some of the commercial abalone reef to the south east of the reef. The boundaries run due south of the hang glider launch ramp to a point immediately south of the Bismarck Reef then due east along the southern edge of the Bismarck Reef then between the Mushroom Reef and an unnamed reef to shore.
- A decline in intertidal invertebrates has been noted in recent years, despite some protection through shellfish protection regulations.

Recommendation

B10 That the Mushroom Reef Marine Sanctuary of approximately 80 ha shown on Map A be used in accordance with the general recommendations for marine sanctuaries outlined on page 45.



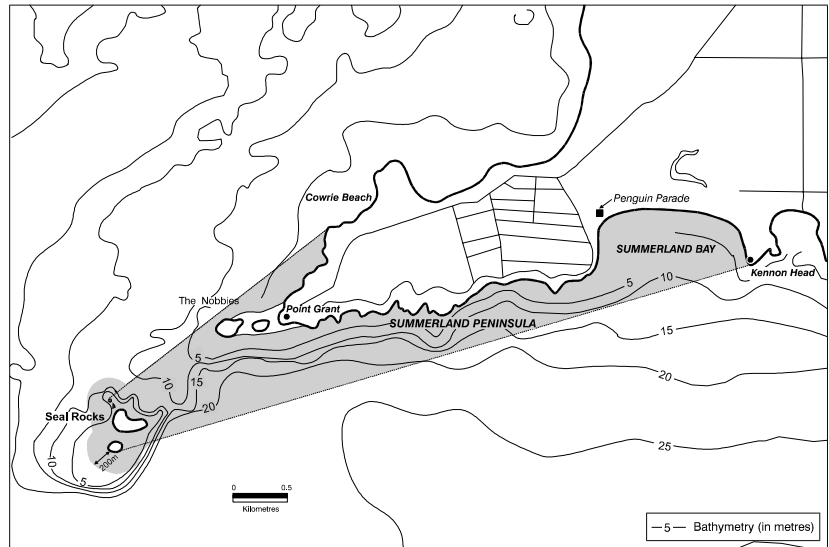
Special Management Areas

C15 Summerland Peninsula (Phillip Island)

Values

This 400 ha area is recommended to complement management of the wildlife values of both Seal Rocks and the penguin colonies at Phillip Island.

The Summerland Peninsula is home to the famous colony of little penguins and significant numbers of short-tailed shearwaters. Seal Rocks is one of Victoria's two largest breeding colonies of Australian fur seals. It is also the only Victorian breeding site of the kelp gull, and is a breeding site for the sooty oyster catcher. Seal Rocks are exposed basalt rocks, and the surrounding waters are rich in marine life, including the endangered great white shark.



Management issues

Phillip Island Penguin Parade is a major tourist attraction and generates a substantial income, a large part of which is spent on conservation programs. Although the Penguin Parade occupies only a small area at the west end of Summerland Bay, the penguins utilise a much larger area for feeding and nesting. The penguins collect in 'rafts' on the water surface off the southern coast of the Summerland Peninsula, prior to making their way to their nests, and can be easily disturbed by inappropriate boating.

Seal Rocks, the Nobbies and the penguin habitat on Summerland Peninsula form part of the Phillip Island Nature Park.

Consistent with management recommendations for waters adjacent to other seal breeding colonies, restrictions on the use of rock lobster pots, nets and line fishing should be put in place within 200 metres of Seal Rocks. Disturbance to the colony during the breeding season (typically between mid October and late December) should be avoided, and managers should ensure that vessel access is appropriately regulated during this time.

Vessel access and speed within the above area should be managed throughout the year to minimise disturbance to penguins.





Recommendations

Part Three

Recommendations for the Eastern biophysical region

This section sets out the recommendations for marine protected areas for the open coast east of Wilsons Promontory to the New South Wales border.

Victoria's Eastern biophysical region is incorporated into the IMCRA Twofold Shelf region which extends to Tathra in southern New South Wales and includes Tasmania's Kent Group of islands in Bass Strait. The coastline is dominated by dunes and associated sandy shorelines including the long sweep of the Ninety Mile Beach and the coastal wilderness of Croajingolong National Park. The marine environment along this coastline incorporates the warmer water environments close to the NSW border. Warmer water habitats off east Gippsland are often very diverse, including flora and fauna from both cool and warm water.

Other than Lakes Entrance, there are few large regional centres situated on the coast in eastern Victoria. There are however a number of smaller towns such as Mallacoota, Seaspray, and Marlo, where agriculture, tourism, fishing, and consumer services are important economic activities. Oil and gas from the offshore Gippsland Basin platforms are brought onshore in the Ninety Mile Beach area, and piped for processing in plants at Longford near Sale.

This part of the report gives descriptions of the following recommended marine national parks, marine sanctuaries, and special management areas. See the Executive Summary for a table of changes to the recommendations since the Draft Report.

Section 3.7 of this report provides an overview of the recommendations for marine protected areas, including recommendations for permitted uses and activities.

Recommended Areas

Marine National Parks

- A11** Ninety Mile Beach Marine National Park
- A12** Point Hicks Marine National Park
- A13** Cape Howe Marine National Park

Marine Sanctuary

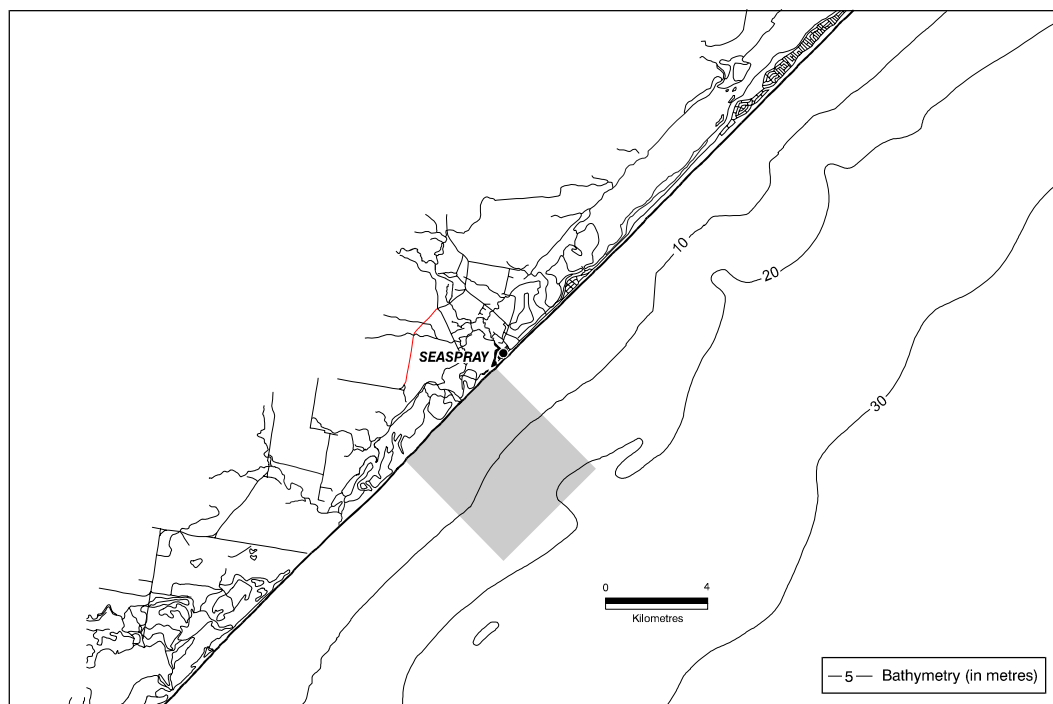
- B11** Beware Reef Marine Sanctuary

Special Management Areas

- C16** The Skerries
- C18** Gabo Island harbour



A11 Ninety Mile Beach Marine National Park



The recommended park captures typical marine habitats in Victoria's well-known Ninety Mile Beach area, including scientifically significant low profile offshore reefs. The park has been located to minimise impacts on fishing along this popular coastline.

Description of the park

- One of three marine national parks, with Point Hicks and Cape Howe, proposed for Victoria's Eastern biophysical region.
- Located about 40 km south of Sale, south west of Seaspray.
- Extends along approximately 5 km of coastline southwest of Seaspray, and offshore approximately for three nautical miles to the limit of Victorian waters.
- Approximately 2 750 hectares.

Environmental values

- The following open coast habitat types are represented in the park: sandy beaches, subtidal rocky reefs and subtidal soft sediments.
- The rocky habitats of this area include patchy low profile, calcarenite reefs (from a few centimetres to a metre high). The lowest lying reefs can be covered and uncovered periodically by sand, driven by very strong, tidal currents (2 to 2.5 knots) characteristic of this area. Reefs cover about 20% of the area, are flat topped with occasional small ledges and crevices. The reef area extends from 1 to 4 km (and possibly further) offshore, at depths of 5 to 20 metres.

- Subtidal soft sediments consist of a mixture of fine and medium sand with some silt, gravelly sand and shell, with a carbonate content of 14 to 19%.
- Reefs are dominated by invertebrates (70% coverage) and have sparse floral communities. Large kelps are absent and only small red algae are visible.
- Invertebrates include sponges and ascidians, and smaller bryozoans and hydroids. Clumps of ascidians (mainly *Pyura australis*) also occur on sand between reefs.
- *Coscinasterias muricata*, a large endemic southern Australian seastar, occurs here in large numbers, although its usual prey of mussels, abalone and scallops is absent.
- *Pseudogorgia godeffroyi*, an unusual soft coral is only found in Victoria between McGuarans and Delray beaches.
- The low relief reefs may be remnants of dune systems that formed when sea-levels were lower. This is supported by the presence, between some reefs, of mud containing fossils.
- There is good evidence of aggregations of young white sharks indicating this area to be their feeding grounds; snapper (likely food of sharks) are also known to feed here.



Aboriginal interests

- An application for a native title determination has been lodged including the recommended marine national park area.
- Gippsland and East Gippsland Aboriginal coastal communities strongly expressed the need for Government to consult their communities prior to decision-making and implementation.

Community views

Input from the local community centred on impacts on shore-based recreational fishing. Commercial fishers generally did not oppose the proposal.

In response to suggestions from the local communities, the park has been relocated to broadly similar habitats to the south-west, near Seaspray, to further reduce the impact on shore-based recreational fishing.

Social and economic implications

Impacts on coastal communities

The nearest township to this park is Seaspray with an estimated population of 200 residents.

Seaspray is a small coastal community, with a high level of holiday home ownership and is a 'retiree haven'. Consumer services (including retail trade and accommodation, cafes and restaurants) with 45% of employed residents, is the key industry in the town. The town does not rely on the fishing industry, although recreational fishing is an attraction for residents and visitors. The establishment of Ninety Mile Beach Marine National Park is unlikely to have any adverse effects on Seaspray's economy. (See Appendix 4 for more details.)

Recreation and tourism

The whole of this coastline is popular for recreational surf-fishing and beach activities.

Charter boat operators offering boat-based recreational fishing for shark, pike and snapper are increasing in popularity, as is other boat-based recreational fishing.

On balance, the recommended park should have a minor overall effect on recreational fishing in the region, given the ready accessibility of much of this coastline. This site has been recommended to minimise the overall impact on local communities.

There will be no restrictions on boating, diving, and other non-harvesting activities.

Commercial fishing

The major commercial activity – trawling – occurs along the entire length of the Ninety Mile Beach. The proposed park includes only a very small part of these fishing grounds.

Although estimates are not available, the value of commercial fishing in the proposed park is probably relatively low. The overall impact of the proposed park is likely to be minor, given the large alternative areas available. The presence of low reef reduces the netting effort in the area.

Petroleum exploration and extraction

The recommended park is near the oil and gas fields of the Gippsland Basin. All the current production comes from offshore platforms outside Victorian waters. All the existing pipelines are outside the recommended parks. Oil and gas pipelines will be allowed subject to an Environment Effects Statement process, as for terrestrial national parks. However any future pipelines are likely to be along or adjacent to the existing easements.

Oil and gas exploration that does not disturb the seabed and biota will be allowed, but exploratory drilling and extraction will not be permitted in marine national parks.

Implementation and management

- The park is relatively inaccessible from the land, except through private property. It is readily accessible by boat from Seaspray.
- Monitoring and assessment of the effectiveness of the park will be assisted by comparison with similar areas where activities such as fishing take place. Any areas off the Ninety Mile Beach between Woodside Beach and Golden Beach could be included in a monitoring program.

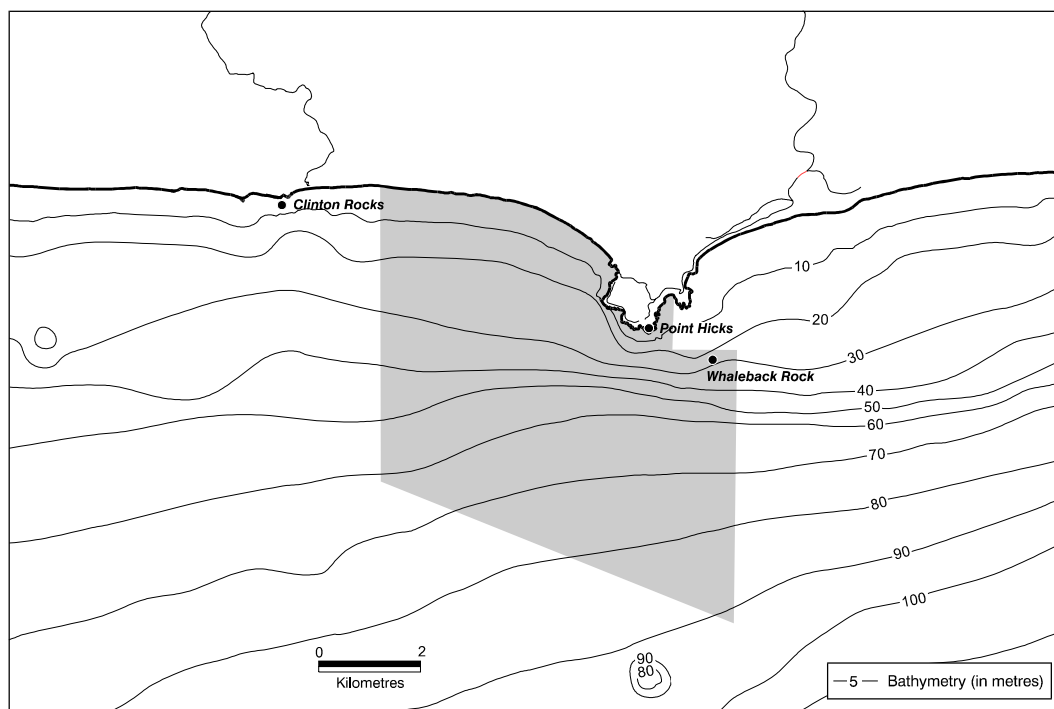
Recommendation

A11 That the Ninety Mile Beach Marine National Park of 2 750 ha shown on Map A be used in accordance with the general recommendations for marine national parks outlined on page 43.

References: 40, 177.



A12 Point Hicks Marine National Park



Point Hicks was the first point on the coast seen in 1770 from Captain Cook's ship Endeavour. This recommended park adjoins the major granite outcrop and spectacular lighthouse of Point Hicks, part of Croajingolong National Park. The rich marine life of the area, with its colourful algae and diverse reef fish, provide excellent opportunities for diving and snorkelling.

Description of the park

- One of three marine national parks, with Cape Howe and Ninety Mile Beach, proposed for Victoria's Eastern biophysical region.
- Located about 25 km south-east of Cann River, and adjacent to Croajingolong National Park.
- Extends along approximately 8 km of coastline west of Point Hicks, and offshore to the east of Point Hicks to include Whaleback Rock approximately for three nautical miles to the limit of Victorian waters.
- Approximately 4 050 hectares.

Environmental values

- The following open coast habitat types are represented in the park: sandy beaches, intertidal and subtidal rocky reefs, and subtidal soft sediments.
- The rocky habitats of this area have varied forms from large boulders rising to 6 metres to clusters of smaller rocks and stones.

- Subtidal soft sediments consist of a mixture of fine, medium and coarse sand with some silt, pebbles and shell, with a carbonate content of 8 to 13%.
- Very high total species richness of fauna, including intertidal and shallow subtidal invertebrates. A survey of the reef just outside the park boundary had more species than from anywhere else on the Victorian coast. It is likely that similar species richness occurs within the reefs in the proposed park.
- Plentiful and beautiful marine flora and fauna, including spectacular subtidal reefs with colourful and diverse sessile invertebrates.
- Kelps including *Ecklonia* and *Phyllospora* and small algae.

Aboriginal interests

- An application for a native title determination has been lodged including part of the recommended marine national park area.



- Gippsland and East Gippsland Aboriginal coastal communities strongly expressed the need for Government to consult their communities prior to decision-making and implementation.

Community views

Input from the local community centred on the impact on shore-based recreational fishing and collecting at Clinton Rocks. Commercial fishers generally did not support the proposal, although some sectors indicated that they would support a much smaller park in this locality.

The ECC has made a substantial change to this recommended park by excluding Clinton Rocks to reduce impact on the recreational activities of Cann River and Tamboon Inlet residents, and by including Whaleback Rock to improve habitat representation. The offshore boundary was straightened for easier identification at sea. The major reefs for commercial abalone harvesting were already excluded from the earlier draft recommendation. Other changes to the recommended park would not be possible without significantly reducing the ecological viability of the park.

Other nearby areas that were reconsidered during public consultation on this proposal were around or near Cape Conran, Petrel Point, Rame Head, The Skerries, Little Rame Head, and Sandpatch Point. Input from earlier consultation indicated that they were less acceptable on balance than the recommended location due to the impacts on users, particularly commercial fishers.

Social and economic implications

Impacts on coastal communities

The nearest townships to this park are Cann River with an estimated population of about 190 residents and Mallacoota with about 1 000 residents.

Manufacturing, mainly timber production, is the key industry base of Cann River, employing 27% of residents. Also 27% are employed in consumer services such as accommodation, cafe and restaurants, and retail trade. The town is promoted as a small community with access to scenic drives, bushwalking and fishing, particularly to the popular Tamboon Inlet and Clinton Rocks. The economy of Cann River – not a base for commercial fishing – is unlikely to be affected by the establishment of Point Hicks Marine National Park (see Appendix 4 for more details). However, Cann River is a small rural town that has experienced the decline of its key industry – timber

harvesting – and in these circumstances any additional change can be perceived as a threat to the community.

Mallacoota relies to a large extent on leisure services (see A13 Cape Howe Marine National Park). Point Hicks, together with Cape Howe Marine National Park, will enhance the overall nature-based tourism assets of the region.

The agriculture, forestry and fishing sector, and manufacturing sector (mainly fishing related) are equally important for Mallacoota (see discussion in A13 Cape Howe Marine National Park). The impact of the Point Hicks Marine National Park on commercial fishing (see below) may have some flow-on effects on Mallacoota's economy. Although it is not possible to determine exactly the level of this impact, it can be said that the level of commercial fishing-related activities, including fish processing, may be affected but the viability of the operations will not. (See Appendix 4 for more details.)

Recreation and tourism

The general area is popular for recreational fishing, snorkelling and diving due to the rich and colourful marine life and the variety of reef fishes. There will be no restrictions on boating, diving, and other non-harvesting activities.

The Point Hicks Lighthouse Reserve and two camping areas, at the mouths of the Thurra and Mueller Rivers east of the proposed park, provide a focus for walking and sightseeing. Accommodation is provided at the lighthouse. The potential increase of visitors to Point Hicks Lighthouse Reserve and the two camping areas at the mouths of the Thurra and Mueller Rivers may provide considerable potential for marine and land based interpretation programs.

For recreational fishing, the effect of the proposed park should be limited. The most popular recreational fishing areas on the beach east of Point Hicks, the accessible rock fishing areas on the east side of the point, and Clinton Rocks are not included in the proposed park.

Commercial fishing

Current commercial fishing activities include fishing for abalone, rock lobster and mesh netting. The following estimates of fisheries catch and value were provided by MAFRI and are based on the 1996/97 year to allow consistent comparisons between areas. However average catches over a number of years are also a useful measure in some situations and, where appropriate, additional comments are made about average catches. Values are based on 1999 prices for



abalone and 1998/99 for rock lobster. See Appendix 5 for a fuller discussion of fisheries estimates.

Abalone harvested within the area of the proposed park was estimated to be 16.7 tonnes or 3.6% of the Eastern Zone catch quota, valued at approximately \$567 000.

Rock lobster catches were estimated to be approximately 0.9 tonnes, or 1.3% of the Eastern Zone rock lobster catch, valued at \$28 000. This estimate had a high random standard error associated with it, and the ECC believes that the actual catch may be higher (see Appendix 5 for details).

Other significant commercial fishing activity within this area, mainly mesh netting, is estimated to be worth approximately \$42 000 for 1996/97. The current catches in the area of the proposed park are likely to be greater than that estimated for 1996/97.

Implementation and management

- The proposed park is readily accessible from the shore, with good road access to the park available from Cann River, a one-hour drive away. Two camping areas, at the mouths of the Thurra and Mueller Rivers, east of the park provide a focus for day visitor use.
- Monitoring and assessment of the effectiveness of the park will be assisted by comparison with similar areas where activities such as fishing take place. Areas which could be included in a monitoring program are Petrel Point, Rame Head, Skerries, Little Rame Head, Sandpatch Point, Cape Conran and areas to the east of Point Hicks excluded from the park.

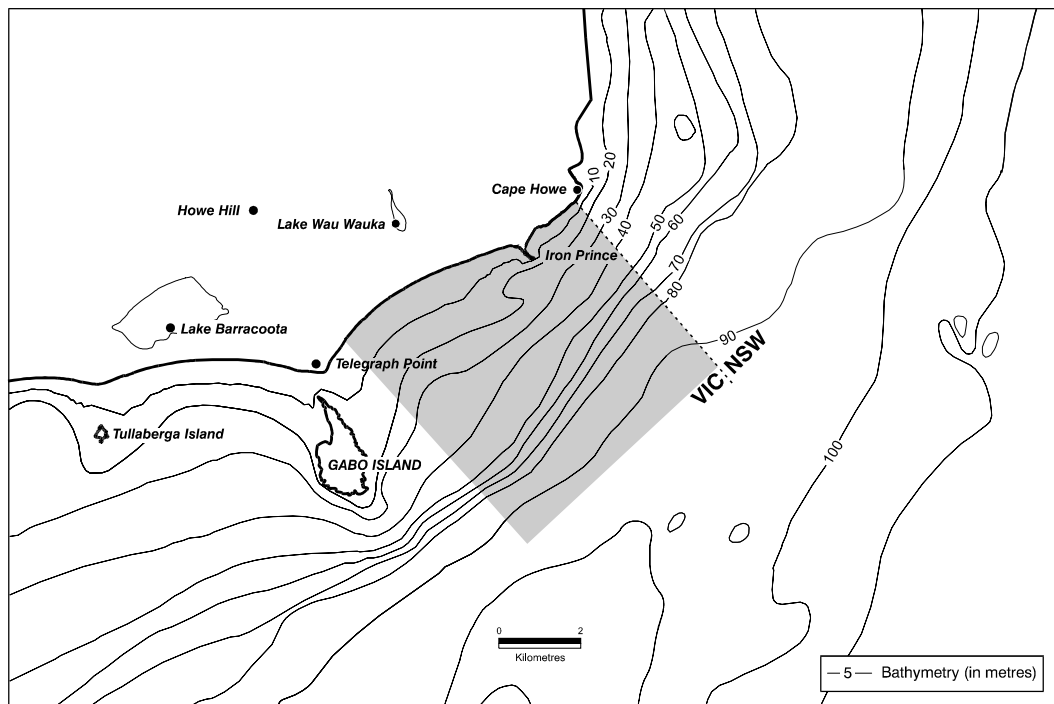
Recommendation

A12 That the Point Hicks Marine National Park of 4 050 ha shown on Map A be used in accordance with the general recommendations for marine national parks outlined on page 43.

References: 40, 176, 242, 258, 289, 332.



A13 Cape Howe Marine National Park



This recommended park is the most remote in the State, and adjoins one of only two wilderness areas on Victoria's coast.

Description of the park

- One of three marine national parks, with Point Hicks and Ninety Mile Beach, proposed for Victoria's Eastern biophysical region.
- Located about 15 km east of Mallacoota, and adjacent to Croajingolong National Park.
- Extends along approximately 7 km of coastline from 2 km east of Gabo Island to the New South Wales border, and offshore approximately for three nautical miles to the limit of Victorian waters.
- Approximately 3 850 hectares.

Environmental values

- Croajingolong National Park, together with NSW's Nadgee Nature Reserve, is part of the largest coastal conservation reserve on the south-eastern Australian mainland. The proposed marine national park is adjacent to the Cape Howe Wilderness Area.
- The following open coast habitat types are represented in the park: sandy beaches, intertidal and subtidal rocky reefs, and subtidal soft sediments.

- The rocky habitats of this area have complex forms/structure, including low profile reef eroded into pits and gutters, and heavy boulder reef with gutters and ridges up to 3 metres high.
- Subtidal soft sediments consist of a mixture of fine and medium sand with some silt, shell and worm tubes, with a carbonate content of 6 to 10%.
- High diversity of intertidal and shallow subtidal invertebrates.
- Many species from warmer northern waters reach their southern limits in far east Gippsland.
- Variety of reefs including granite and sandstone reefs adding to the total substrate complexity of the area. Sandstone reefs observed in the park to about 50 metres depth heavily covered by a diverse array of sponges, hydroids, ascidians and gorgonians.

Aboriginal interests

Gippsland and East Gippsland Aboriginal coastal communities strongly expressed the need for Government to consult their communities prior to decision-making and implementation.



Community views

Input from the local community centred on the implications for commercial fishing, and the potential difficulties of management and enforcement.

The ECC has not made substantial changes to this recommended park, other than straightening part of the seaward boundary for easier identification at sea. Reducing the area of the recommended park would not be possible without significantly reducing the ecological viability of the park.

Other nearby areas that were reconsidered during the public consultation on this proposal were around or near Petrel Point, Rame Head, The Skerries, Little Rame Head and Sandpatch Point.

Social and economic implications

Impacts on coastal communities

The nearest township to this park is Mallacoota with an estimated population of 1 000 residents.

Leisure services such as accommodation, café and restaurants and retail trade, with 26% of employed residents, are key industries of the town. Mallacoota is actively promoted as a holiday destination offering a range of nature-based experiences including fishing, walking and adventure tours. Some 20 fishing areas in and surrounding Mallacoota are promoted for recreational fishing, with Mallacoota Inlet identified as one of the most popular sites. The Cape Howe Marine National Park together with the Point Hicks Marine National Park would enhance the overall nature-based tourism assets of the region.

The agriculture, forestry and fishing sector, and manufacturing (mainly fishing-related) industries engage 12.1% and around 11% employed residents respectively. Abalone fishing and processing is particularly important to the town. The impact of the Cape Howe Marine National Park on commercial fishing (see below) may have flow-on effects on Mallacoota's economy if abalone catches fall. Although it is not possible to determine exactly the level of this impact, it can be said that the level of commercial fishing-related activities, including fish processing, may be affected but the viability of the operations will not. (See Appendix 4 for more details.)

Recreation and tourism

The area is used for boat-based recreational fishing, although boating access from Mallacoota Inlet to offshore waters is sometimes difficult. Most boat-

based fishing takes place west of Gabo Island but waters east of Gabo Island are also used depending on weather conditions. Effects on recreational fishing have been minimised by excluding the sheltered waters around Gabo Island from the park.

There will be no restrictions on boating, diving, and other non-harvesting activities.

Development of a new boat launching facility at Mallacoota, providing access to offshore waters, has been under discussion for some time.

The adjacent mainland is a spectacular coastline for remote bushwalking.

Commercial fishing

Current commercial fishing activities include fishing for rock lobster, abalone, and mesh netting, haul, purse and Danish Seining. The following estimates of fisheries catch and value were provided by MAFRI and are based on the 1996/97 year to allow consistent comparisons between areas. However average catches over a number of years are also a useful measure in some situations and, where appropriate, additional comments are made about average catches. Values are based on 1999 prices for abalone, and 1998/99 for rock lobster. See Appendix 5 for a fuller discussion of fisheries estimates.

Abalone harvested within the area of the proposed park was estimated to be 19.7 tonnes or 4.3% of the Eastern Zone catch, valued at approximately \$667 000.

Rock lobster catches were estimated to be less than 100 kg in 1996/97, valued at approximately \$2 000.

Other fishing activities include mesh netting, haul, purse and Danish seining. A developmental fishery for sea urchins utilises reefs in these waters. Estimated total value of these commercial fishing activities in the area of the proposed park was \$97 000.

The impact of the park on commercial fishing has been minimised by not including the waters around Gabo Island in the proposal.

Implementation and management

- The proposed park is not readily accessible, is remote from vehicle access, and borders NSW waters. Abalone theft is a serious issue, which must be addressed cooperatively with NSW authorities.



- Monitoring and assessment on the effectiveness of the park will be assisted by comparison with similar areas where activities such as fishing take place. Areas which could be included in a monitoring program are Petrel Point, Rame Head, Skerries, Little Rame Head and Sandpatch Point.
- A contiguous NSW park would facilitate management. Discussions have been initiated with the relevant NSW agencies.

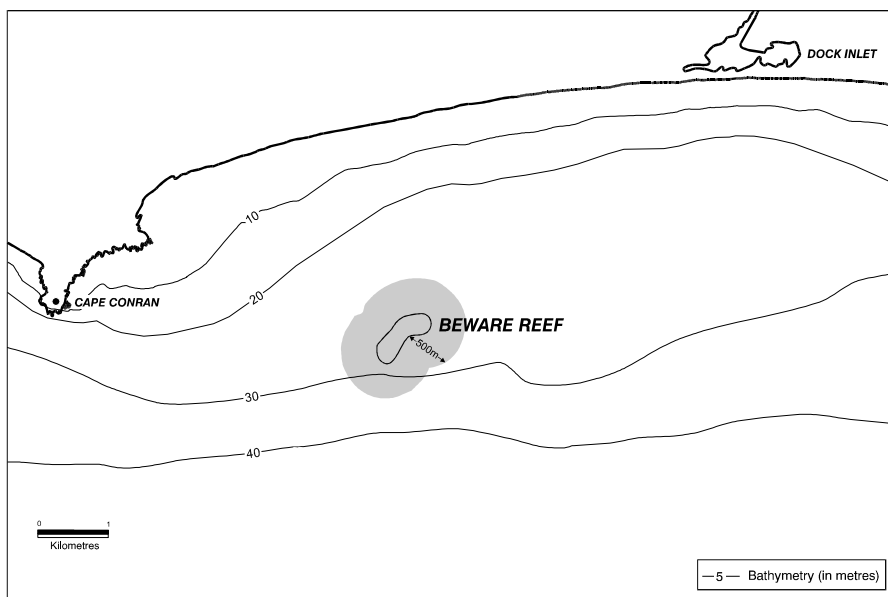
Recommendation

- A13** (i) That the Cape Howe Marine National Park of 3 850 ha shown on Map A be used in accordance with the general recommendations for marine national parks outlined on page 43; and
- (ii) that the Victorian Government initiate discussions with the New South Wales Government to develop a joint proposal for a Victorian/New South Wales marine protected area.

References: 176, 242, 258, 289, 332.



B11 Beware Reef Marine Sanctuary



Beware Reef Marine Sanctuary is located south-east of Cape Conran in East Gippsland.

It is approximately 220 ha, extending for a distance of 500 metres from the reef edge and is recommended for its contribution to representation of reef environments in the Eastern biophysical region, and for its values for underwater recreation.

Environmental values

- The granite reef has forests of bull kelp and shipwreck remains.
- A diversity of corals, sponges, sea anemones, gorgonians, zooanthids, crinoids and other invertebrates have been recorded, with more than 20 species of reef fish present.

Aboriginal interests

- An application for a native title determination has been lodged including the recommended marine sanctuary area.
- Gippsland and East Gippsland Aboriginal coastal communities strongly expressed the need for Government to consult their communities prior to decision-making and implementation.

Implications for users

- This reef is currently used for commercial abalone and rock lobster fishing. The value of abalone catch from this area is determined from catch and effort data. The entire reef is included in one reef code. Between 1988/89 and 1996/97 the average weight of abalone attributed to Beware Reef is 4.3 tonnes, or 0.9% of the Eastern Zone catch, valued at \$146 000 using average 1999 prices.
- Beware Reef is also a significant area for rock lobster fishers. Catch data indicate that for this area the annual catch is less than one tonne.
- The area is used by boat-based recreational anglers and divers, launching from Cape Conran.

Recommendation

B11 That the Beware Reef Marine Sanctuary of approximately 220 ha shown on Map A be used in accordance with the general recommendations for marine sanctuaries outlined on page 45.



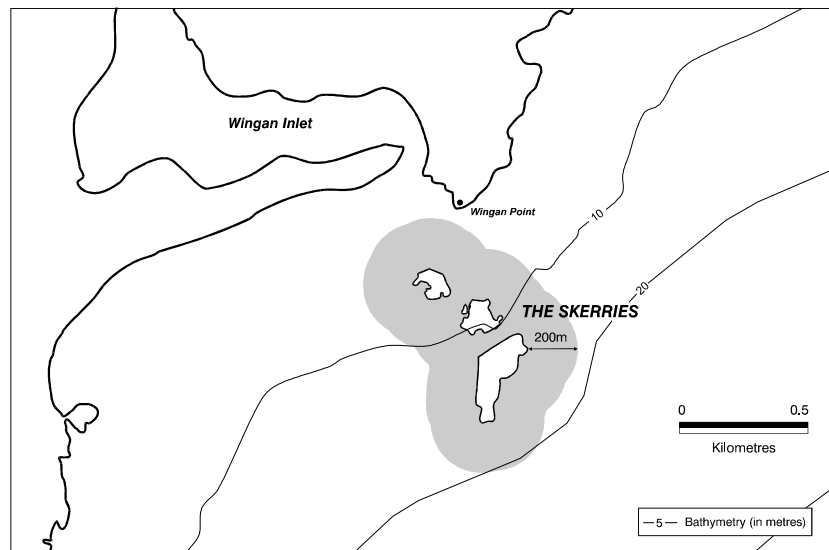
Special Management Areas

C16 The Skerries

Values

This 50 ha area includes waters for 200 metres offshore from the Skerries, one of four breeding sites in Victoria of the Australian fur seal. The Skerries are a granite outcrop located opposite Wingan Inlet in East Gippsland, and are part of the Crojlong National Park.

The Skerries are also known as a significant breeding site for the crested tern and as a roosting site for the black-faced shag.



Management issues

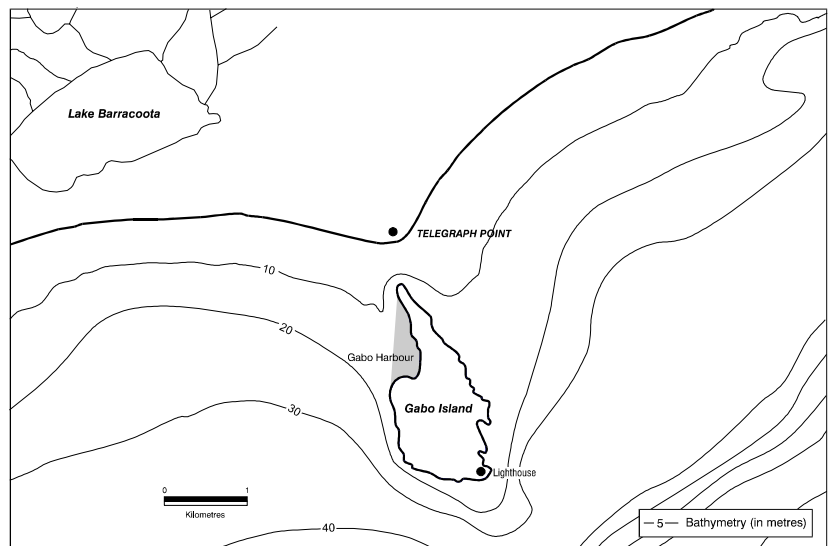
Management of the area should complement management of the Skerries for its wildlife values. Consistent with management recommendations for other seal breeding areas (eg C4 and C15), restrictions on the use of rock lobster pots, nets and line fishing should be implemented within this area.

Disturbance to the colony should be avoided during the breeding season (typically between mid October and late December), and managers should ensure that vessel access is appropriately regulated during this time.

C18 Gabo Island harbour

Values

This 23 ha area in far East Gippsland recognises the important nature-based tourism values of Gabo Island. These values include the largest colony of little penguins in Victoria, and temperate reef communities surrounding both natural reef and a shipwreck within the Gabo Island harbour. These reef communities include reef fish such as morwong, wrasse and leatherjacket species.



Management issues

Intact reef communities in the harbour would provide quality snorkelling and diving opportunities, enhancing the total visitor experience. Spearfishing and commercial fishing activities that impact on reef fish species should be excluded.

A management regime to minimise impacts of recreational fishing on these reef species should also be explored. Other fishing and collecting activities (eg line fishing for species moving through the area, commercial abalone harvesting) that do not have major impacts on reef fish should continue.





Recommendations

Part Three

Recommendations for the Bays, Inlets and Estuaries biophysical region

Port Phillip Bay

Western Port

Other bays, inlets and estuaries





Port Phillip Bay

This section sets out the recommendations for marine protected areas for Port Phillip Bay.

Port Phillip is a large major embayment, almost 2000 km² in area, in Victoria's Bays, Inlets and Estuaries biophysical region, equivalent to IMCRA's Victorian Embayments region. Commonly known as Port Phillip Bay, it comprises 16 named bays, the best known being Swan Bay, Corio Bay and Hobsons Bay. It is extremely shallow for its size being only 24 metres at its deepest part (except for the entrance which plunges to over 90 metres), with much of its waters shallower than 8 metres. The bay is a unique ecosystem, supporting diverse communities of birds, fish, bottom dwelling (benthic) invertebrates, seaweeds and microscopic algae. The benthic communities are exceptionally rich in species compared to similar ecosystems in other parts of the world. The species assemblages in the muddy central region are distinct from those in the sand to the west and east.

Although most of the bay is surprisingly healthy in terms of water quality, the ecosystems of the bay are under continued pressure from urban and agricultural runoff, previous physical disruption (eg dredging), and recently from the spread of introduced marine species.

About three million people live close to Port Phillip Bay, making it Australia's most densely populated catchment, and one of the most urbanised coastlines in the world. Port Phillip Bay is enormously important to Victoria, and to Melbourne in particular. It is Australia's busiest port, and is also a huge recreational resource for residents and visitors. Recreational pursuits include swimming and beach activities, sightseeing, diving, recreational fishing, sailing and boating. Port Phillip Bay supports a commercial fishery and a growing aquaculture industry.

This part of the report gives descriptions of the recommended marine national parks, marine sanctuaries and special management areas. See the Executive Summary for a table of changes to the recommendations since the Draft Report.

Section 3.7 of this report provides an overview of the recommendations for marine protected areas, including recommendations for permitted uses and activities.

Note that in February 1998, the ECC provided the then Minister with a final recommendation for a marine park at Port Phillip Heads. In December 1998 the Minister asked the Council to review the recommendation having regard to the incompatibility of incorporating major shipping channels in a marine park. The revised recommendation is included in this section.

Recommended areas

Marine National Park

A4 Port Phillip Heads Marine National Park

Marine Sanctuaries

B7 Point Cook Marine Sanctuary

B8 Jawbone Marine Sanctuary

B9 Ricketts Point Marine Sanctuary

Special Management Areas

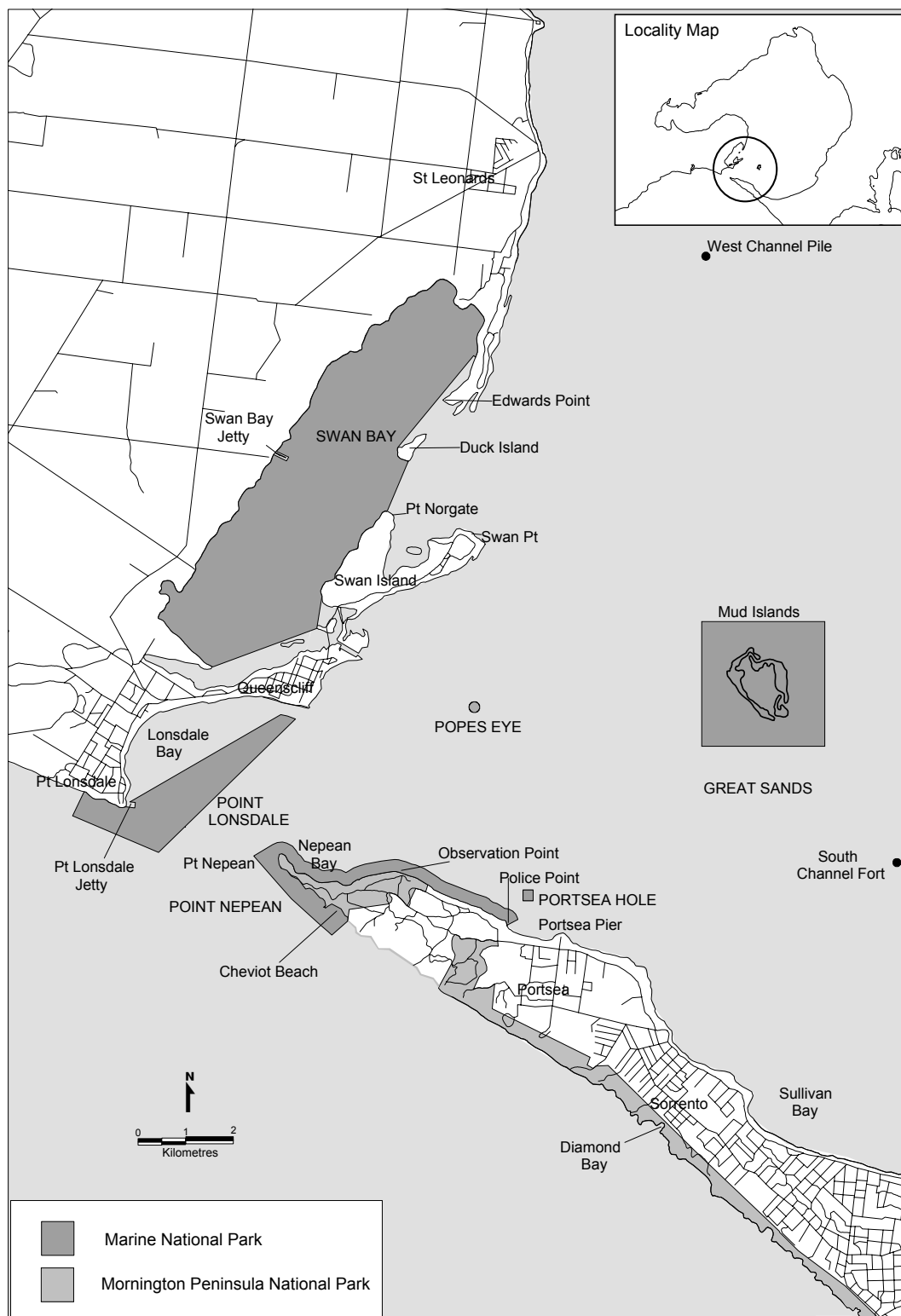
C7 Clifton Springs

C8 Werribee River estuary

C9 Capel Sound



A4 Port Phillip Heads Marine National Park



Southern Port Phillip Bay and the Port Phillip Heads area contain some of Victoria's most treasured marine and coastal environments, within easy access of Melbourne and Geelong. The six areas making up the recommended park have outstanding environmental, cultural and recreational values.



Description of the park

- One of five marine national parks (with Yaringa, French Island, Churchill Island and Corner Inlet) proposed for Victoria's Embayments biophysical region. The small part of the park on the open coast falls within Victoria's Central biophysical region.
- Located at the southern end of Port Phillip Bay, including the entrance to the bay at Port Phillip Heads.
- Made up of six separate areas:
 - Swan Bay;
 - Great Sands (Mud Islands);
 - Point Lonsdale;
 - Point Nepean;
 - Popes Eye; and
 - Portsea Hole.
- Approximately 3 340 hectares.

Background

In February 1998 the Environment Conservation Council provided an Interim Report to the then Minister for Conservation and Land Management prepared in accordance with its terms of reference.

In the Interim Report, the ECC recommended establishment of a major multiple-use marine park of 17 453 hectares in southern Port Phillip Bay – the Port Phillip Heads Marine Park. The proposed marine park was made up of two highly protected sanctuary zones and five highly protected special nature sites totalling 3 525 ha or about 20% of the park. The remainder of the area was recommended to be available for recreational fishing and some forms of commercial fishing. Shipping areas, including the shipping routes to the Ports of Melbourne and Geelong, and associated channels, were recommended to be included in the park as a shipping zone.

The Port Phillip Heads area was considered a priority for the establishment of a marine park because of its wide range of natural and recreational values and its ready accessibility to large numbers of people. Port Phillip Bay is Melbourne's most important recreational area.

In December 1998 the then Minister, under section 17(3) of the Act, requested that the Council review the recommendation for Port Phillip Heads Marine Park, having regard to the incompatibility of incorporating major shipping channels in a marine park.

Matters considered in the review

In undertaking the review, the ECC took into account two factors in addition to the issues relating to shipping channels: the ECC's reconsidered approach to marine protected areas (outlined above in section 3.2 of this report); and changes in fisheries management arrangements for bays and inlets, abalone, rock lobster and crabs.

Although the Port Phillip Heads proposal in the Interim Report was a final recommendation to Government as required under the terms of reference, and formal submissions could therefore not be received, there was a considerable amount of community input on the recommended marine park (see *Community views* below).

Shipping channels

Declared port waters for the Port of Melbourne are gazetted under the provisions of the *Port Services Act* 1995. The Victorian Channels Authority exercises certain functions in relation to declared port waters. Parts of the channels must be routinely modified in order to maintain safe navigable water. South Channel, for example, requires regular maintenance dredging, and the associated dredge spoil sites are necessary for channel maintenance. In addition to regular maintenance, enhancement of shipping channels may be required in the future, including deepening or blasting in some areas.

There are three small areas within the previously recommended special nature sites that fall within declared port waters: Popes Eye, Portsea Hole and the Lonsdale Wall area. Of these, Popes Eye is currently set aside as a marine reserve. None of these areas are within major shipping channels.

ECC's approach to marine protected areas

Since the Interim Report was released in 1998 the ECC has reviewed its approach to marine parks, and is proposing a system of highly protected areas outlined in section 3.7 of this report. No multiple-use marine parks are recommended in the Final Report.

Fisheries management arrangements

The previous recommendation for the Port Phillip Heads Marine Park included disallowing commercial harvesting of scalefish by netting, long lining and trapping within the park. Since the Interim Report was released, the process of voluntary buy-back of commercial scale fishery access licences in Victoria's bays and inlets has been completed. The buy-back



has reduced the number of Port Phillip Bay/Western Port Bay commercial scale fish licences from 116 to 54, reducing the likelihood of any substantial increase in commercial fishing effort in Port Phillip Bay in the future.

To increase protection levels in the park, the previous recommendations for the Port Phillip Heads Marine Park also included a proposed reduction in the daily recreational bag limit for abalone to five, rock lobster to one, and the introduction of a bag limit for crabs of 15. Since then, changes in fisheries management arrangements for recreational abalone harvesting, recreational rock lobster harvesting and the introduction of a recreational bag limit for crabs have been implemented for all Victorian waters.

Environmental values

A full description of the natural values and uses of the proposed Port Phillip Heads area can be found in the ECC's Interim Report (1998).

Southern Port Phillip Bay and the Port Phillip Heads area contain some of Victoria's most treasured marine and coastal environments. Foremost amongst these are:

- the incised entrance to the Bay (the Rip) and the "Heads" at Point Nepean and Point Lonsdale;
- spectacular dive sites such as the Lonsdale and Nepean Walls;
- intertidal rock platforms at Cheviot and Point Lonsdale;
- the coastal landscape of Point Nepean in the Mornington Peninsula National Park;
- bottlenose dolphin populations;
- sites listed under the Ramsar Convention for their importance for migratory wading birds (Swan Bay, Mud Islands);
- distinctive bird-dominated (nutrient-rich, guano-based) island ecosystem of Mud Islands;
- popular recreational dive locations (eg Popes Eye, Portsea Hole); and
- sheltered environments such as the seagrass meadows of Swan Bay.

Recent reef monitoring programs found substantial differences in reef marine ecological communities along the central Victorian coast. At the regional scale, the Wilsons Promontory region was well differentiated from the more western Port Phillip Heads to Bunurong region in terms of macrophyte, invertebrate and fish community composition. The proposed Port Phillip Heads and Bunurong Marine National Parks were

found to share a number of marine ecological communities, but a number of others were distinct within the Port Phillip Heads area (see Appendix 6 for details).

The reef biota changed considerably across the central Victorian region, supporting the findings of O'Hara (1999) that this region is an area of rapid change in species composition.

Community views

Informal community input to the ECC on the Port Phillip Heads Marine Park proposal since the Interim Report was released has focused on the impacts on recreational fishers in the Geelong region. Fishers were particularly concerned about impacts on boat-based fishing activities in Swan Bay, although most also expressed support for marine habitat protection. Other concerns related to restrictions on shore-based fishing on the open coast at Point Lonsdale.

Charter fishing operators using the Nepean Bay and Lonsdale Bight areas were strongly opposed to restrictions on fishing in these areas, while dive charter operators were largely supportive of the recommended park.

There was also strong community support for highly protected areas in the Port Phillip Heads area. However, conservation groups and scientists were concerned about the adequacy of the highly protected areas, seeking additional protection for eastern Swan Bay, Nepean Bay and Cheviot in particular.

Changes since the Interim Report

The major changes to the recommendations for Port Phillip Heads are as follows:

- a highly protected marine national park is recommended, replacing the previous recommendation for a larger multiple-use marine park;
- two small areas in Swan Bay have been excluded from the park to provide for the continuation of recreational fishing in these areas;
- the western boundary of the Point Lonsdale section has been moved a small distance to the east to reduce the impact on recreational shore-based fishing; and
- an offshore extension to the highly protected area has been recommended for the Point Nepean section at Cheviot.



Social and economic implications

A summary of the implications of the recommended Port Phillip Heads Marine Park is provided in Appendix 2 of the ECC's Interim Report (1998). The summary was based on the information on costs and benefits in previous LCC reports and on detailed information provided by Fisheries Victoria and other sections of NRE.

The revised recommendations for the Port Phillip Heads Marine National Park in this report modify the previously identified social and economic impacts in the following ways:

- impacts on commercial netting, long-lining and fish trapping have been reduced as a result of the exclusion of the multiple-use areas from the marine national park, and therefore allowing the continuation of current fishing activities in these areas;
- impacts on commercial abalone harvesting have increased as a result of the offshore extension to the Point Nepean section at Cheviot;
- impacts on recreational fishing have been reduced by excluding two small areas in Swan Bay from the park, and moving the western boundary of the Point Lonsdale section of the park approximately 500 metres from Fellows Rd to Buckleys Rd;
- changes in fisheries management arrangements since the Interim Report (outlined in *Matters considered in the review* above) have also contributed to a reduction in overall impact of the recommendation on both commercial and recreational fisheries.

The value of commercial fishing in the park is difficult to estimate because of the coarse resolution of the data, but in 1996/97 was about 33 tonnes of abalone or 4.7% of the Central Zone catch quota. Industry reports that the catch from this area has diminished in recent years. The rock lobster catch was estimated at less than 1.0 tonne or 1.5% of the Eastern Zone catch.

Implementation and management

- Five significant areas in the southern Port Phillip Bay region were set aside in 1979 as the Harold Holt Marine Reserves – the Point Nepean, Point Lonsdale, Mud Islands, Swan Bay and Popes Eye (The Annulus) Marine Reserves. Except for Popes Eye, various forms of fishing are permitted in the existing reserves. These reserves will be largely incorporated within the Port Phillip Heads Marine National Park.

- In 1997 NRE initiated an on-going monitoring program for Victoria's marine environment. This program has an emphasis on existing and proposed marine protected areas. By December 1999, 57 reef monitoring sites were established along the central Victorian coastline, including 15 sites in the Port Phillip Heads area, both within and outside the recommended marine national park.. At each site, the abundances of fish, invertebrate and macroalgal species are measured using the same quantitative techniques. This systematic sampling has resulted in a large data set for the description and comparison of reef assemblages at a range of spatial scales, and comprises a baseline for performance assessment of the park.

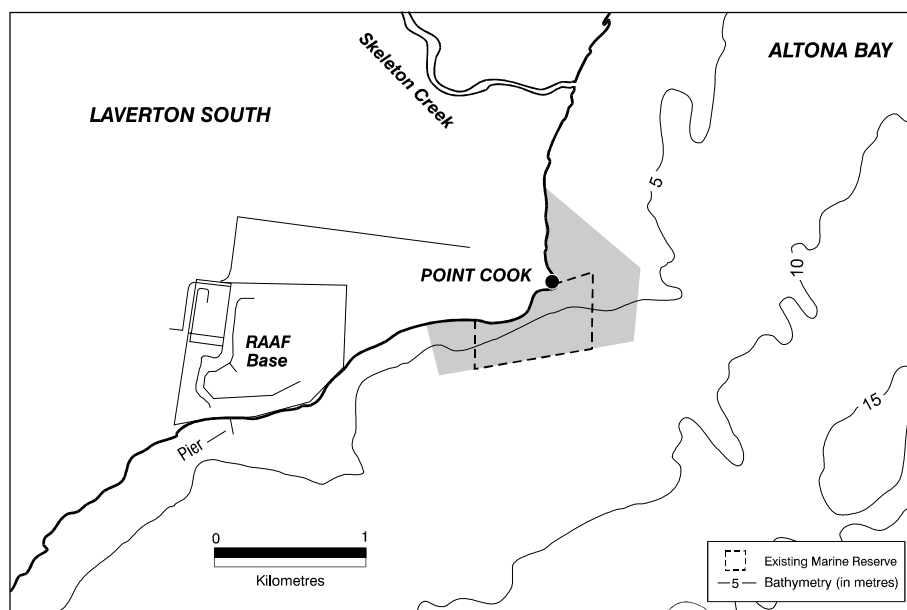
Recommendation

- A4**
- (i) That the Port Phillip Heads Marine National Park of 3 340 ha shown on Map A be used in accordance with the general recommendations for marine national parks outlined on page 43;
 - (ii) that commercial netting continue to be prohibited from that part of Swan Bay outside the recommended marine national park as at present; and
 - (iii) that collection of flora and fauna be prohibited from the intertidal area of the Mornington Peninsula National Park between the boundary of the Marine National Park and London Bridge.

References: 25, 40, 146, 147, 176, 242, 258, 264, 313, 375, 407.



B7 Point Cook Marine Sanctuary



Point Cook Marine Sanctuary is located about 10 km east of Werribee, adjoining Point Cook Coastal Park, and includes the existing Point Cook Marine Reserve.

The area of approximately 290 ha is recommended for its contribution to representation of western shoreline environments of Port Phillip Bay, and for the ready accessibility of its relatively intact habitats to the population of Melbourne.

Environmental values

- The sanctuary includes a typical example of the very shallow western shore of Port Phillip Bay with narrow beaches of mud and sand.
- Basalt reefs within the proposed sanctuary support a community of algae and associated epibenthic fauna. Sponges, bryozoans, sea-stars, sea-urchins, anemones, ascidians, shellfish, crustaceans, molluscs, sharks, skates and many other species of fish occur in this area.
- The significant wetlands of the adjoining Point Cook Coastal Park are part of the Port Phillip Bay (Western Shoreline) Ramsar area. The Ramsar area, together with an area 300 metres offshore (part of the existing marine reserve), are listed on the Register of the National Estate.

Implications for users

- The proposed sanctuary is popular for bird-watching, sightseeing, diving and snorkelling.
- Boat-based recreational fishing is popular along much of this coastline. Reef areas are popular for fishing for some species, eg snapper, and the Sheoak, a reef south of the sanctuary, provides good fishing grounds.
- The major commercial activity is abalone harvesting. The larger marine national park recommended in the Draft Report took in parts of the Sheoak reef complex as well as the Point Cook reef. Between 1988/89 and 1996/97 the average catch from the Point Cook Reef was 23.3 tonnes, or approximately 3.3% of the Central Zone catch. This is a significant reef for abalone

divers due to the relatively benign conditions of the bay, and the typically higher prices paid for smaller abalone from Port Phillip Bay, and industry reports that abalone catches have significantly increased in recent years.

- The general area is important to commercial finfish fishers, with seining operations taking place between the Sheoak and the Point Cook reefs. Some of the areas for seining shots between the reefs will remain available to commercial fishers.
- The recommendations in the Draft Report have been amended largely to reduce the impact on commercial abalone fishers, commercial net fishers, and recreational fishers.

Implementation and management

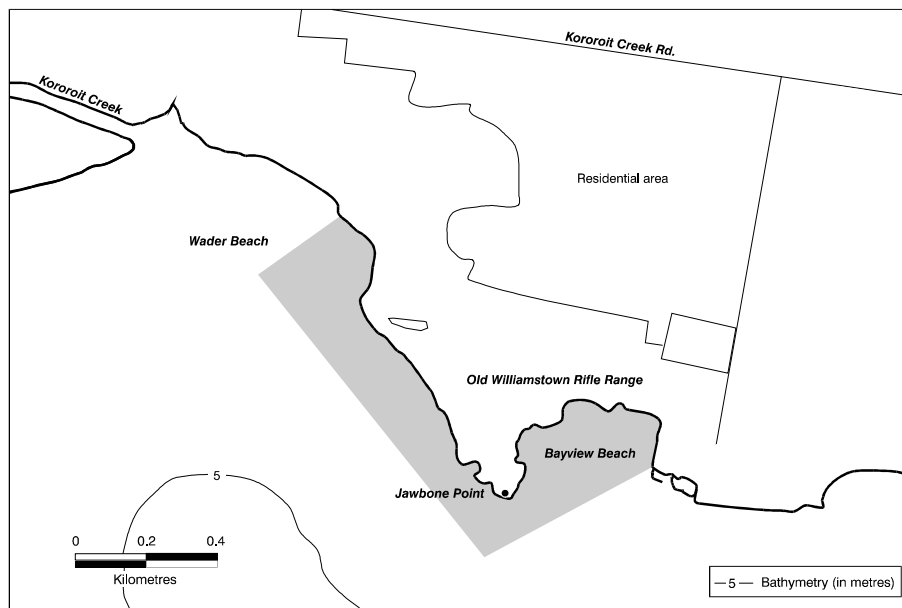
- Ecological monitoring will be facilitated by the amendment of the boundary to take in the entire Point Cook reef, and comparisons with the Sheoak reef to the south west where fishing will continue to take place.
- The recommended sanctuary is readily accessible. Parks Victoria currently run an educational and interpretative summer program in the adjacent coastal park.

Recommendation

- B7** That the Point Cook Marine Sanctuary of approximately 290 ha shown on Map A be used in accordance with the general recommendations for marine sanctuaries outlined on page 45.



B8 Jawbone Marine Sanctuary



Jawbone Marine Sanctuary is located at Williamstown less than 10 km from the centre of Melbourne, adjacent to the former Williamstown Rifle Range.

The area of approximately 30 ha is recommended for its ecological values, its contribution to representation of Port Phillip Bay environments, and for its significance as a scientific reference area.

Environmental values

- The site supports habitats including rocky basalt reef, seagrass beds, intertidal flats, saltmarsh and the largest occurrence of mangroves in Port Phillip Bay.
- The reef has a diverse algal community and associated fauna which is, for Port Phillip Bay, unusually unmodified. The softer subtidal sediments are fine clayey sands, which support high species richness.
- The basalt platform is a roosting site for migratory waders.

Implications for users

- The area of the proposed sanctuary is used for both commercial and recreational fishing, as well as the collection of shellfish.
- Port Phillip Bay net fishermen use mesh nets and beach seines in this area to target snapper, whiting and other species, with small but reliable catches.
- Recreational fishers use areas off the Jawbone for targeting large snapper, especially in some of the holes off the point.
- Commercial harvest of abalone has virtually ceased in this area, reportedly due to recreational pressure.
- The western boundary of the sanctuary has been moved away from the mouth of the Kororoit Creek, reflecting community concern about past dredging in this area.

Implementation and management

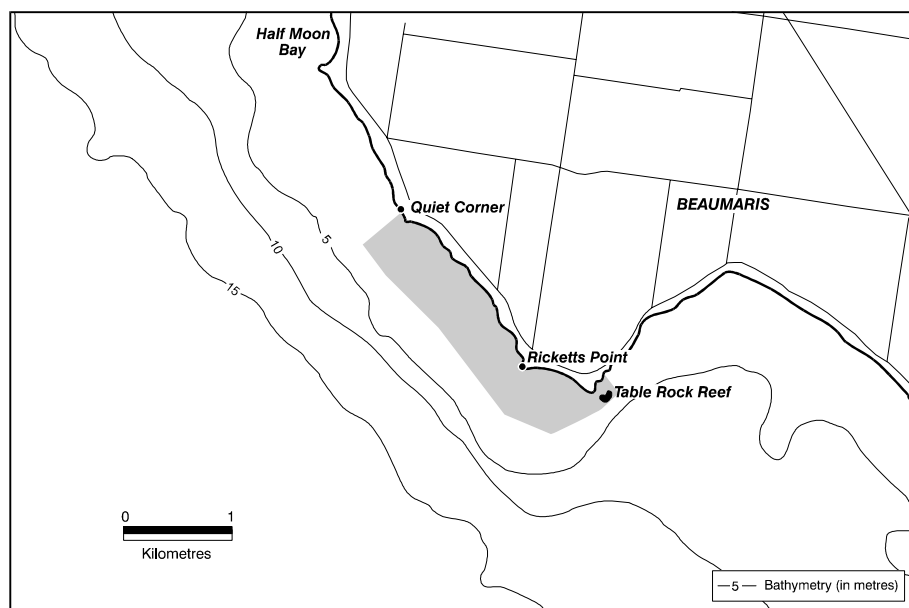
- The areas around the old Williamstown Rifle Range have been protected from human access since the turn of the century until the late 1980s when the Commonwealth sold the Rifle Range. Since then there has been significant damage to sensitive mangrove and saltmarsh areas, as people have sought access to harvest shellfish. There have also been changes in size and abundance of intertidal shellfish, in particular the gastropods *Turbo undulatus* and *Cellana tramoserica* (Keough *et al.* 1993).
- Land access to the area is restricted, and restrictions should be maintained.
- Boundaries have been located to facilitate enforcement, and will require onshore and offshore markers at appropriate points.

Recommendation

B8 That the Jawbone Marine Sanctuary of approximately 30 ha shown on Map A be used in accordance with the general recommendations for marine sanctuaries outlined on page 45.



B9 Ricketts Point Marine Sanctuary



Ricketts Point Marine Sanctuary is located at Beaumaris, in Melbourne.

The area of approximately 120 ha extends about 500 metres offshore and follows the cardinal marks. It is recommended for its contribution to representation of eastern shoreline environments of Port Phillip Bay, and its potential for public education and enjoyment of marine environments.

Environmental values

- The sanctuary includes rocky (sandstone) intertidal and subtidal habitats, sandy beaches and subtidal soft substrates.
- The offshore reefs have a high diversity of flora and fauna.

Implications for users

- In response to community input, the area of the recommended sanctuary has been significantly reduced. The boundary of the recommended area now begins in line with Fourth Street, north of Quiet Corner, seaward to the nearest cardinal mark, following the marks to Ricketts Point across Watkins Bay and to the cardinal mark at Table Rock then on shore at Sparks Street.
- The amended boundary captures the subtidal nearshore reefs, while leaving most of the important boat-based recreational fishing spots.
- Commercial fishers have used the area inside the cardinal marks in the past. This area has diminished in importance over the past few years, especially for commercial abalone harvesting.

Implementation and management

- The site is readily accessible to large numbers of people, providing a major resource for public enjoyment and education, but also creating major challenges for management.
- The area's popularity for recreational fishing, diving, snorkelling, shellfish collection and schools education, has resulted in pressure on species using the reef and overall degradation of the area.
- Current management arrangements for the foreshore should continue, but integrated arrangements should be developed with the marine sanctuary.

Recommendation

- B9** That the Ricketts Point Marine Sanctuary of approximately 120 ha shown on Map A be used in accordance with the general recommendations for marine sanctuaries outlined on page 45.

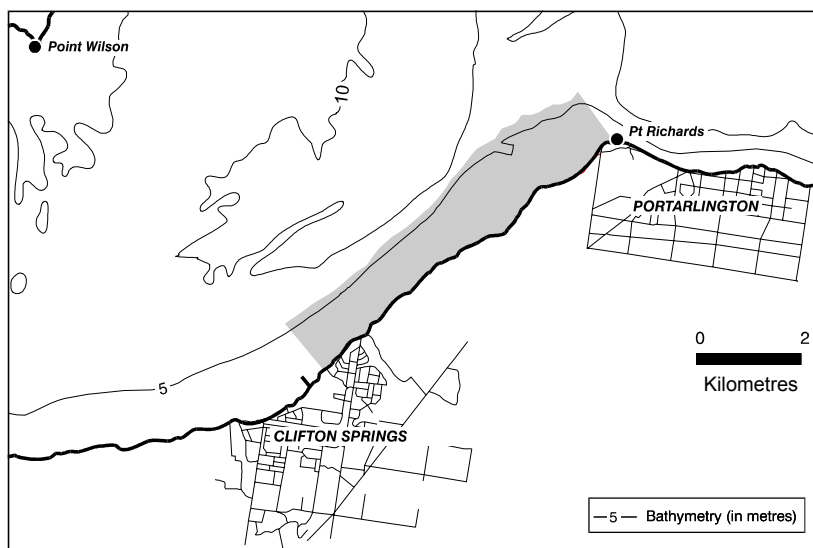


Special Management Areas

C7 Clifton Springs

Values

This 785 ha area contains some of the best examples of intertidal and subtidal seagrass (*Heterozostera tasmanica*, *Zostera muelleri*) in the Geelong Arm of Port Phillip Bay and is an important area for settlement of larval fish, including King George whiting and shark. The seagrass at Clifton Springs are part of a larger seagrass meadow extending westward from Point Richards to Point Henry.



Management issues

The seagrass meadows in the Geelong Arm have experienced substantial dieback and regrowth in past years and continue to be threatened by poor water quality, introduced pests such as the European tube worm, *Sabella*, as well as physical damage from propeller scour and anchoring. Management of the area should focus on ensuring the continued health of the seagrass beds, in the context of overall protection of seagrasses in the Geelong Arm and Port Phillip Bay. Activities that may damage seagrass and its associated marine life (eg some forms of boating and anchoring, dredging, dredge spoil disposal) should be regulated within this area.

Land access to the site is restricted, however there is good boat access from the Clifton Springs and Portarlington boat ramps. Some boating and recreational fishing occurs within this area, whilst commercial fishing tends to be concentrated in the western areas of the site. There may be potential to develop a visitor education facilities at Portarlington to highlight the important ecological role of seagrass communities in the bay.



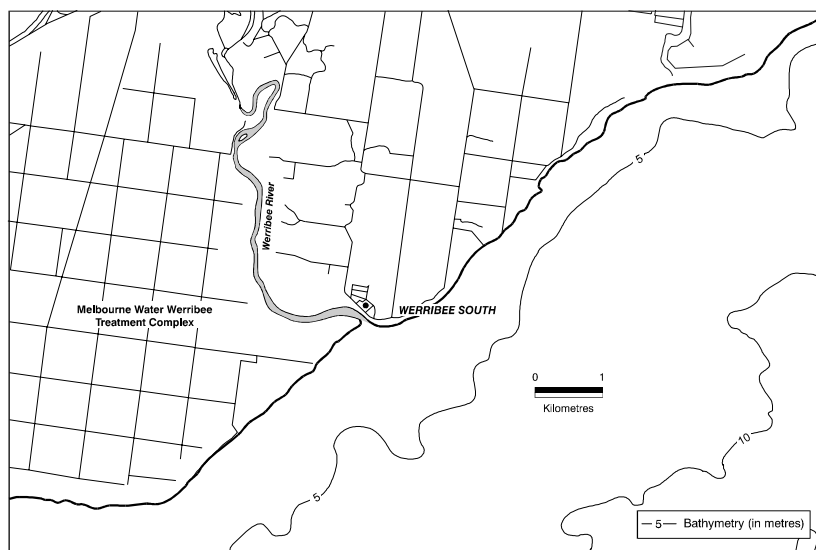
Special Management Areas

C8 Werribee River estuary

Values

This 50 ha area is situated adjacent to the suburb of Werribee South, and includes the lower estuarine waters of the Werribee River. Melbourne Water's Western Treatment Plant is located on the western side of the river.

The Werribee River estuary has a number of recognised environmental and recreational values, including important habitat for waterbirds, geological and geomorphological significance, value for recreational fishing and boating, and potential value for nature-based tourism.



Management issues

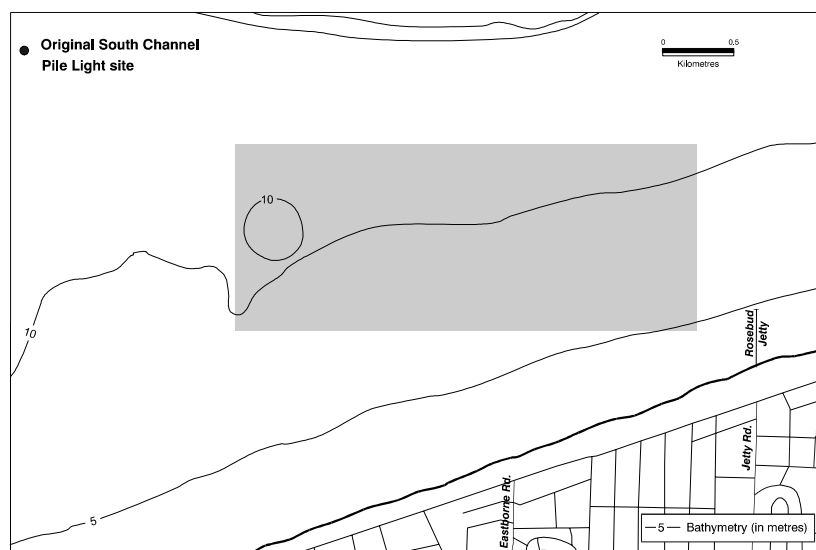
There is strong potential to enhance the environmental and recreational assets of this area, as a cooperative community project. Management planning for the area should involve NRE, the Port Phillip Catchment and Land Protection Board, Melbourne Water, local government, local Aboriginal people, adjacent landholders and the community.

C9 Capel Sound

Values

This 420 ha area lies offshore from Rosebud, and encompasses the wreck of the Hurricane and a hard coral reef. The area lies about 400 metres west of the end of the jetty, extending west for 2.3 km and north for 1–3 km.

The area surrounding the Hurricane is noted in particular for an unusually extensive bed of pink sea pens, and numerous reef fish. The reef, which emerges from the sea floor at 9 metres depth and rises to about 6 metres, has a colourful understorey, dominated by an extensive covering of hard coral. Hard corals are relatively uncommon in Victoria.



Management issues

The hard coral areas are vulnerable to disturbance by aquarium collectors, and collection should be prohibited. Recreational line fishing for pelagic fish such as snapper and whiting is popular in summer in this area. To enhance protection of reef communities in this very limited and vulnerable area, spearfishing and commercial fishing for reef fish should be prohibited.



Western Port

This section sets out the recommendations for marine protected areas for Western Port

The waters of Western Port cover nearly 700 km², more than a third of which are exposed as mud flats at low tide. Western Port is included in Victoria's Bays, Inlets and Estuaries biophysical region, equivalent to IMCRA's Victorian Embayments region. Two large islands are situated within the bay, French Island and Phillip Island. The bay has very high natural values and the whole area is listed as a wetland of international importance under the Ramsar Convention. Western Port has an unusually wide range of habitat types, including deep channels, extensive seagrass meadows, mangroves and saltmarsh. Two thirds of Victorian bird species have been recorded in the bay.

Community interest in the quality of the Western Port environment and concern about potential impacts of development has been strong for many years. The loss of intertidal seagrass habitat in Western Port was first reported in the north eastern sector of the bay during the early 1970s. Reduction in seagrass habitat continued – up to 70% of total cover and 85% of biomass by 1976 – and subsequent changes in catches of commercial fish, bird life, water quality and habitat value have been linked to the decline.

Other changes placing stress on the marine environment of Western Port included increased loads of freshwater, sediments, nutrients and contaminants. The rapidly expanding urban development in the catchment in areas such as Pakenham, Berwick and Cranbourne will further increase stress on the input streams and Western Port.

Recent investigations indicate that there has been limited recovery of seagrass (a total of 30% in area but limited increase in biomass), and many of the catchment issues are being addressed in the EPA's draft State Environment Protection Policy for Western Port (released in June 2000). It is recognised that the long-term management of the Western Port

catchment is critical if Western Port is to maintain its valuable environmental, commercial and recreational resources.

The bay supports a commercial fishing industry and a growing recreational fishery. Hastings in the north-western part of the bay is one of Victoria's four major commercial ports, with most ships carrying liquid fuel. The deep water in the Western Entrance and North Arm of Western Port is significant for deep draught shipping. No other harbour in Victoria and few in Australia provide sheltered water of such depth.

This part of the report gives descriptions of the recommended marine national parks and special management areas for Western Port. See the Executive Summary for a table of changes to the recommendations since the Draft Report.

Section 3.7 of this report provides an overview of the recommendations for marine protected areas and aquaculture areas, including recommendations for permitted uses and activities.

Note that the ECC is recommending that the Government investigate the establishment of a Biosphere Reserve for Western Port (see page 50).

Recommended areas

Marine National Parks

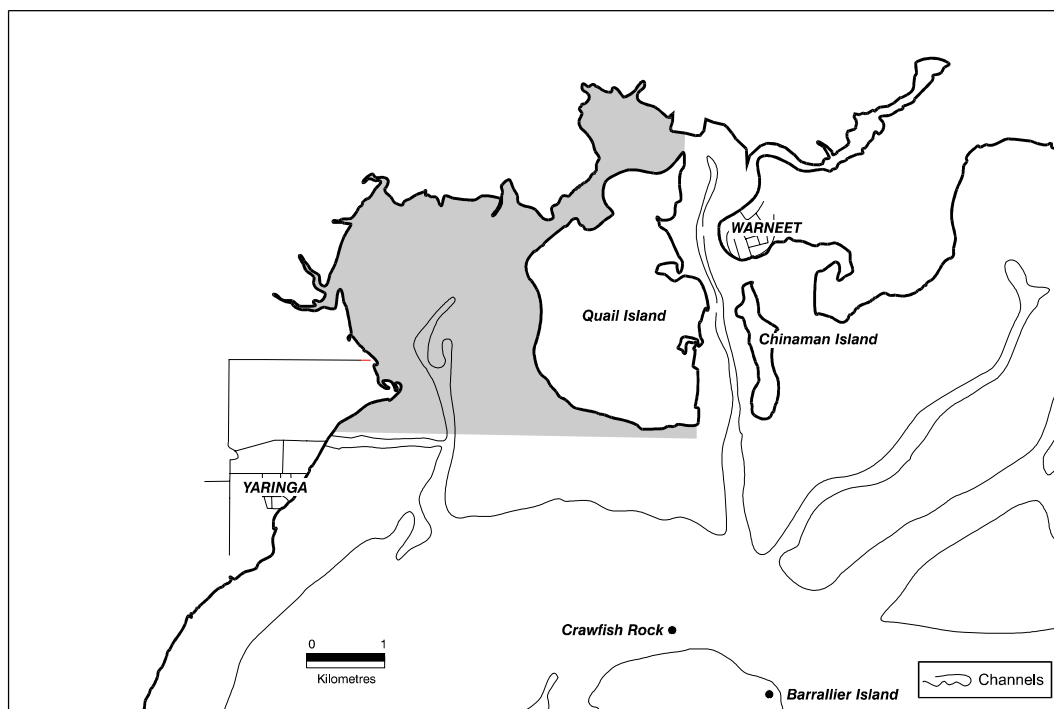
- A5** Yaringa Marine National Park
- A6** French Island Marine National Park
- A7** Churchill Island Marine National Park

Special Management Areas

- C10** Honeysuckle Reef
- C11** Crawfish Rock
- C12** Bass River delta
- C13** San Remo
- C14** Rhyll



A5 Yaringa Marine National Park



This recommended park is one of three in Western Port. It protects intertidal mudflats and extensive mangrove and saltmarsh areas in one of the least disturbed and least accessible parts of the bay.

Description of the park

- One of five marine national parks (with Port Phillip Heads, French Island, Churchill Island and Corner Inlet), proposed for the Victoria's Embayments biophysical region.
- Located in Western Port, about 9 km south-west of Tooradin, and adjacent to Quail Island Nature Conservation Reserve.
- Extends along the coastline north of Yaringa private marina to the eastern coastline of Quail Island.
- Approximately 930 hectares.

Environmental values

- The following bay habitat types are represented in the park: saltmarsh, mangroves, sheltered intertidal mudflats and subtidal soft sediments in tidal channels.
- The relatively undisturbed mangrove (*Avicennia marina*) and saltmarsh habitats of Watson Inlet and Quail Islands are of State geomorphological significance. Mangroves are a vital part of the bay ecosystem and provide important habitat for numerous invertebrates including crustaceans

(crabs, shrimps and sand hoppers), marine snails and bivalves, adult and juvenile fish.

- The intertidal mud flats are of national zoological significance, with many waterbirds and waders roosting among the mangroves and waders foraging in the surrounding muddy substrates.
- The area is part of the Western Port Ramsar wetlands.
- The adjacent coast, including the coast of Quail Island, supports good examples of sand heathland, coastal saltmarsh, and low woodland dominated by coast manna gum. Quail and Chinaman Islands are considered to be of State botanical and zoological significance. Currently they are managed as a nature conservation reserve, extending 150 metres out from the high water mark.

Community views

The local community, in general, supported the proposal although some concern was expressed about loss of recreational fishing grounds. No changes have been made to this recommended park.



Social and economic implications

Recreation and tourism

The area is not readily accessible by land or sea, and only limited recreational fishing takes place. There will be no restrictions on boating and other non-harvesting activities. The impact of the restriction on recreational fishing will be minimal as there is currently little fishing in the proposed park.

Development and dredging activities which impact upon the natural values of this park will not be allowed. The channel leading into the nearby marina should continue to be maintained by dredging. This dredging should continue to be managed so that impacts on the park are minimal.

Commercial fishing

Only a very limited amount of fishing takes place within the proposed park, specifically mesh netting for mullet.

Implementation and management

- Access to the site is limited due to the shallow nature of the channels.
- The location of the proposed park adjacent to the existing North Western Port Nature Conservation Reserve will facilitate management.
- Monitoring and assessment of the effectiveness of the park will be assisted by comparison with similar areas where activities such as fishing, dredging etc, take place. Areas near Rutherford Inlet and Chinaman Island could be included in a monitoring program.

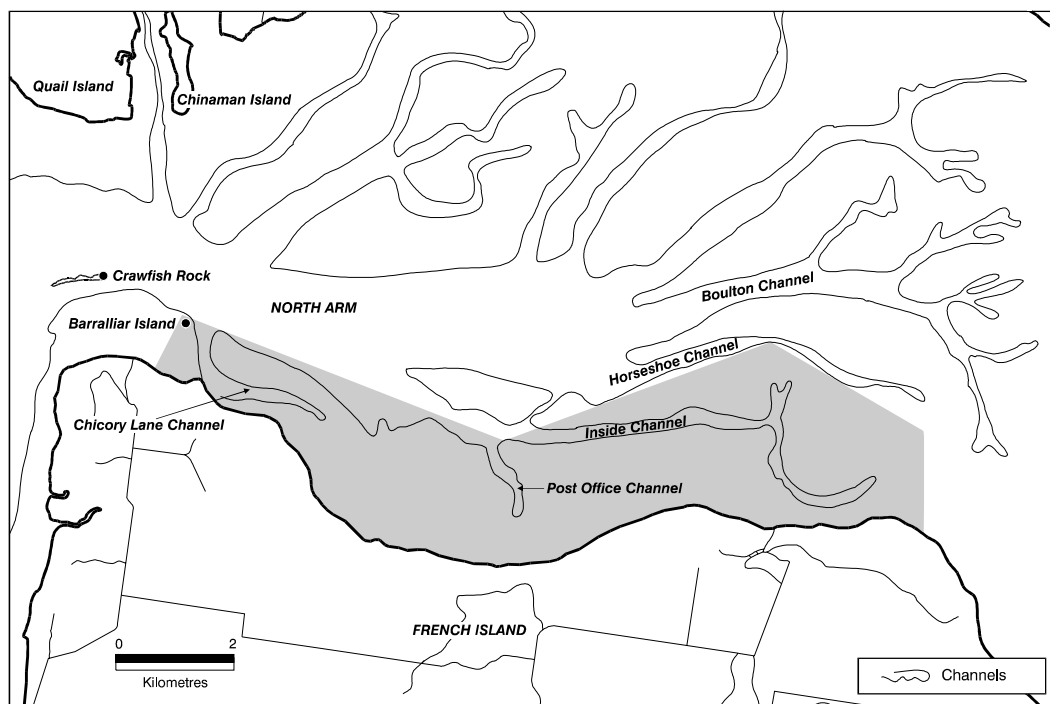
Recommendation

- A5** That the Yaringa Marine National Park of 930 ha shown on Map A be used in accordance with the general recommendations for marine national parks outlined on page 43.

References: 25, 247, 267, 361, 376, 388.



A6 French Island Marine National Park



This recommended park is one of three in Western Port. It protects seagrass beds as well as intertidal mudflats, areas of deeper channels, mangroves and saltmarsh.

Description of the park

- One of five marine national parks (with Port Phillip Heads, Yaringa, Churchill Island and Corner Inlet) proposed for the Victoria's Embayments biophysical region.
- Located about 10 km south of Tooradin, and adjacent to the northern shoreline of French Island National Park.
- Extending approximately 15 km along the northern shore of French Island; the park's northern boundary follows North Arm and the Horseshoe Channel.
- Approximately 2 700 hectares.

Environmental values

- The following bay habitat types are represented in the park: seagrass beds, mangroves, sheltered intertidal mudflats, sandy beaches and subtidal soft sediments in tidal channels.
- The north shore of French Island is one of the major areas of saltmarsh and mangrove fringe in Victoria and is of State geomorphological significance.

- The proposed park contains areas of seagrass (*Heterozostera tasmanica* and *Zostera muelleri*) including some areas where little loss of seagrass has been recorded. These are nursery areas for fish, including commercially important species such as whiting.
- Includes a well-developed tidal channel system of varying depth, profiles and orientations contributing to the high diversity of habitats.
- The area is part of the Western Port Ramsar wetlands. Intertidal flats are significant wader and foraging habitat used by 32 migratory species.
- Includes the waters around Barrallier Island – one of the bay's 13 high tide roost sites – areas particularly sensitive to disturbance.

Community views

Input from the local community centred on difficulty of identification of boundaries due to exclusion of Post Office Channel from the park. The boundaries have been straightened and the Post Office Channel is now included within the park.

Commercial and recreational fishers were concerned about restrictions on their fishing activities in this



area, although most supported a smaller park in this location, or a marine protected area that would allow fishing to continue.

There was a high level of community concern about catchment activities and the poor condition of the Western Port environment.

Other nearby areas that were reconsidered during the public consultation on this proposal included various sections of Western Port waters bordering the northern and western shores of French Island. On balance, the recommended park is believed to best provide for conservation of a range of habitats with an acceptable level of impact on current uses.

Social and economic implications

Recreation and tourism

Popular area for boat-based recreational fishing for King George whiting, rock flathead, snapper, southern sea garfish, mostly in deeper channels outside of, or towards the outer boundaries of the park. There will be no restrictions on boating and other non-harvesting activities.

Commercial fishing

Current commercial fishing activities include mesh netting and seining. The following estimates of fisheries catch and value were provided by MAFRI and are based on the 1996/97 year to allow consistent comparisons between areas. See Appendix 5 for a fuller discussion of fisheries estimates.

The major commercial activities are mesh netting, seining for King George whiting and garfish, and longlining for snapper, valued in total at \$85 000. The ECC believes that the inclusion of Post Office Channel will not significantly affect this value.

Implementation and management

- The proposed park is readily accessible from Warneet, Blind Bight, Tooradin and other Western Port shore jetties.
- Monitoring and assessment of the effectiveness of the park will be assisted by comparison with similar areas where activities such as fishing, take place. Areas, west of the proposed park, adjoining the shoreline of French Island, could be included in a monitoring program.

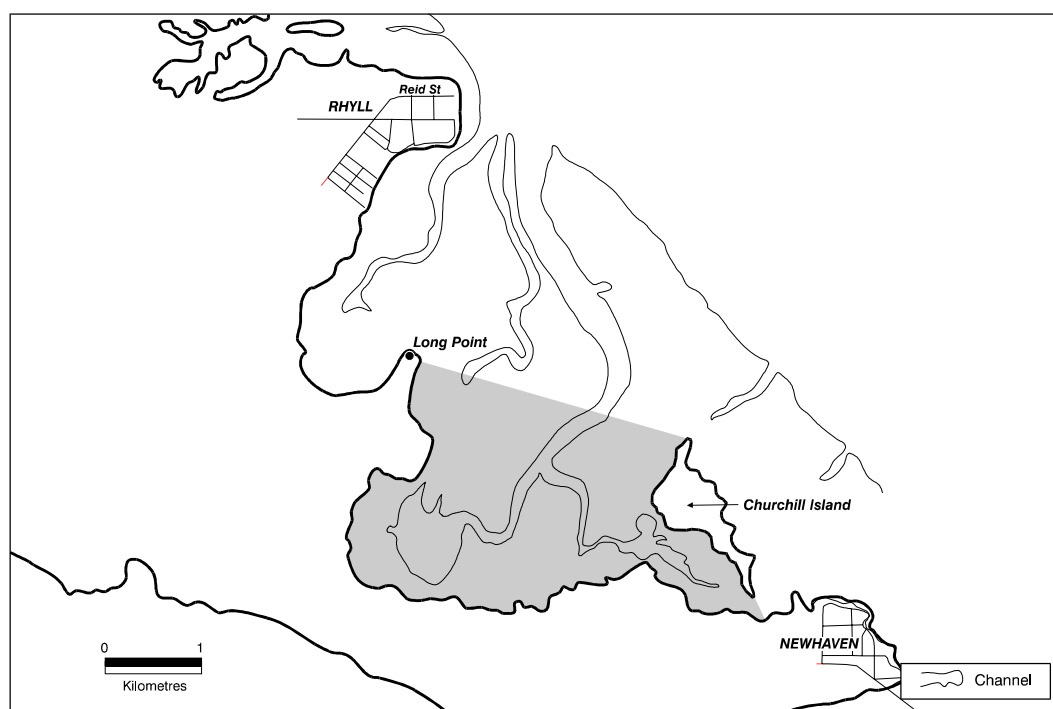
Recommendation

- A6** That the French Island Marine National Park of 2 700 ha shown on Map A be used in accordance with the general recommendations for marine national parks outlined on page 43.

References: 25, 242, 247, 267, 361, 376, 388.



A7 Churchill Island Marine National Park



The recommended park is one of three in Western Port. It protects a variety of sheltered habitats, including intertidal mudflats, seagrass beds and deep channels.

Description of the park

- One of five marine national parks (with Port Phillip Heads, Yaringa, French Island and Corner Inlet), proposed for the Victoria's Embayments biophysical region.
- Located south of Rhyll, on the eastern shore of Phillip Island.
- Extends from Long Point south of Rhyll township to the north point of Churchill Island and along the island's western shore to the bridge.
- Approximately 675 hectares.

Environmental value

- The following bay habitat types are represented in the park: seagrass beds, mangroves, sheltered intertidal mudflats, sandy beaches, subtidal soft sediments in tidal channels and rocky intertidal habitats (cobble and shingle).
- Significant roosting and feeding habitat for migratory waders.
- The intertidal mud flats extending from Rhyll to Newhaven are of State significance, and the area from Rhyll Inlet to Churchill Island is of national

significance as part of a group of primary foraging areas for the 32 migratory waders found in Western Port (especially whimbrels and bar-tailed godwits).

- The area is part of the Western Port Ramsar wetlands.
- Seagrasses *Zostera muelleri*, *Amphibolis antarctica* and *Heterozostera tasmanica*.
- The raised beach between Chambers Point and Long Point and the adjacent Churchill Island are of State geological and geomorphological significance.

Community views

Input from the local community centred on concerns about the loss of boat-based recreational fishing in the channels, and potential flow-on impacts to local businesses dependent on recreational fishing visitors.

Scientists and conservation groups expressed the view that the proposed park did not adequately reflect the full range of intertidal and subtidal habitats in the area. Other groups commented that the significant areas for migratory waders were not included in the park.



The boundaries of the park have been amended and the area of the park substantially reduced to lessen the potential impact on local businesses and recreational fishing. Further changes to the recommended park would not be possible without significantly reducing the ecological viability of the park.

Social and economic implications

Impacts on coastal communities

The nearest coastal town to this park is Rhyll with an estimated population of 430 residents.

Rhyll is a small coastal community with a high level of holiday housing (approximately 50% of dwellings) and a high share of retirees (about 44% compared to the State average of 16%). Consumer services account for 29% of employed residents. Although not all of employed residents work in Rhyll, the town's business profile indicate there are six businesses classified as retail trade, or accommodation, cafes and restaurants – servicing visitors to Rhyll, including recreational fishers. The Churchill Island Marine National Park, which does not include the major recreational fishing grounds, is unlikely to impact on Rhyll's economy. (See Appendix 4 for more details.)

Recreation and tourism

The general area is popular for boat-based recreational fishing and hand spearing, shore-based sightseeing, and bird watching and other natural history activities.

The areas which are particularly popular for boat-based recreational fishing – off Rhyll township, and parts of the channels between Rhyll and Churchill Island – are not included in the park, to minimise impacts on users.

There will be no restrictions on non-harvesting activities.

Commercial fishing

Current commercial fishing activities include mesh netting and beach seining. The following estimates of fisheries catch and value were provided by MAFRI and are based on the 1996/97 year to allow consistent comparisons between areas. See Appendix 5 for a fuller discussion of fisheries estimates.

There is little commercial activity within this park, the major activity being mesh netting with some beach seining south of Rhyll. The estimated total value of commercial fishing for an area similar to the previous (larger) proposed area is \$11 000. The full implications of the buy-back of commercial bay and inlet fishing licences have yet to be determined, but it is likely that commercial fishing near Rhyll will decrease.

Implementation and management

- Ready access from Pleasant Point, Churchill Island, Newhaven (boat ramp) and San Remo will allow visitors to enjoy the park.
- Monitoring and assessment of the effectiveness of the park will be assisted by comparison with similar areas where activities such as fishing, take place. The area east of the recommended park, between Corinella and Reef Island, could be included in a monitoring program.

Recommendation

- A7** That the Churchill Island Marine National Park of 675 ha shown on Map A be used in accordance with the general recommendations for marine national parks outlined on page 43.

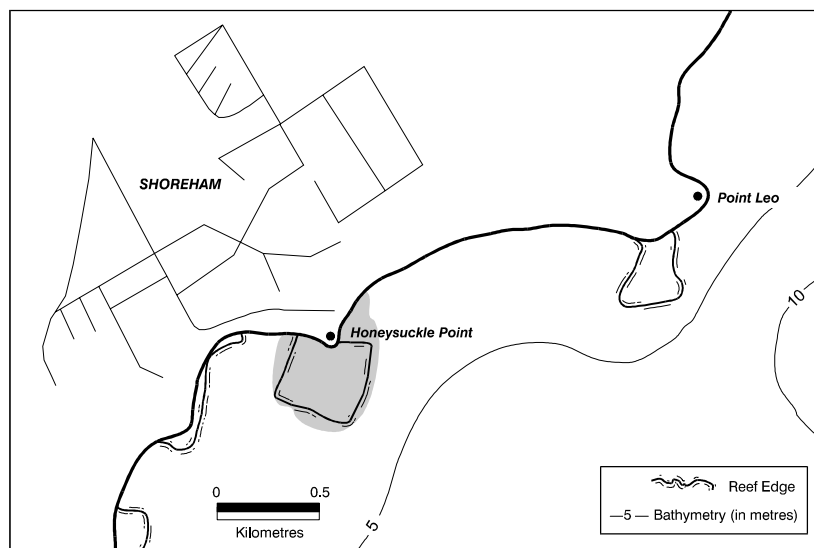
References: 25, 242, 247, 267, 361, 376, 388.



Special Management Areas

C10 Honeysuckle Reef**Values**

This 25 ha area is recommended for its diverse intertidal reef communities. It is predominantly flat and shallow, within a relatively sheltered bay area. Honeysuckle Reef has a shallow pool area used extensively by schools of young fish. The small site includes mainly intertidal reefs and some subtidal reefs. Part of the adjacent beach is used as a high tide roost for migratory waders. The intertidal rock platform is used for rocky shore angling. The area is popular for walking, beachcombing, sightseeing and some snorkelling. The subtidal reef also provides excellent opportunities for underwater recreation.

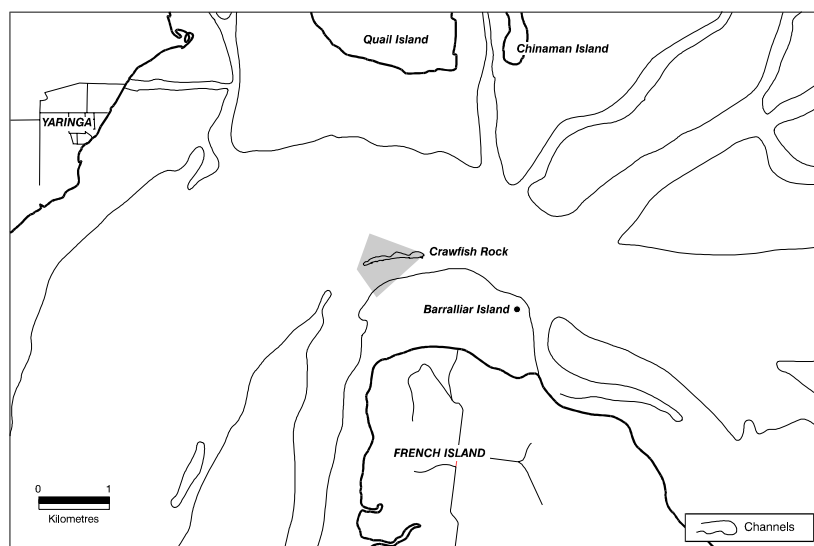
**Management issues**

Extensive shellfish harvesting has depleted the intertidal and subtidal invertebrate populations. Management of the area should focus on developing and implementing strategies for restoration of the intertidal rocky reef communities, and minimising disturbance to high tide roosts.

C11 Crawfish Rock**Values**

This 45 ha area is an unusual intertidal/subtidal reef located in the north-west of Western Port. Crawfish Rock is significant because it supports a benthic fauna with apparent affinities with deep water communities in Bass Strait. Due to high water turbidity around Crawfish Rock reducing light penetration, many deep-water species of algae, hydroids and sponges occur at unusually shallow depths.

The Underwater Study Group of Victoria (1971) described the high density of flora and fauna at this site. Overall there are believed to be more than 500 species present here. High numbers of species have been recorded for some groups – for example, 150 species of sponges, 123 hydroids and 34 ascidians.



Crawfish Rock also has a number of distinct communities characterised by differing combinations of light, current energy and substrate types. A recent visit conducted by divers from the Marine Research Group indicates that the area has remained largely intact since the original 1971 survey.

Management issues

Management should address specific strategies to protect the biological and scientific values of the site.

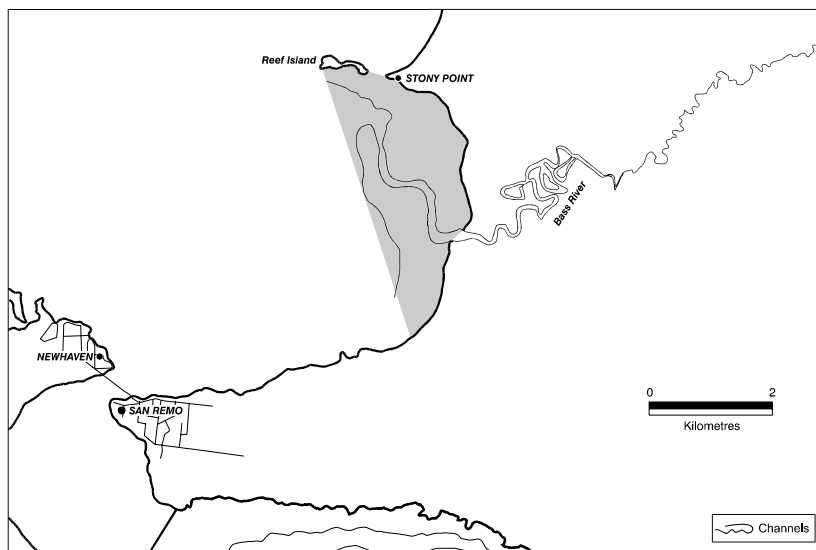


Special Management Areas

C12 Bass River delta

Values

This 635 ha area in eastern Western Port has significant ecological values as a fish nursery, bird roost, and for its diversity of habitats including intertidal flats and subtidal areas. The shallow waters of the Bass River delta support diverse fish life, and the area is a nursery for various species of shark and whiting. The intertidal flats are foraging areas for waders associated with the adjoining high-tide roost at Reef Island. The delta complex is of geomorphological significance and supports significant mangrove-saltmarsh habitat, extensive intertidal and subtidal flats of bare sand, dense algal beds and seagrass. The delta is a major boat-based recreational fishing area with significant commercial seine and mesh netting activity. Whiting and flathead are the species predominantly targeted.



Management issues

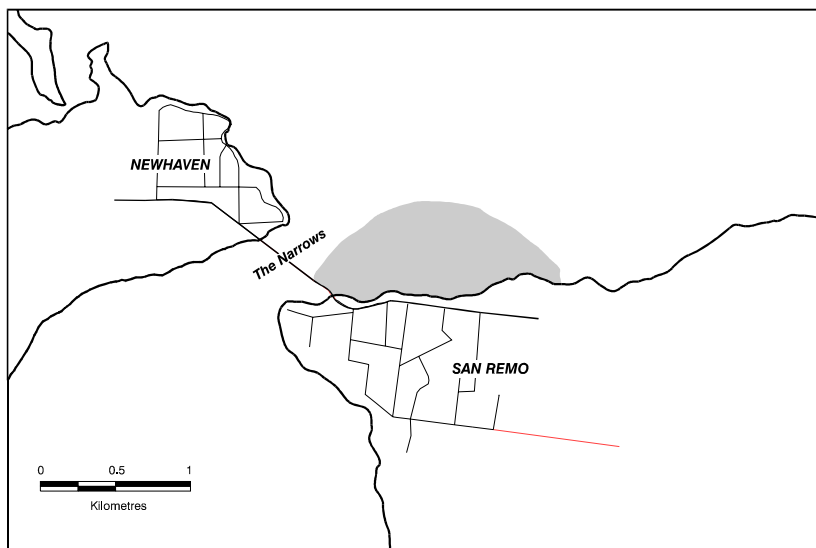
The Bass River delta suffers from serious infestation of the exotic weed *Spartina*. Within a management planning process, threats to the ecological values of the site should be identified and appropriate protection measures implemented.

C13 San Remo

Values

This 70 ha site contains the only marine community listed under the *Flora and Fauna Guarantee Act* 1988. It is the only known example of its kind, comprising an extremely rich opisthobranch (sea slugs) and bryozoan (sea mosses) community. 125 species of opisthobranchs have been recorded at San Remo of which eight are known only from this site.

The diversity of substrate types including patches of sand, mud, boulders and vesicular, weathered basalt; the north-facing aspect; and the low wave energy and proximity to a fast-flowing tidal channel, are some of the factors that contribute to the existence of this apparently rare community. The site includes the edge of a deep and fast-flowing tidal channel, which is the most diverse part of the community.



Management issues

An Action Statement has been prepared for this community under the provisions of the *Flora and Fauna Guarantee Act*. There are a number of measures available under the Act to control works and activities which may pose a threat to the community. The status of the community should continue to be monitored.



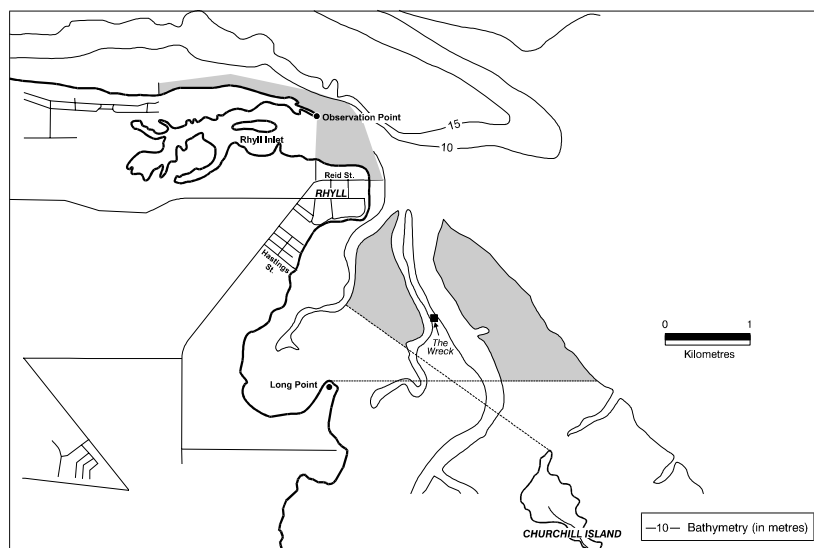
Special Management Areas

C14 Rhyll

Values

This 375 ha area is within a primary foraging area for 32 species of migratory waders. Rhyll Wetlands, (including Rhyll and Rowell Wetlands, Rhyll Inlet, and Conservation Hill) have international significance as bird habitat and fall within the Western Port Ramsar area.

The Rhyll wetlands area, off the previously recommended special management area at Observation Point, is recognised as a major high tide roost, and the mudflats further south are important feeding areas for red-necked stints, curlew sandpipers, eastern curlews, and double-banded plovers. As well as abundant bird life, the low profile basalt reef, mangroves, saltmarsh, soft sediments and dynamic sand spit, with a complex array of active and relict geomorphological features, are of high conservation value.



Management issues

The recommendation includes an extension of the Rhyll Wetlands precinct of Phillip Island Nature Park (PINP), and additional intertidal mudflats further south. The boundary of the site extends offshore from the western boundary of the PINP, and eastwards from the PINP boundary at Rhyll Inlet. The offshore boundaries, with Reid Street as a reference, have been adjusted for ease of identification.

Management should address strategies for protection of the values of the area for migratory waders. Incorporation of the northern portion of this area (Observation Point) into the Phillip Island Nature Park should be considered.



Other bays, inlets and estuaries

This section sets out the recommendations for marine protected areas for bays, inlets and estuaries other than Port Phillip Bay and Western Port. (Note that the Gippsland Lakes are specifically excluded under the Terms of Reference.)

Bays, inlets and estuaries have biophysical characteristics that clearly distinguish them from the open coast. They are typified by predominantly soft substrates, restricted water exchange patterns and low wave energy. Two habitat types – mangroves and intertidal flats with associated channel systems – occur only in this biophysical region.

Victoria's bays, inlets and estuaries contain a diverse range of biotic assemblages depending on their physical morphology and hydrological regimes. Corner Inlet, like Western Port, is a large, mostly shallow estuarine area with extensive mudflats and seagrass beds. The small narrow estuaries in western Victoria have an impoverished fauna compared to those in the east which tend to be larger and better wind-mixed. The dominant seagrasses are *Zostera muelleri* and *Heterozostera tasmanica*, with large areas of *Posidonia australis* occurring only in Corner Inlet, and the east coast species *Zostera capricorni* reaching its southern limit in Mallacoota Inlet. Although all of Victoria's bays, inlets and estuaries are grouped in one biophysical region, individual areas are very different from each other, and the larger bays and inlets are quite distinct.

Shallow Inlet and Anderson Inlet are small inlets in south Gippsland, with significant values especially for wading birds. The Corner Inlet and Nooramunga area in south Gippsland is Victoria's third largest embayment, and its natural values were recognised in the mid 1980s when it was declared a marine and coastal park. The whole area is listed as a wetland of international importance under the Ramsar Convention. The inlet supports a commercial fishery and is also popular for recreational fishing and boating. There are four small ports in the area: Port Franklin, Port Welshpool, Port Albert and Barry Beach. Shallow Inlet and adjoining coastal land was declared a marine and coastal park in the mid-1980s.

Both Shallow Inlet and Anderson Inlet are highly significant for migratory wading birds, and are very popular for beach activities, recreational fishing and boating. Although Corner Inlet, Nooramunga and Shallow Inlet in south Gippsland are marine and coastal parks, no highly protected areas have been established.

Most of Victoria's inlets, lagoons and larger estuaries have been heavily modified. Very few of the estuaries or their catchments are essentially unmodified. Of the less modified examples, most are included within national parks or other protected areas. Only those in far East Gippsland, between Wingan Inlet and the Betka River (particularly the estuary areas of Shipwreck Creek, Seal Creek, Benedore River, Red River and Easby Creek), are essentially natural. These rivers and their catchments are located in the Sandpatch Wilderness area of Croajingolong National Park, and are listed in the *Heritage Rivers Act* 1992 as natural catchment areas. Given the very high significance of these areas, the high level of protection already afforded to them, and the fact that very few similar estuaries are in such a natural condition, the ECC believes that three of these five small estuaries should remain as undisturbed as possible to provide a benchmark against which the condition of other estuaries can be measured (see Recommendation D4 on page 50).

The management of particular areas within some bays and inlets is subject to international obligations to protect wetlands and specific birds, such as the Ramsar Convention on Wetlands of International Importance and bilateral migratory bird agreements with Japan and China. Catchment management plans and coastal action plans are an additional means to address management issues affecting smaller estuaries.

In western Victoria, estuary management is a specific focus of current coastal planning being carried out by the Western Coastal Board. In eastern Victoria, many smaller inlets and estuaries are within national parks or other protected areas, and management issues are dealt with through park management planning processes, eg Wingan and Tamboon Inlets in the Croajingolong National Park.



The recent voluntary buy-back of commercial bays and inlets fishing licences has resulted in the cessation of commercial fishing in Anderson Inlet, Shallow Inlet, and only a small number of licences remain in Lake Tyers, Tamboon Inlet and Mallacoota Inlet. The remaining Lake Tyers and Tamboon Inlet licences are non-transferable, and commercial fishing in these inlets will cease when the current licence holders exit the fishery.

This part of the report gives descriptions of the recommended marine national park and special management area in Victoria's Bays, Inlets and Estuaries biophysical region outside Port Phillip Bay and Western Port. Additional recommendations relating to existing parks can also be found in this

section on page 50. See the Executive Summary for a table of changes to the recommendations since the Draft Report.

Section 3.7 of this report provides an overview of the recommendations for marine protected areas, including recommendations for permitted uses and activities.

Recommended areas

Marine National Park

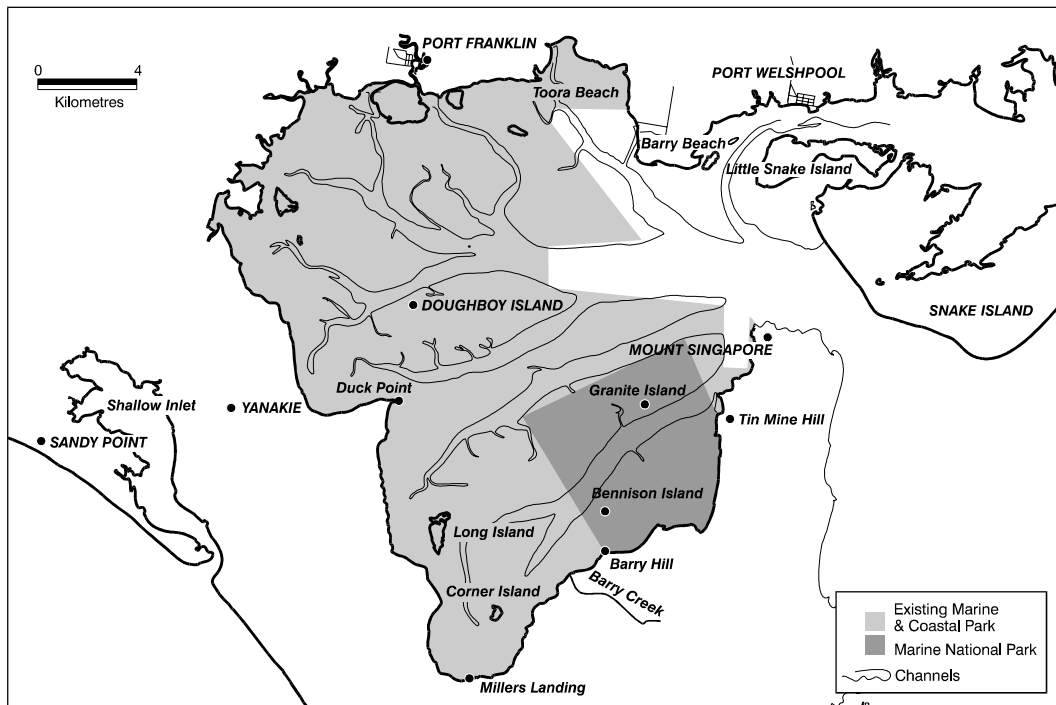
A10 Corner Inlet Marine National Park

Special Management Area

C17 Mallacoota Inlet (parts)



A10 Corner Inlet Marine National Park



*This recommended marine national park is within the well-known and popular Corner Inlet Marine and Coastal Park and is the only highly protected area in Victoria's third largest bay. The shoreline varies from the low watery landscapes of the marshes and dunes to the dramatic backdrop of the granite peaks of Wilsons Promontory National Park. The park protects a variety of sheltered habitats such as intertidal mudflats, channels and seagrass beds including the only substantial beds of broad-leafed seagrass (*Posidonia australis*) in Victoria.*

Description of the park

- One of five marine national parks (with Port Phillip Heads, Yaringa, French Island and Churchill Island), proposed for the Victoria's Embayments biophysical region.
- Located north of Wilsons Promontory and about 6 km east of Yanakie, part of existing Corner Inlet and Marine and Coastal Park.
- Extends along approximately 11 kilometres of coastline east of Barry Creek to south of Tin Mine Cove.
- Approximately 4 150 hectares in size.

Environmental values

- Includes many open bay habitat types such as seagrass, mangrove, intertidal sandy beaches and subtidal soft sediments.
- Contains samples of extensive seagrass communities, including the broad-leafed seagrass (*Posidonia australis*). Corner Inlet contains the only extensive beds of *Posidonia* in Victoria. The *Posidonia* community is the most faunally diverse

of all habitats studied in the Corner Inlet-Nooramunga area. Other seagrasses include *Zostera muelleri* and *Halophila ovalis*.

- Very high diversity of invertebrates in soft sediments.
- Part of the internationally listed Ramsar area, especially significant for over-wintering, migratory wading birds. Corner Inlet supports up to 50% of Victoria's migratory waders and 21.5% of Victoria's total wading population.

Aboriginal interests

Gippsland and East Gippsland Aboriginal coastal communities strongly expressed the need for Government to consult their communities prior to decision-making and implementation.

Community views

Input from the local community centred on concern about the impact on commercial fishers and recreational fishers who generally opposed the proposal, and others who called for better representation of seagrass habitats.



An alternative proposal was submitted to the ECC, focusing on protection of intertidal mangrove and saltmarsh habitats. However this proposal did not adequately protect the full range of seagrass and other subtidal habitats in Corner Inlet.

The ECC has not made substantial changes to this recommended park, other than a small increase in area to provide a better representation of *Posidonia* and *Halophila* seagrasses.

Social and economic implications

Impacts on coastal communities

The nearest townships to this park are Foster, Port Franklin, Port Welshpool, and Toora with an estimated combined population of 1 750 residents.

Collectively, these four townships share a diverse economy. The largest proportion of employment (31% of employed residents) falls within the consumer services sector, including retail trade and accommodation, cafes and restaurants, and health services. Fifteen percent of residents are employed in the manufacturing sector and about 10% in the agriculture, forestry and fishing industry.

The implementation of Corner Inlet Marine National Park will have some impact on fishing industry (see below) but it is unlikely to affect the economy of the four townships to any substantial degree (see Appendix 4 for more details). However, these towns have been affected by major changes experienced in rural and regional Victoria over the last decade which can affect the way in which communities perceive and deal with further change.

Recreation and tourism

The general area is popular for boating, boat-based recreational fishing and, to a lesser extent, diving. Part of the coastline adjacent to the proposed park is used for boat-based camping and coastal bushwalking. There will be no restrictions on boating, diving, and other non-harvesting activities.

The effect of the recommended park on recreational fishing is likely to be limited due to the availability of alternative areas in Corner Inlet.

Commercial fishing

Current commercial fishing activities include estuary/beach seining and mesh netting. See Appendix 5 for a fuller discussion of fisheries estimates.

This area is used by Corner Inlet licence holders, predominantly from Port Franklin and, to a lesser extent, Port Welshpool. Techniques used include seines, ring nets, mesh nets and snapper long lines. A variety of species are caught in this area.

The MAFRI catch estimates are for a substantially different area to the current proposal, and hence are not included here. However, with recent changes to the catch reporting areas for Corner Inlet, an upper limit can be put on the catch for this area. The proposed park is within the catch and effort cell south of a line between Duck Point and Mount Singapore. In the fishing year 1998/99 the value of fish attributed to this area was \$325 000. It is estimated that approximately one third of the catch comes from the area within the proposed park, hence the impact is a loss of areas that yield approximately \$100 000 of catch.

Implementation and management

- The proposed park is readily accessible by boat, mainly from Port Welshpool and Port Franklin but also from Toora Beach and Yanakie Landing.
- Management of bay and inlet fisheries in Victoria is currently being reviewed by Government, including a voluntary buy back of commercial fishing licenses. The outcomes will influence management of the proposed park.
- Monitoring and assessment of the effectiveness of the park will be assisted by comparison with similar areas where activities such as fishing take place. Other areas in Corner Inlet could be included in a monitoring program.
- The ECC has recommended that the intertidal area of Wilsons Promontory Marine National Park between Tin Mine Cove and Millers Landing be set aside as areas in which harvesting of flora and fauna is not permitted (see Recommendation D2 on page 50).

Recommendation

A10 That the Corner Inlet Marine National Park of 4 150 ha shown on Map A be used in accordance with the general recommendations for marine national parks outlined on page 43.

References: 127, 147, 212, 275, 295, 304, 337, 372.

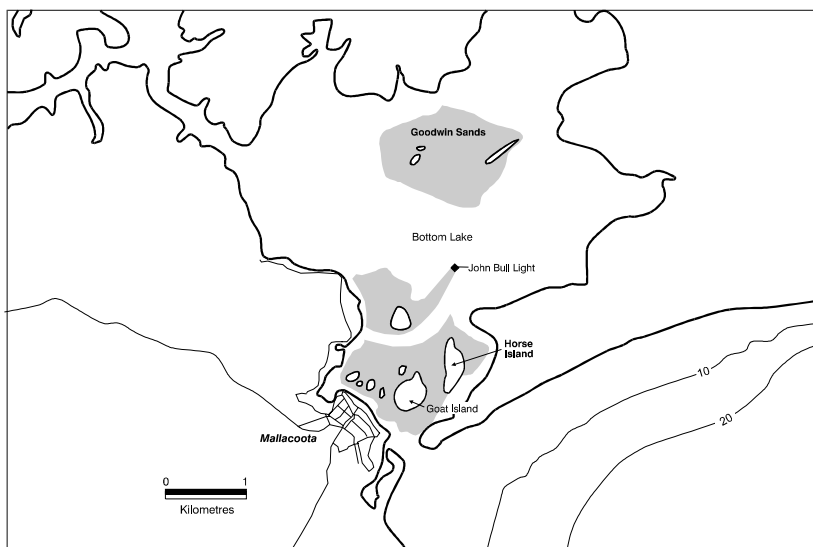


Special Management Areas

C17 Mallacoota Inlet (parts)

Values

This 340 ha area includes the tidal delta area at the entrance to the inlet, and the Goodwin Sands. Mallacoota Inlet is the largest estuarine lagoon system in south-eastern Australia, and provides habitat for a wide range of flora and fauna. Three species of seagrass were recorded in Mallacoota Inlet, *Zostera muelleri*, *Heterozostera tasmanica* and a species of *Ruppia*. *Zostera muelleri* is the dominant subtidal vegetation in Mallacoota Inlet with the largest area in the tidal delta. *Ruppia* beds are restricted to the Bottom Lake and are most dense around the Goodwin Sands area. A wide variety of birds depend on the inlet, including Caspian, little, fairy and crested terns, all of which breed on Goodwin Sands. Some of these birds are listed under the bilateral Japan Australia Migratory Birds Agreement. Both the tidal delta and Goodwin Sands are of regional geological and geomorphological significance.



Management issues

The islands on the Goodwin Sands are included in the Croajingolong National Park. Management of the recommended areas should complement management of the wildlife values of the islands.





Marine Aquaculture Areas



4. Marine aquaculture areas

The ECC's Terms of Reference require it to investigate and make recommendations on areas suitable for marine aquaculture, which can be developed on an environmentally sustainable basis. Marine aquaculture has the potential to contribute substantially to the Victorian economy.

The ECC's recommendations have focused on achieving a balance between providing access for aquaculture and minimising the impact on environmental values.

4.1 Overview

Marine aquaculture (or mariculture) is the cultivation and harvesting (or farming) of fish, shellfish and other aquatic species, including seaweeds, utilising seawater as a growing medium. Although the production levels from marine aquaculture are presently low in comparison to other States, there is potential for significant expansion in Victoria. Mussels are currently the main species for aquaculture, with most operations located in Port Phillip Bay. There are three categories of marine aquaculture each with specialised requirements and different impacts on the environment. See Appendix 7 for more details of operational requirements.

Land-based aquaculture of marine species

Land-based marine aquaculture appears to have immediate potential for economic growth. Seawater is pumped or diverted into the holding structures and subsequently discharged to sea, recirculated or utilised elsewhere. This form of aquaculture is relatively free of many of the technical problems which beset marine-based operations. The advantages and disadvantages of land-based aquaculture were outlined in the ECC's Interim Report published in February 1998. Compared with the criteria for marine-based aquaculture, the criteria for land-based proposals are simpler. Key criteria include salinity of water source, contaminants, water temperature, water quality, water intake site, and waste discharge.

Extensive marine aquaculture (generally shellfish)

While this form of aquaculture, where growth is dependent on naturally available food in the water column, requires larger areas for lease, it is a relatively non-intensive use. If sited so as not to interfere with other water users, most issues can be resolved. Supplementary feeding is not usually required.

Intensive marine aquaculture (generally finfish)

Cultivation is undertaken in controlled conditions and growth is promoted by the addition of food supplements. While the areas required for raising finfish at sea are not large, the use of supplementary feeding can have a significant impact in waters where there is inadequate water movement and exchange.

4.2 Victoria's aquaculture programs and the ECC's role

Marine aquaculture has major potential for growth within Victoria, and several initiatives over recent years have aimed to facilitate the development and growth of the aquaculture industry. The ECC has been requested to identify areas suitable for farming of marine species.

Since these terms of reference were given to the ECC in 1997, the Victorian Aquaculture Strategy was released in late 1998, and the Final Report of the Aquaculture Regulatory Reform Task Force was released in 1999. The EPA's State Environment Protection Policy (SEPP) (Waters of Victoria) provides for the management of aquaculture operations so that water quality is protected both for and from aquaculture. Schedule 6 (Waters of Port Phillip Bay) of the SEPP (Waters of Victoria) also requires aquaculture projects to include provision for site rehabilitation, as is accepted practice for land-based industries, to ensure that private operators do not pass on clean-up costs to the State.

The existing strategies and programs provide the framework to develop a profitable, diverse, ecologically sustainable and well managed aquaculture industry.

A major factor repeatedly identified as limiting aquaculture development in Victoria is lack of access to suitable sites in marine waters. Suitable sites are few in number outside Port Phillip Bay because of the high-energy nature of the open coastline and the ecological sensitivity of Victoria's major bays and inlets. The new Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (see page 10) increases the scrutiny that new developments such as marine aquaculture operations will undergo if they are proposed to be located in sensitive environments such as Ramsar wetlands.





Abalone are a valuable product suited to commercial aquaculture. Land-based farms are located near the coast with access to high quality sea water.
Photo: Peter Kinchington

The ECC has looked closely at potential sites for the various forms of aquaculture across Victoria's marine and coastal areas, working closely with industry, the Fisheries Co-Management Council's Aquaculture Sub-committee, and Fisheries Victoria's Aquaculture section.

The ECC highlights the following components of existing strategies and programs, stressing the importance of the provisions for protection of environmental values.

- Preparation of management plans for each new aquaculture area, which establishes the operational, environmental and administrative requirements, including specification of baseline and ongoing environmental monitoring requirements for management purposes.
- The establishment of a one-stop shop within Fisheries Victoria to provide a single point of contact between State Government and potential aquaculture proponents.
- Development of a Victorian Translocation Policy and guidelines.

4.3 Community views

The ECC received a considerable amount of input on marine aquaculture proposals following the release of the Draft Report. Two related issues dominated the submissions. Firstly, environmental risks associated with aquaculture operations in open waters were considered by some sections of the community to be so potentially serious that they believed that aquaculture should not proceed except in land-based facilities. Secondly, recommendations for aquaculture areas in some locations were strenuously opposed for these reasons, especially in sensitive environments such as Western Port and Corner Inlet, both listed as wetlands of international importance under the Ramsar Convention.

Several submissions commented that some recommendations appeared to be inconsistent with the ECC's own principle that aquaculture should not be practised on or immediately adjacent to sites with significant environmental values. Many submissions supported marine aquaculture in on-shore facilities, in preference to open water operations. See Appendix 2 for a fuller discussion of issues raised in submissions and the ECC's response.

Other people were frustrated that there were such negative views of aquaculture, especially as they believe there is the potential for some environmental benefits eg from the reduced pressure on some wild stocks. However there was little enthusiasm from the aquaculture industry itself for the proposed areas other than the extensions to existing sites, and only patchy support from local government for the proposed areas in their municipalities. Despite this, many believed that lack of access to suitable sites in marine waters or, at least, continuing uncertainty about whether such access will be provided, is an impediment to development of marine aquaculture in Victoria. The ECC agrees with this view.

User conflicts were an issue for some proposed zones, eg with commercial net fishers in some recommended areas, and with boating users in others. Infrastructure requirements and aesthetic issues were raised in relation to the draft recommendations for an aquaculture zone in Waratah Bay. Concerns about the potential impacts of abandoned infrastructure were raised several times in meetings and submissions.

Scientists recommended comprehensive monitoring and public reporting of existing operations as a means both to provide data on impacts, and potentially to allay community concerns about the environmental impacts of marine aquaculture.



4.4 Nutrient management and finfish culture in Port Phillip Bay

Nutrient enrichment is one of the major factors leading to degradation of aquatic systems around the world. Analysis of EPA monitoring data and the findings of the CSIRO Port Phillip Bay Environmental Study (1996) indicates that while much of the Bay appears to be in a good condition, the Werribee and Hobsons Bay segments are displaying signs of nutrient enrichment. These two areas are adjacent to two of the main inputs of nutrients to the Bay, the Western Treatment Plant and the Yarra River.

Nutrient enrichment is widely viewed as the single most important risk to the environmental quality of Port Phillip Bay (EPA 1997). The Port Phillip Bay Environmental Study recommended a target reduction in overall load of 1000 tonnes per year of nitrogen. It is Victorian Government policy – see Schedule F6 (Waters of Port Phillip Bay) of the SEPP (Waters of Victoria) – to reduce nitrogen inputs to Port Phillip Bay by 1000 tonnes per annum (approximately 15%) by the year 2006.

Some key risks leading to nutrient enrichment of the Bay include sewage, stormwater run-off from urban and rural land, and activities directly connected to the bay such as aquaculture. The Victorian Government has recently announced its new Victorian Stormwater Action Program. The program will improve the management of urban stormwater in metropolitan and regional areas, reducing adverse impacts on the environment.

Effects of aquaculture on world fish supplies

Global production of farmed fish and shellfish has more than doubled in the past 15 years. Many people believe that such growth relieves pressure on ocean fisheries, but the opposite is true for some types of aquaculture. Farming carnivorous species requires large inputs of wild fish for feed. Some aquaculture systems also reduce wild fish supplies through habitat modification, wild seedstock collection and other ecological impacts. On balance, global aquaculture production still adds to world fish supplies; however, if the growing aquaculture industry is to sustain its contribution to world fish supplies, it must reduce wild fish inputs in feed and adopt more ecologically sound management practices.

Source: Naylor, R.L. *et al.* (2000), *Nature* 405: 1017-1024.

The additional nutrient loading from active feeding aquaculture such as finfish farming is apparent as the supplied food represents a net input to the system. Passive feeding aquaculture can also alter the nutrient regime of an area as it effectively operates as a filter, or concentrator, of ambient food material. Sedimentation of excretory products is known to occur under mollusc farms. Similar sedimentation is observed beneath other types of aquaculture (EPA 1997).

Because finfish farming in the bay would require supplementary feeding (which would result in increased nitrogen input), the establishment of any proposed farms would need to be done with considerable caution. Finfish farming also has other risks which the community has expressed concern about such as the potential introduction of exotic organisms through the use of artificial feed. The use of therapeutic chemicals or biostimulants is already disallowed under the provisions of the SEPP (Waters of Victoria).

Although nutrient offsets appear to be a conceptually simple and attractive proposition (eg siting a shellfish or seaweed operation adjacent to a finfish operation) the ECC believes that in practice, for technical reasons it may be difficult to demonstrate no net nutrient input, especially at a local scale and, for economic or commercial reasons, the incentive to maintain offsets may waver. In addition, the legislative and administrative mechanisms for ensuring such offsets are maintained and monitored need to be clearly articulated.

Recommendation

R40 Commercial finfish aquaculture should not be considered in Port Phillip Bay until preliminary trials have been conducted under the following conditions:

- the trials are undertaken according to the nutrient reduction plan as outlined in clause 12, Schedule F6 (Waters of Port Phillip Bay) of the State Environment Protection Policy (Waters of Victoria); and
- a detailed monitoring program, including monitoring of the ongoing net nutrient balance, is carried out by the Department of Natural Resources and Environment.



Commercial operations should only be approved by the Department of Natural Resources and Environment after advising the Minister responsible for Fisheries and the Minister for Environment and Conservation that:

- the trial demonstrates that commercial operations can be carried out with no net additional nutrient input to Port Phillip Bay; and
- a mechanism is developed, and put in place, to ensure independent monitoring of the ongoing net nutrient balance of commercial finfish aquaculture operations in the bay.

4.5 Principles for selection and management of marine aquaculture areas

The terms of reference for this investigation required the ECC to make recommendations on areas suitable for marine aquaculture, which can be developed on an environmentally sustainable basis.

In the Interim Report (1998) and the Draft Report (1999), comment was sought on principles and criteria which were established for the selection and management of both marine and land-based aquaculture sites. This input built on that provided earlier in response to the LCC Draft Final Recommendations (1996).

As outlined in the Draft Report, the ECC has adopted the following principles for the selection and management of marine aquaculture areas. Two additional principles (the last two in the following list) have been adopted in response to a preference for land-based aquaculture, and widely expressed concerns about the risks of introducing diseases or exotic species through aquaculture of marine species.

A number of recent initiatives address minimising and controlling introductions of exotic species, including the Action Statement, *Introduction of exotic organisms* prepared under the *Flora and Fauna Guarantee Act 1988* and the Interim Victorian Protocol for Managing Exotic Marine Organism Incursions (2000). In addition NRE is developing codes of practice to minimise the risk of introduction and spread of exotic marine organisms via fishing and aquaculture.

Principles

- ❑ Aquaculture at each of the chosen sites must be able to demonstrate and deliver a significant socio-economic gain to the Victorian community.

- ❑ Aquaculture should not be practised on or immediately adjacent to sites with significant environmental values.
- ❑ Aquaculture should not impose permanent ecological change to the site where it is located or to the ecosystem of which it is a part.
- ❑ Conflict with other uses or values should be avoided.
- ❑ Aquaculture practices should not increase the risk of introducing exotic organisms and diseases into Victoria's marine waters.
- ❑ Public waters be available for aquaculture if there is no reasonable land-based alternative. The highest priority should be for the development of land-based aquaculture.

Technical criteria for marine aquaculture have been identified and revised through consultation with Fisheries Victoria, and are outlined in Appendix 7. Criteria include physical site details such as water depth and sediment characteristics, water movement and exchange, access and serviceability, and water quality.

Managing risks

The viability of all aquaculture operations is directly dependent on the maintenance of a healthy and productive aquatic environment. It is in the interests of aquaculture operators to ensure minimal pollution and to prevent negative environmental impacts. However, not all the effects of resource use by aquaculture on other members of society are understood. As a result, most resource use carries with it some risk that unintended or unaccounted impacts (for example, pollution) may occur.

To some extent, science can be used to reduce uncertainty about the effects of aquaculture on other users, although it can rarely eliminate it. Rather, it can be used to more narrowly define the boundaries of risk. As a result, scientific investigation and monitoring has a valuable role to play in avoiding resource use conflicts in the long term. In the meanwhile, however, government decision makers must still make decisions in the face of some uncertainty.

Since the risks of external costs associated with resource use can rarely be eliminated, the question arises of how much risk governments are willing to accept in exchange for aquaculture production. Governments need to trade off the known benefits that aquaculture production may generate to the community against the risks that external costs may arise. Monitoring any impacts from aquaculture will therefore become important.

Source: Holland & Brown (1999), Australian Bureau of Agricultural and Resource Economics Research Report 99.7



4.6 The proposed areas

In accordance with the principles for selection and management of marine aquaculture areas, aquaculture areas are recommended as follows:

Aquaculture zones

Aquaculture zones are areas that have demonstrated successful aquaculture performance or growth of target species in the past or, on advice from Fisheries Victoria and industry, will almost certainly be suitable for target species.

Aquaculture investigation areas were recommended in the ECC's Draft Report for areas which had shown evidence of aquaculture potential through growth of wild or cultured product, but which required further evaluation. No aquaculture investigation areas are recommended in this final report. In most cases further evaluation has been carried out and, together with input from industry and the community following release of the Draft Report, the ECC has decided that either the site does not have any immediate potential, or a smaller aquaculture zone is recommended within the former investigation area.

Aquaculture operations only use part of their lease area, for finfish this is approximately 5%, and for shellfish approximately 50%. This relatively low intensity of use reduces the risk of disease, allows for access between farmed areas and allows for fallowing of sites.

Twelve aquaculture zones are recommended with a total area of 2682 ha, a more than thirteen-fold increase of over the current area licensed for marine aquaculture. Each of the areas is described fully in the following section. For completeness, a description of the earlier recommendation in the ECC's Interim Report (1998) for Aquaculture Areas at Pinnacle Channel and Avalon (land-based) are included.

Aquaculture proposals outside the recommended areas

The selection of the proposed aquaculture zones was based on input from industry, Fisheries Victoria, the community and other relevant bodies such as port authorities. However as aquaculture is a rapidly developing industry, with offshore technology in particular undergoing rapid improvements, other areas may be suitable to meet future needs and requirements for marine aquaculture.

In addition some forms of marine aquaculture have only very general site requirements, eg abalone grow-out, and nomination of particular sites for these activities is unlikely to be of much assistance to industry.

For these reasons it is important that there be a mechanism to consider aquaculture development outside areas specifically recommended in this report. The Aquaculture Development Committee is the appropriate body for this and will ensure that such proposals are considered through the usual planning processes, and that there is an integrated public consultation process for all proposals. The role and workings of the Aquaculture Development Committee are covered in more detail in the Victorian Aquaculture Strategy (pages 18 and 24). The principles outlined on page 126 of this report should guide this Committee.

4.7 Recommended Marine Aquaculture Zones

The ECC recommends the following 12 marine aquaculture zones in areas that have demonstrated successful aquaculture performance or growth of target species in the past or, on advice from Fisheries Victoria and industry, will almost certainly be suitable for target species.

It is expected that marine aquaculture zones approved by Government will be established as Fisheries Reserves under section 88(2)(iii) of the *Fisheries Act* 1995 and a management plan prepared for each area, prior to the sites within the zone being leased. The Victorian Aquaculture Strategy broadly outlines the process for commercial development of the marine aquaculture zones.

Recommendations

- R41** Each aquaculture area be subject to preparation of a management plan, including:
- specification of baseline and ongoing environmental monitoring requirements;
 - access to the zone by other users;
 - design, construction, maintenance and visual impact of structures; and
 - any additional requirements for individual areas noted in recommendations E1 to E12 below.



R42 Until the completion and approval of a Victorian Translocation Policy consistent with the National Policy for the Translocation of Live Aquatic Organisms, (Ministerial Council on Forestry, Fisheries and Aquaculture 1999), translocation of marine organisms for aquaculture be conducted according to interim translocation protocols or codes of practice, which should be publicly available. Preparation of the State policy and associated codes of practice should include public consultation.

R43 NRE expand existing and introduce new research and monitoring programs for existing and new aquaculture operations to include the following:

- assessment of changes in benthic species composition and abundance beneath aquaculture farms;
- monitoring for introduced species, pathogens, diseases, nutrient enrichment (particularly when supplementary feeding is used) and other potential ecosystem effects on the surrounding environment;
- an assessment of recovery times following cessation of aquaculture activities in an area;
- participation by the proponent in, and contribution to the cost of these programs; and
- publicly available reports.

R44 Aquaculture operations which use supplementary food ensure that the food is tested and certified to be free from diseases, pathogens, other unwanted species, and therapeutic chemicals, subject to Import Risk Analyses (IRAs) to be developed by AQIS for processed aquatic animal feeds, aquatic meals and other aquatic animal products (see AQIS 1997).

R45 Conditions of aquaculture licences include provision for an instrument such as a performance bond to ensure that the operator undertake restoration of the site should the operation be abandoned or destroyed.

R46 Other uses within licensed sites be allowed, except where they affect safe, secure and efficient aquaculture operations.

Recommended Aquaculture Zones

Recommendation

E The recommended areas shown on Map A (numbered E1 to E12) be made available for marine aquaculture subject to recommendations R41 to R46 above

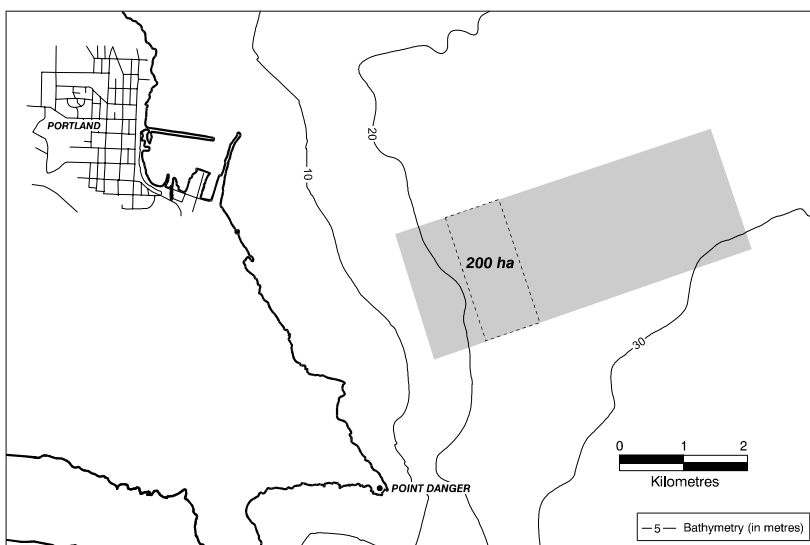
- E1** Portland Aquaculture Zone
- E2** Grassy Point Aquaculture Zone
- E3** Clifton Springs Aquaculture Zone
- E4** Point Lillias Aquaculture Zone (land-based)
- E5** Avalon Aquaculture Zone (land-based)
- E6** Bates Point Aquaculture Zone
- E7** Kirk Point–Werribee Aquaculture Zone
- E8** Beaumaris Aquaculture Zone
- E9** Mount Martha Aquaculture Zone
- E10** Dromana Aquaculture Zone
- E11** Pinnace Channel Aquaculture Zone
- E12** Flinders Aquaculture Zone.



Aquaculture Zones

E1 Portland Aquaculture Zone

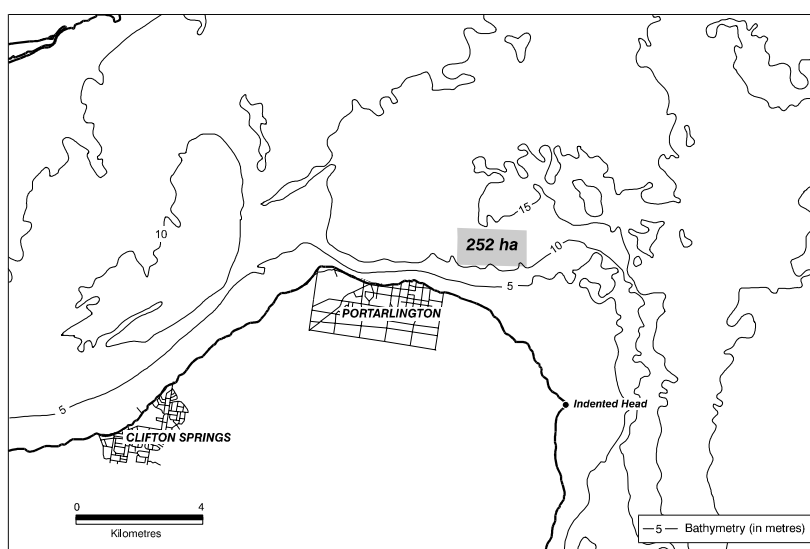
This area off Portland would be suitable for finfish. The area overlies low profile reef consisting of rubble interspersed with sand. The 200 ha area shown within the larger shaded area is indicative only. The actual zone should be located to avoid low profile reef. The aquaculture zone would be appropriately marked and should not represent a shipping hazard.



E2 Grassy Point Aquaculture Zone

This zone is an existing licence area where mussels have been grown successfully for many years. It is recommended that the existing zone be extended from 239 ha to 252 ha through the addition of an additional row to the northern edge of the licence area.

The diatom, which causes a bitter taste in mussels, blooms in association with cold water temperatures, and has from time to time been a particular problem at this site. The Pinnacle Channel area recommended as a Marine Aquaculture Area in the ECC's Interim Report (1998) is not subject to blooms and could be used as an area to cleanse the "bitter taste" diatoms from mussels grown at Clifton Springs and elsewhere in Port Phillip Bay.



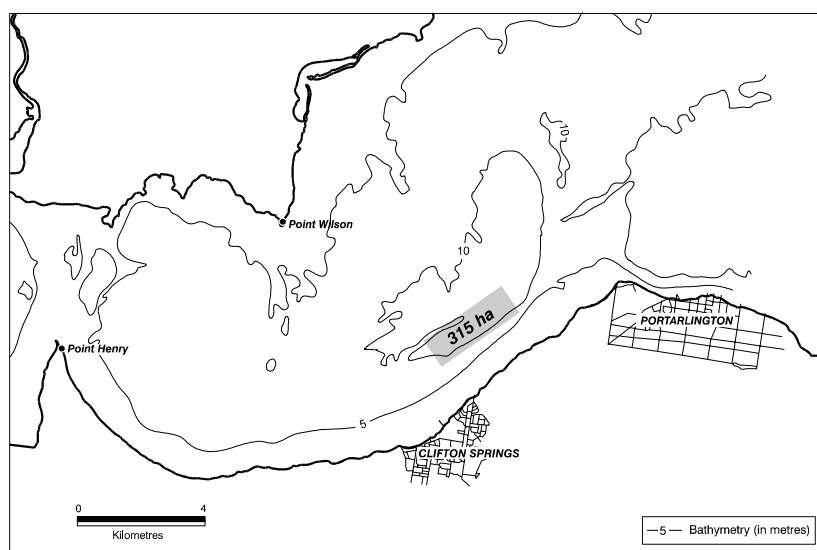
Aquaculture Zones

E3 Clifton Springs Aquaculture Zone

Clifton Springs has been a mussel production site since 1979. Some experimental production of abalone, scallops and flat oysters also occurs.

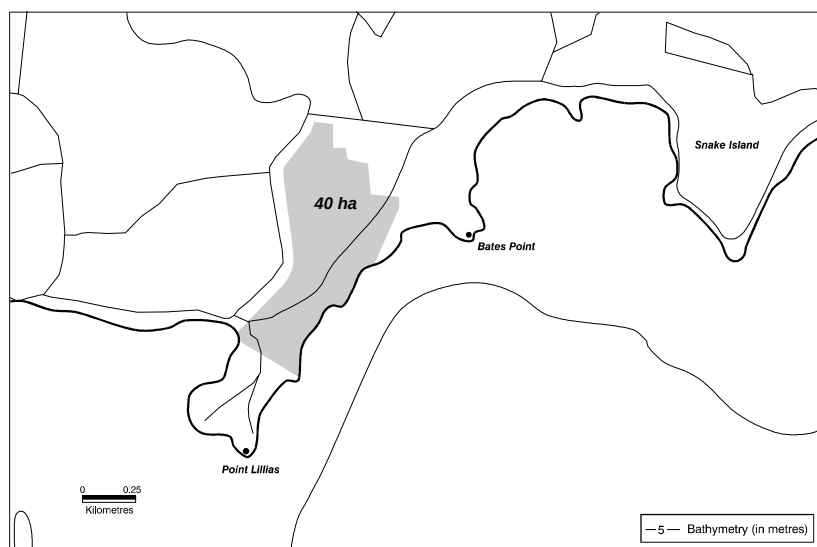
This 315 ha zone is adjacent to significant seagrass beds. Provided mussel ropes do not directly overhang seagrass, there are unlikely to be detrimental impacts on seagrass communities.

Algal blooms of the “bitter taste” diatom occur here, as at Grassy Point. Again the Pinnacle Channel area has the potential to minimise this problem.



E4 Pt Lillias Aquaculture Zone (land-based)

This 40 ha aquaculture zone replaces the 46 ha investigation area recommended in the ECC's Draft Report. The natural values of this zone were intensively studied as part of the Environment Effects Study (EES) for the proposed relocation of the Coode Island chemical storage complex. This zone coincides with the area previously approved for the location of the complex (which did not proceed). The area is part of a large area on the western side of Port Phillip Bay designated as a Wetland of International Importance under the Ramsar Convention. A report commissioned by NRE classified the area included in this recommendation as not having values for waterbird habitat at a regional or higher level. The Environment Effects Study also indicated that while the actual site values are relatively low, the values of adjoining areas are very high (including some areas of international significance).



The detailed management plan for the area must ensure that the Ramsar and other values are protected. The management plan should include a detailed plan of the areas to be occupied and should include buffer areas between the aquaculture site and the high value adjoining areas. It should also specify rehabilitation measures for unoccupied areas to enhance the natural values. This zone is immediately south of the Avalon aquaculture zone recommended in the ECC's Interim Report (1998), see E5 below.

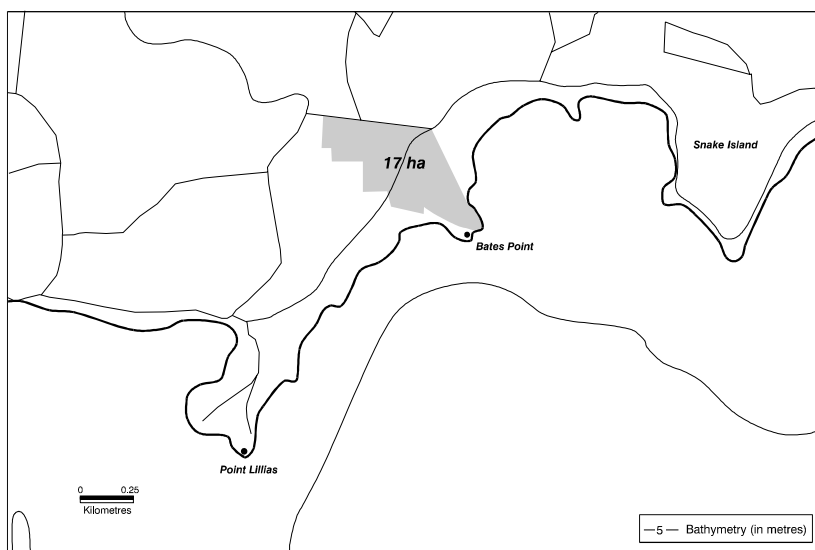
This area is suitable for the cultivation of abalone and finfish in an open system land-based aquaculture facility.



Aquaculture Zones

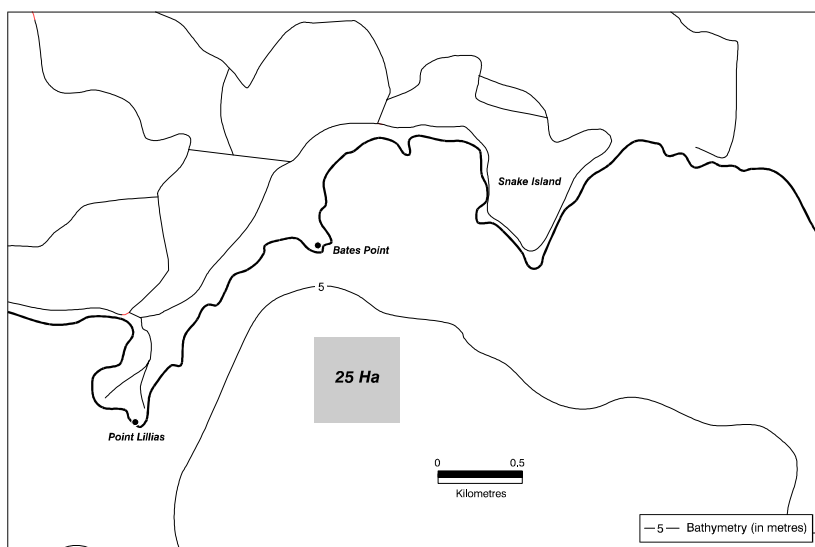
E5 Avalon Aquaculture Zone (land-based)

This 17 ha zone was recommended in the ECC's Interim Report (1998), and is currently under consideration by Government. Experimental production of abalone and finfish is being carried out on this site. An additional 30 ha north of this zone was also proposed in the Interim Report, but Fisheries Victoria now consider this site unsuitable, and an alternative area has been recommended at Point Lillias (see E4 above).



E6 Bates Point Aquaculture Zone

The recommended 25 ha area can be used as a holding facility for harvested product from other aquaculture areas, or as a nursery. In a nursery situation product would be on-grown from “seed” provided by hatcheries (eg flat oysters). Juveniles would then be grown to maturity in a land-based facility. This aquaculture zone will complement the adjacent land-based aquaculture zone (see E5).

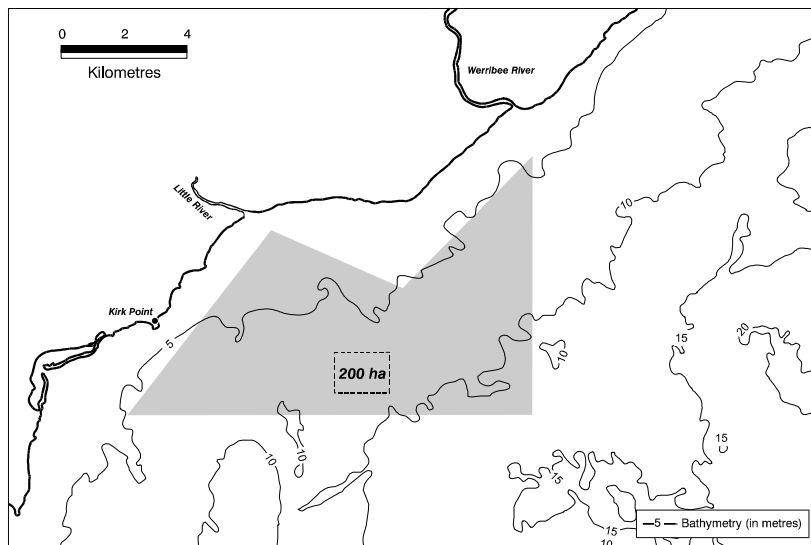


Aquaculture Zones

E7 Kirk Point–Werribee Aquaculture Zone

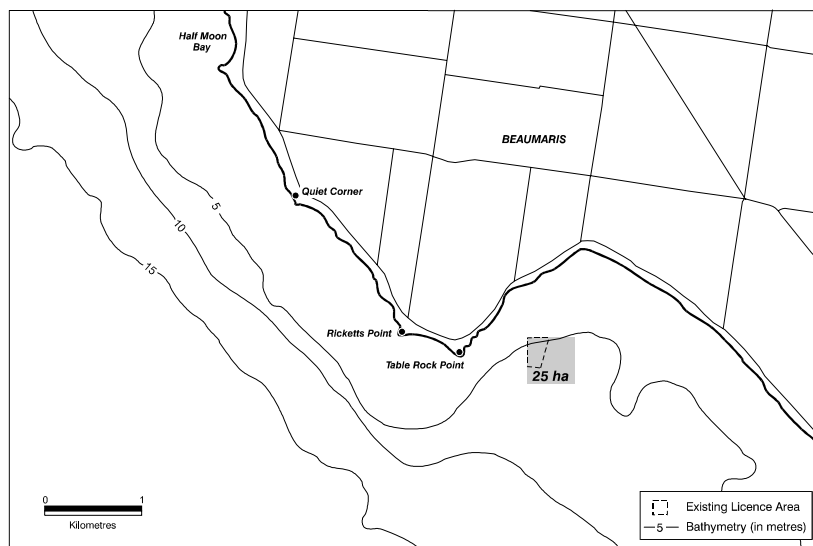
The 200 ha aquaculture zone indicated by the broken line is indicative only and the zone could be re-located to an alternative location within the shaded area, depending on site assessments and operational requirements. The shaded area is characterised by shallow water and is influenced by outflows from the Melbourne Water Western Treatment Plant at Werribee. As a result these waters are nutrient rich and are likely to be highly productive.

Suitable species groups for this area are seaweeds and shellfish. Products such as mulches and soil tonics for the horticultural market and agar for bacteriological plates could be produced from farmed seaweed. An aquaculture industry in this area has potential to reduce net nutrient inputs to Port Phillip Bay (also see section 4.4 on pages 125–126).



E8 Beaumaris Aquaculture Zone

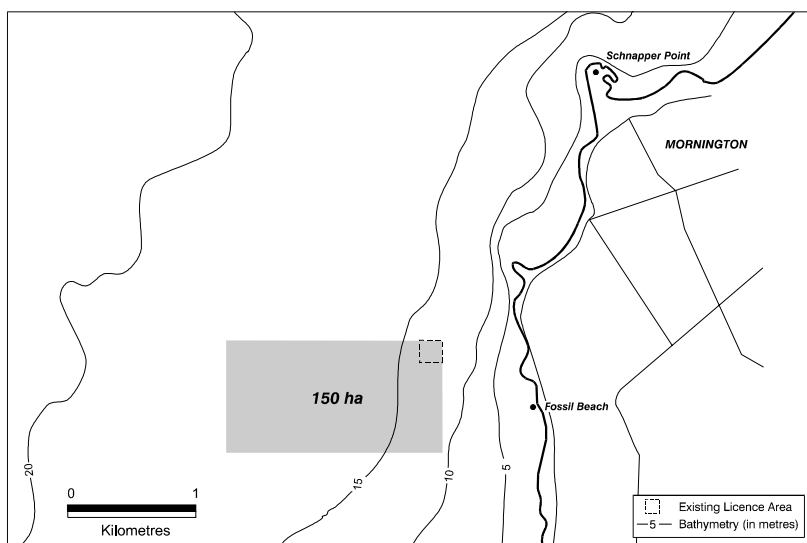
This recommended zone includes an existing lease area where mussels have been grown successfully for many years. It is recommended to expand the existing area from 6 ha to 25 ha. During the public consultation on this proposal, concern was expressed about abandoned aquaculture infrastructure in the area. The ECC has made recommendations in section 4.7 about site restoration. The management plan for this aquaculture zone should include provisions to ensure the clean-up of any abandoned infrastructure prior to further development of the zone.



Aquaculture Zones

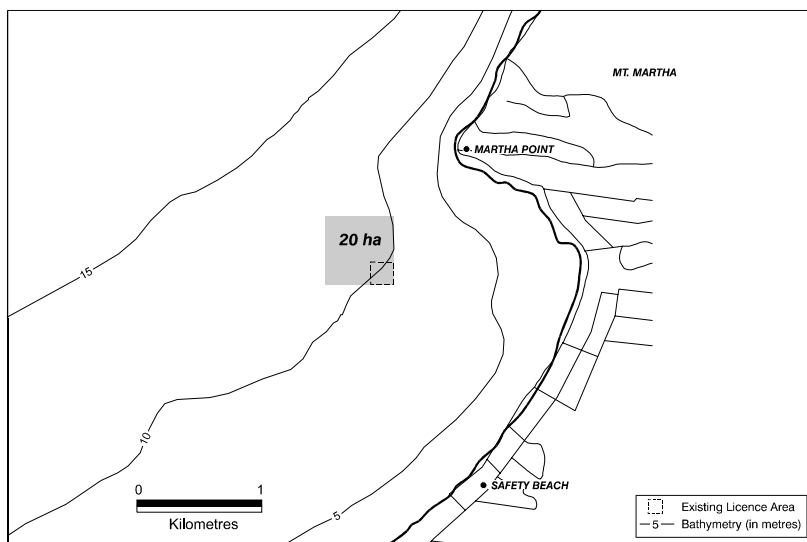
E9 Mount Martha Aquaculture Zone

This recommended zone includes a small existing licence area where mussels have been grown. It is recommended to expand the current area from 3 ha to 150 ha. During the public consultation on this proposal, some concerns were expressed about the size of the recommended aquaculture zone, and the potential for user conflicts. As a result the recommended zone has been reduced from 300 ha to 150 ha.



E10 Dromana Aquaculture Zone

This recommended zone includes a small existing area where shellfish are grown. It is recommended to expand the current area from 3 ha to 20 ha. During the public consultation on this proposal, strong concerns were expressed about the location and size of the recommended zone, particularly the potential for conflict with boating, and safety issues arising from the potential conflict. As a result the recommended aquaculture zone has been substantially reduced from 150 ha to 20 ha. The management plan for this zone must clearly address navigation and boating issues.



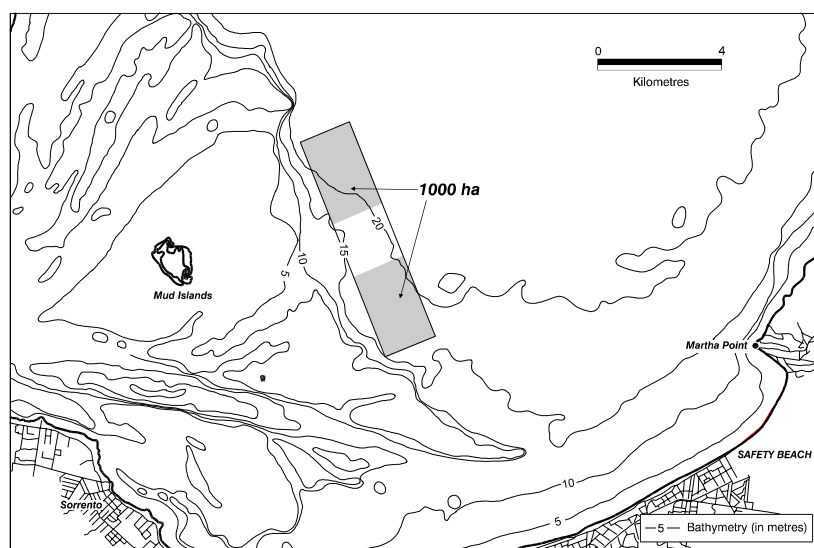
An inland marina development has been proposed at Brokil Creek to the east of the site. The aquaculture zone is located one kilometre from the Brokil Creek/Tassel Drain mouth and is unlikely to impact on potential boat traffic from such a development.



Aquaculture Zones

E11 Pinnacle Channel Aquaculture Zone

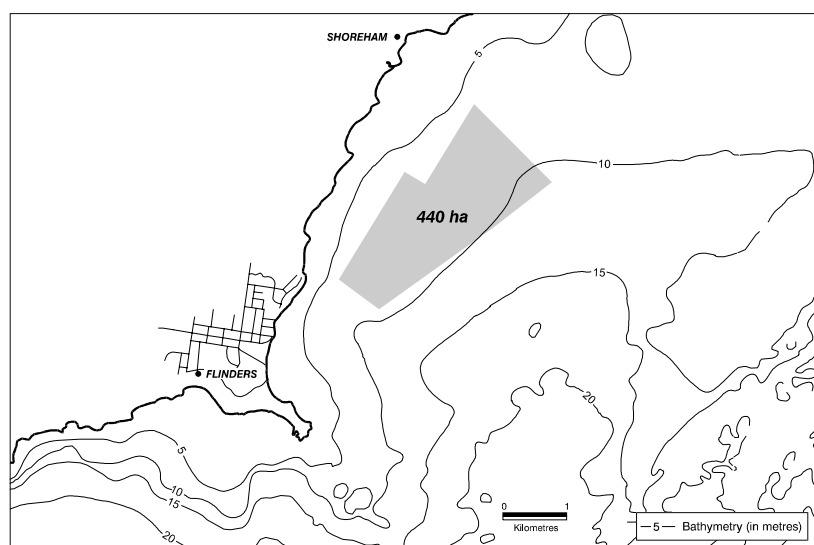
This 1000 ha zone, consisting of two 500 ha blocks, was recommended in the ECC's Interim Report (1998), and is currently under consideration by Government. The Pinnacle Channel area has favourable conditions for the growth of shellfish, particularly scallops. The area is not subject to algal blooms, and could be used to cleanse "bitter taste" diatoms from mussels grown elsewhere in Port Phillip Bay. A detailed description of the area can be found in the Interim Report.



E12 Flinders Aquaculture Zone

This site is an existing aquaculture licence area of 400 ha. Mussels are currently being grown on 17 (of the existing 25) three hectare leases with abalone being grown on the remaining eight leases. It is recommended to expand the existing area to 440 ha. Recommended expansion of the area involves removing two rows from the north-western section, because they are too shallow and subject to excessive wave action, and adding two full rows to the deeper eastern side.

Mussels are currently translocated here from Port Phillip Bay aquaculture licence areas to cleanse the "bitter taste" diatoms.



References

1. Agardy, M.T. (1994) Advances in Marine Conservation: The Role of Marine Protected Areas. *Trends in Ecology and Evolution* 9: 267–270.
2. Agardy, T. (ed.) (1995) *The Science of Conservation in the Coastal Zone: New Insights on how to Design, Implement, and Monitor Marine Protected Areas*. IUCN.
3. Alder, J. (1994) Have six years of marine park public education changed community attitudes and awareness? In *Proceedings of the Seventh International Coral Reef Symposium*, June 1992, Guam, pp. 1043–1051.
4. Allison, G.W., Lubchenco, J. and Carr, M.H. (1988) Marine reserves are necessary but not sufficient for marine conservation. *Ecological Applications* 8(1): 79–92.
5. Appleby, G. (1997) *Waterbird Habitat Values of the Werribee–Avalon Area, including Ramsar Sites*. Flora and Fauna Technical Report No. 146, Department of Natural Resources and Environment.
6. Arnott, G.H. (1974a) *An ecological study of the zooplankton of Westernport and adjacent Bass Strait waters*. Ministry of Conservation, Publication No 95.
7. Arnott, G.H. (1974b) *Studies on the zooplankton of Port Phillip Bay and adjacent waters with special reference to Copepoda*. Ph.D. thesis, Monash University.
8. Arnott, G.H. (1990) *Port Phillip Bay shellfish sanitation program. 1. Introduction and overview*. Marine Science Laboratories, Technical Report No 75.
9. Arnott, G.H. and McKinnon, A.D. (1985) Distribution and abundance of eggs of the anchovy *Engraulis australis antipodum* Gunther, in relation to temperature and salinity in the Gippsland Lakes. *Australian Journal of Marine and Freshwater Research* 36: 433–39.
10. Arnott, G.H., Conron, S.D., Gorfine, H.K. and Hayes, L.M. (1991) *Port Phillip Bay shellfish sanitation program 3. Sanitary survey of Clifton Springs and Grassy Point (Portarlington) shellfish growing areas*. Marine Science Laboratories, Technical Report No 77.
11. Ashton D.H. (1971) Mangroves in Victoria. *Victoria's Resources* 13: 27–30.
12. Attwood, C.G., Harris J.M. and Williams, A.J. (1997) International experience of marine protected areas and their relevance to South Africa. *South African Journal of Marine Science* 18: 311–332.
13. Australian and New Zealand Environment and Conservation Council (2000) *Australian National Guidelines for Cetacean Observation and Areas of Special Interest for Cetacean Observation*. February 2000. Environment Australia, Canberra.
14. Australian and New Zealand Environment and Conservation Council Taskforce on Marine Protected Areas (1998) *Guidelines for Establishing the National Representative System of Marine Protected Areas*. Environment Australia, Canberra.
15. Australian and New Zealand Environment and Conservation Council Taskforce on Marine Protected Areas (1999) *Strategic Plan of Action for the National Representative System of Marine Protected Areas: A Guide for Action by Australian Governments*. Environment Australia, Canberra.
16. Babcock, R.C., Kelly, S., Shears, N.T., Walker J.W. and Willis, T.J. (1999) Changes in Community Structure in Temperate Marine Reserves. *Marine Ecology Progress Series* 189: 125–134.
17. Baelde, P. (1992) *Royal red prawn – Haliporoides sibogae*. In Tilzey, R.D.J. (ed.) *The S.E.T. Fishery – a Scientific View with Particular Reference to I.T.Q. Management*. Bureau of Rural Resources, Canberra.
18. Baker, J., Shepherd, S. and Edyvane, K. (1996) The use of marine fishery reserves to manage benthic fisheries, with emphasis on the South Australian abalone fishery. In: R. Thackway (ed.) *Developing Australia's representative system of marine protected areas: Criteria and guidelines for identification and selection*. Proceedings of a technical meeting held at the South Australian Aquatic Sciences Centre. West Beach, Adelaide, 22–23 April 1996. Department of the Environment, Sport and Territories, Canberra.
19. Ballantine, W.J. (1987) New Zealand's Course for Marine Reserves. *New Scientist*, 4 June 1987.
20. Ballantine, W.J. (1991) *Marine Reserves for New Zealand*. University of Auckland.
21. Ballantine, W.J. (1994) *Networks of 'No-Take' Marine Reserves are Practical and Necessary*. Paper given at the 2nd International Conference on Science and Management of Protected Areas, Halifax, Canada, May 1994.
22. Barnard, J.L. and Drummond, M.M. (1978) Gammaridean Amphipoda of Australia. III: The Phoxocephalidae. *Smithsonian Contributions to Zoology* No 245.



References

23. Barnham, C. (1984). *Census of angling clubs 1984*. Fisheries and Wildlife Service, Technical Report Series No 10.
24. Barnham, C. and Tunbridge, B. (1990) *Report on Census of Angling Clubs and Associations – 1990*. Freshwater Fish Management Branch, Fisheries Division, Department of Conservation and Environment.
25. Barret, D. H. (ed.) (1997) *Crawford's Mariners Atlas – Apollo Bay to Jervis Bay*. Crawford's House Publishing, Bathurst.
26. Barret, N. and Edgar G. (1998) How Marine Reserves Work for the Fish. *Fishing Today* 11(2) April/May 1998.
27. Barton, D. (1980) Seabird islands: No 81, The Skerries Rocks, Victoria. *Corella* 4: 67–8.
28. Bathgate, R. (1999) *The Ecological Sustainability of Marine Fisheries – An Overview of Southeastern Australian Fisheries*. A report for the Victorian National Parks Association.
29. Beer, T. (1983) *Environmental Oceanography: An Introduction to the Behaviour of Coastal Waters*. Pergamon Press, Oxford.
30. Behrendt, J. (1995) So long, and thanks for all the fish...Aboriginal fishing rights and the Commonwealth's acquisition power. *Alternative Law Journal/Aboriginal Law Bulletin* Joint Issue 20(1)/3(72): 11–15.
31. Beinssen, K. (1978) *Recreational and commercial estuarine fishing in Victoria: a preliminary study*. Fisheries and Wildlife Paper No 16.
32. Bell, J.D. (1983) Effects of depth and marine reserve fishing restrictions on the structure of a rocky reef fish assemblage in the north-western Mediterranean Sea. *Journal of Applied Ecology* 20: 357–369.
33. Bennett, B.A. and Attwood, C.G. (1991) Evidence for recovery of a surf-zone fish assemblage following the establishment of a marine reserve on the south coast of South Africa. *Marine Ecology Progress Series* 75: 173–181.
34. Bennett, B.A. and Attwood (1993) C.G. Shore-Angling Catches in the Hoop Nature Reserve, South Africa, and Further Evidence for the Protective Value of Marine Reserves. *South African Journal of Marine Science* 13: 213–222.
35. Bennett, I. and Pope, E.C. (1953) Intertidal zonation of the exposed rocky shores of Victoria, together with a rearrangement of the biogeographical provinces of temperate Australian shores. *Australian Journal of Marine and Freshwater Research* 4: 105–59.
36. Bennett, I. and Pope, E.C. (1960) Intertidal zonation of the exposed rocky shores of Tasmania and its relationship with the rest of Australia. *Australian Journal of Marine and Freshwater Research* 11: 182–221.
37. Bennett, S., Brereton, R., Mansergh, I., Berwick, S., Sanderford, K., and Wellington, C. (1991) *The potential effect of the enhanced greenhouse climate change on selected Victorian fauna*. Arthur Rylah Institute for Environmental Research Technical Report Series No 123.
38. Bergquist, P. and Skinner, I.G. (1982) Sponges (phylum Porifera). In Shepherd, S.A. and Thomas, I.M. *Marine Invertebrates of Southern Australia, Part 1*, pp. 38–72. Government Printer, Adelaide.
39. Bilney, R.J. and Emison, B.W. (1983) Breeding of the white-bellied sea-eagle in the Gippsland Lakes Region of Victoria, Australia. *Australian Bird Watcher* 10: 61–8.
40. Bird, E.C.F. (1993) *The Coast of Victoria – The Shaping of Scenery*. Melbourne University Press, Melbourne.
41. Bird, E.C.F. (1973) *Sites of Special Scientific Interest on the Victorian Coast*. (Wall chart.) Town and Country Planning Board, Melbourne.
42. Bird, E.C.F. (1980) Historical changes on sandy shorelines in Victoria. *Proceedings of the Royal Society of Victoria* 91: 17–32.
43. Bird, E.C.F. (1981) Victorian coastal geomorphology. *Proceedings of the Royal Society of Victoria* 92: 19–35.
44. Bird, E.C.F. (1984) *Coasts – An Introduction to Coastal Geomorphology*. 3rd ed. Australian National University Press, Canberra.
45. Bird, E.C.F. and Barson, M.M. (1973) Shoreline changes in Westernport Bay. *Proceedings of the Royal Society of Victoria* 87: 15–21.
46. Bishop, M. (1992) ITE – An alternative approach to fisheries management. *Australian Fisheries* 51 (5).
47. Black, J.H. (1971) Benthic communities. *Memoirs of the National Museum of Victoria* 32: 129–70.
48. Black, K.P. (1992) Evidence of the importance of deposition and winnowing of surficial sediments at a continental shelf scale. *Journal of Coastal Research* 8: 319–31.
49. Blake, S., Roob, R. and Patterson, E. (2000) *Seagrass: Minor Inlets of Victoria*. Marine and Freshwater Resources Institute Report No. 10, Department of Natural Resources and Environment, Melbourne, Australia.



50. Blake, S., Roob, R., Patterson, E. and Morris, P. (2000) *Victorian Marine Habitat Database – Seagrass: Western Port*. Marine and Freshwater Resources Institute Report No 11, Department of Natural Resources and Environment, Melbourne, Australia
51. Blakers, M., Davies, S.J. and Reilly, P.N. (1984) *The Atlas of Australian Birds*. Melbourne University Press, Melbourne.
52. Bohnsack, J.A. (1998) Application of Marine Reserves to Fisheries Management. *Australian Journal of Ecology* 23: 298–304.
53. Bowker, G.M. (1980b) Seabird islands: No 99, Griffiths Island, Victoria. *Corella* 4: 104–06.
54. Bowker, G.M. (1980a) Seabird islands: No 98, Killarney Reef, Victoria. *Corella* 4: 102–03.
55. Bowler, J.M. (1966) The geology and geomorphology. Port Phillip survey 1957–63. *Memoirs of the National Museum of Victoria* 27: 19–68.
56. Brown, V.B., Davies, S.A. and Synnot, R.N. (1990) Long-term monitoring of the effects of treated sewage effluent on the intertidal macroalgal community near Cape Schanck, Victoria, Australia. *Botanica Marina* 33, 85–98.
57. Brown, V.B., Rowan, K.S. and Ducker, S.C. (1980) *The Effects of Sewage Effluent on the Macrophytes off Werribee, Port Phillip Bay*. Ministry for Conservation, Melbourne.
58. Brown, W.L. and Bedford, B.W. (1978) *The distribution of important biological communities of the Victorian coastline*. Environmental Studies Series No 199.
59. Bucher, D. and Saenger, P. (1992) An inventory of Australian estuaries and enclosed marine waters: an overview of results. *Australian Geography Studies* 29: 370–381.
60. Bucher, D. and Saenger, P. (1989) *An Inventory of Australian Estuaries and Enclosed Marine Waters. Volume III – Victoria*. Australian Recreational and Sport Fishing Confederation, Canberra.
61. Buckley, R. (1986) *Dutton Way, assessment of foreshore*. Marine Models Laboratory, Port of Melbourne Authority, Report No 86–7–20.
62. Buckley, R. (1987a) *Portland Harbour breakwater siltation*. Marine Models Laboratory, Port of Melbourne Authority, Report No 87–3–15.
63. Buckley, R. (1987b) *Sediments of Port Phillip Bay*. Marine Models Laboratory, Port of Melbourne Authority, Report No 87–8–15.
64. Buckley, R. (1989) *Assessment of coastal regime, Apollo Bay Harbour*. Marine Models Laboratory, Port of Melbourne Authority, Report No 89–01–15.
65. Buckley, R. (1990) *Assessment of coastal regime, Lakes Entrance Bar*. Marine Models Laboratory, Port of Melbourne Authority, Report No 90–02–25.
66. Buckley, R. (1992) *Victorian coastal sediment survey: final report*. Coastal Investigations Unit, Port of Melbourne Authority, Report No 92–03–15.
67. Buckley, R. (1993) *Sites of geological and geomorphological significance along the Victorian coast*. Geological Survey of Victoria.
68. Bulthuis, D.A. (1981a) *Distribution of seagrasses in Port Phillip, Victoria*. Marine Science Laboratories, Queenscliff.
69. Bulthuis, D.A. (1981b) Distribution and summer standing crop of seagrasses and macro-algae in Western Port, Victoria. *Proceedings of the Royal Society of Victoria* 92: 107–12.
70. Bulthuis, D.A. and Woelkerling, W.J. (1983a) Biomass accumulation and shading effects of epiphytes on leaves of the seagrass, *Heterozostera tasmanica*, in Victoria, Australia. *Aquatic Botany* 16: 137–48.
71. Bulthuis, D.A. and Woelkerling, W.J. (1983b) Seasonal variation in standing crop, density and leaf growth rate of the seagrass, *Heterozostera tasmanica*, in Western Port and Port Phillip Bay, Victoria, Australia. *Aquatic Botany* 16: 111–36.
72. Bulthuis, D.A. (1983) Effects of in situ light reduction on density and growth of the seagrass *Heterozostera tasmanica* (Martins ex Aschers) den Hartog in Western Port, Victoria, Australia. *Journal of Experimental Marine Biology and Ecology* 67: 91–103.
73. Bulthuis, D.A. (1984) *Loss of seagrass in Western Port: Review 1*. Marine Science Laboratories Program Review No 25.
74. Bureau of Rural Resources (1991) *Twenty Five Years of Australian Fisheries Statistics*. Department of Primary Industries and Energy, Canberra.
75. Bureau of Rural Resources (1992) *Fishery Status Report, South East Trawl – Orange Roughy*. Department of Primary Industries and Energy, Canberra.



References

76. Bury, A. and Smith, M.G. (1992) *Abundance of scallops in Port Phillip Bay and predictions of yields for the 1991 season*. Marine Science Laboratories Technical Report No 81.
77. Butler, A. and Jernakoff, P. (1999) *Seagrass in Australia: Strategic review and development of an R & D plan*. FRDC Project 98/223. CSIRO Publishing.
78. Buxton, C. (1993) Life-History Changes in Exploited Reef Fishes on the East Coast of South Africa. *Environmental Biology of Fishes* 36: 47–63.
79. Buxton, C. (1996) *The Role of Marine Protected Areas in the Management of Reef Fish: A South African Example*. Proceedings of OR2000 workshop: Developing Australia's Representative System of Marine Protected Areas, 22–23 April 1996, Adelaide.
80. Buxton, C.D. and Smale, M.J. (1989) Abundance and distribution patterns of three temperate marine reef fish (Teleostei: Sparidae) in exploited and unexploited areas off the Southern Cape coast. *Journal of Applied Ecology* 26: 441–451.
81. Cadwallader, P.L. and Backhouse, G.N. (1983) *A Guide to the Freshwater Fish of Victoria*. Fisheries and Wildlife Division, Melbourne.
82. Campbell, D., Battagene, T. and Pascoe, S. (1991) *Management Options for the Southern Shark Fishery – An Economic Analysis*. Australian Bureau of Agricultural and Resource Economics, Canberra.
83. Campbell, D., Battagene, T. and Pascoe, S. (1992) *Management Options for the Southern Shark Fishery*. Australian Bureau of Agricultural and Resource Economics, Canberra.
84. Campbell, S.J. (1999) Occurrence of *Codium fragile* subsp. *tomentosoides* (Clorophyta: Bryopsidales) in Marine Embayments of Southeastern Australia, *Journal of Phycology* 35: 938–940 (1999).
85. Campbell, S.J. and Burrige, T.R. (1998) Occurrence of *Undaria pinnatifida* (Phaeophyta: Laminariales) in Port Phillip Bay, Victoria, Australia. *Marine Freshwater Research* 49: 379–381.
86. Carey, J.M. and Watson, J.E. (1992) Benthos of the muddy bottom habitat of the Geelong Arm of Port Phillip Bay. *The Victorian Naturalist* 109: 196–202.
87. Castilla, J.C. and Duran, L.R. (1985) Human exclusion from the rocky intertidal zone of central Chile: the effects on *Concholepas concholepas* (Gastropoda). *Oikos* 45: 391–399.
88. Cecil, M.K. (1982) *Coastal erosion on Sunday Island, South Gippsland, appraisals and recommendations*. Geological Survey of Victoria.
89. Cecil, M.K. (1983) *The evolution of the entrance to Shallow Inlet, Waratah Bay, South Gippsland*. Geological Survey of Victoria.
90. Cecil, M.K. (1984) *Corner Inlet study: beach sediments between Cape Liptrap and Seaspray South Gippsland*. Geological Survey of Victoria.
91. Chapman, M.R. and Kramer, D.L. (1999) Gradients in coral reef fish density and size across the Barbados marine reserve boundary: effects of reserve protection and habitat characteristics. *Marine Ecology Progress Series* 181: 81–96.
92. Clark, R., Thomas, R.B., and Tyshing, R.D. (1986) *Assessment of foreshore, Somers*. Marine Models Laboratory, Ports and Harbours Division, Ministry of Transport, Report No 86–3–20.
93. Cochrane, G.W., Quick, G.W. and Spencer-Jones, D. (1991) *Introducing Victorian Geology*. Geological Society of Australia, Victorian Division, Melbourne.
94. Cocklin, C. (1998) Marine Reserves in New Zealand: Use Rights, Public Attitudes, and Social Impacts. *Coastal Management* 26: 213–231.
95. Cole, R.G. (1994) Abundance, size structure, and diver-oriented behaviour of three large benthic carnivorous fishes in a marine reserve in north-eastern New Zealand. *Biological Conservation* 70: 93–99.
96. Cole, R.G., Ayling, T.M. and Creese, R.G. (1990) Effects of marine reserve protection at Goat Island, northern New Zealand. *New Zealand Journal of Marine and Freshwater Research* 24: 197–210.
97. Coleman, N., Cuff, W., Drummond, M. and Kudenov, J.D. (1978) A quantitative survey of the macrobenthos of Westernport, Victoria. *Australian Journal of Marine and Freshwater Research* 29: 445–66.
98. Coleman, N., Gason, A. & Poore, G. (1997) High Species Richness in the Shallow Marine Waters of South-East Australia. *Marine Ecology Progress Series* 154: 17–26.



99. Coleman, N., Gason, A., Heislars, S. and Moverley, J. (2000) Species diversity within the sediments of Victoria's nearshore soft benthic ecosystem. In Ferns, L.W. (ed.). (2000). *Environmental Inventory of Victoria's Marine Ecosystems Stage 4 (Part 2) – Towards the identification of candidate soft benthic marine protected areas*. Parks, Flora and Fauna Division, Department of Natural Resources and Environment, East Melbourne, Australia.
100. Collins, M., Cullen, J.M. and Dann, P. (1999) Seasonal and annual foraging movements of Little Penguins from Phillip Island, Victoria. *Wildlife Research* 26: 705–21.
101. Commonwealth of Australia (1992) *National Greenhouse Response Strategy*. AGPS, Canberra.
102. Commonwealth of Australia (1997) *Australia's Oceans Policy*. Environment Australia.
103. Conron S. and Coutin P. (1998) *The recreational snapper catch from PPB: a pilot study survey of the boat-based fishery 1994/95*. Marine and Freshwater Research Institute Internal Report No 11.
104. Consulting Environmental Engineers (1988) *Oceanographic charts of south-east Australian ocean waters*. Report to Department of Arts, Sport, the Environment, Tourism and Territories.
105. Consulting Environmental Engineers (1992) *Inventory of Victoria's Marine Ecosystems – Stage 1: Review of Information Sources*. Report to the Department of Conservation and Environment and Land Conservation Council, Melbourne, Australia.
106. Cook, W. (1983) *The offshore constitutional settlement and fisheries management*. Paper prepared for the 53rd ANZAAS Congress Perth.
107. Coutin, P., Bruce, B. and Paul, L. (1992) New Zealand school shark cross the Tasman Sea. *Australian Fisheries* 51 (3): 24–5.
108. Craig, F.G. (1994) *Saltwater Recreational Fishing in Victoria: A Questionnaire Survey of Recreational Fishers*. Report to the Land Conservation Council.
109. Crawford, C.M. (1984) *An ecological study of Tasmanian flounder*. Ph.D. thesis, University of Tasmania.
110. Creswell, I.D. and Thomas G.M. (1997) *Terrestrial and Marine Protected Areas in Australia*. Environment Australia, Canberra.
111. Crowder, L.B. (1998) Fisheries Bycatch: Implications for Management. *Fisheries* 23 (6): 8–17.
112. Crowley, J. (1990) *Fishing – Westernport Bay*. Sportfish Australia Publications Pty Ltd
113. Cullen, J.M., Montague, T.L. and Hull, C. (1991) Food of little penguins *Eudyptula minor* in Victoria: comparison of three localities between 1985 and 1988. *Emu* 91: 318–41.
114. Culley, M. (1971) *The Pilchard – Biology and Exploitation*. Pergamon Press, Great Britain.
115. Dann, P. (1987) The feeding behaviour and ecology of shorebirds. pp. 10–20. In Lane B.A. (ed) *Shorebirds in Australia*. Nelson, Melbourne.
116. Dann, P. (1991) Feeding behaviour and diet of Double Banded Plovers *Charadrius bicinctus* in Western Port, Victoria. *Emu* 91: 179–184.
117. Dann, P. (1992) Distribution, population trends and factors influencing the population size of little penguins *Eudyptula minor* on Phillip Island, Victoria. *Emu* 91: 263–72.
118. Dann, P. (1999) Feeding periods and supratidal feeding of Red-necked Stints and Curlew Sandpipers in Western Port, Victoria. *Emu* 99: 218–222.
119. Davidson, R.J. and Chadderton, W.L. (1994) Marine Reserve Site Selection Along the Abel Tasman National Park Coast, New Zealand: Consideration of Subtidal Rocky Communities. *Aquatic Conservation: Freshwater and Marine Ecosystems* 4: 153–167.
120. Dear, S. (1991) *Victorian Coastal Wind Atlas*. Renewable Energy Authority Victoria and the State Electricity Commission of Victoria, Melbourne.
121. Delft University (1976). *Coastal Engineering Volume 1*. University Press, Delft.
122. Demersal and Pelagic Fisheries Research Group, (1991a) *Meeting No 31 Report and Stock Assessment Workshop*. DPFRG Canberra.
123. Demersal and Pelagic Fisheries Research Group, (1991b) *Meeting No 32 Report*. DPFRG Canberra.
124. Department of Conservation and Environment (1999–2000) *Victorian Recreational Fishing Guide*. Melbourne.
125. Department of Conservation and Natural Resources (1991) *Wilson's Promontory Marine Park, Proposed Management Plan*.
126. Department of Conservation and Natural Resources (1992) *Bunurong Marine & Coastal Park, Proposed Management Plan*.



References

127. Department of Conservation and Natural Resources (1996) *Corner Inlet Fisheries Draft Management Plan*.
128. Department of Primary Industry, Fisheries Division (1977) *Commercial Fish of Australia*. AGPS, Canberra.
129. Department of Water Resources (1989) *Water Victoria: a Resource Handbook*. VGPO, Melbourne.
130. Diggles, B.K. and Ernst, I. (1997) Hooking Mortality of the Species of Shallow-Water Reef Fish Caught by Recreational Angling Methods. *Marine Freshwater Research* 48: 479–483.
131. Dixon, J.A. (1993) Economic benefits of marine protected areas. *Oceanus* 36: 35–40.
132. Dorsey, J.H. (1982) Intertidal community offshore from the Werribee sewage–treatment farm: an opportunistic infaunal assemblage. *Australian Journal of Marine and Freshwater Research* 33: 45–54.
133. Douglas, J.G. and Ferguson, J.A. (1988) *Geology of Victoria*. Geological Society of Australia, Victorian Division, Melbourne.
134. Dragun, A.K. (1991) *A Comparative Review of Commercial and Recreational Fishing in Port Phillip Bay and Western Port – A Study of Commercial and Recreational Fishing Conflicts*. Report prepared for the Department of Conservation and Environment, Melbourne.
135. Driml, S. and Common, J. (1995) Economic and financial benefits of tourism in major protected areas. *Australian Journal of Environmental Management* 2: 19–29.
136. Ducker, S.C. (1981) *A history of Australian marine phycology*, In (eds M.N. Clayton and R.J. King) *Marine Botany – An Australasian Perspective*. Longman Cheshire, Melbourne.
137. Ducker, S.C. (1983) Port Phillip Heads: A phycological saga. *Phycologia* 22: 431–443.
138. Ducker, S.C., Ford, N.J. and Knox, R.B. (1977) Biology of Australian seagrasses, the genus *Amphibolis* C. Agardh (Cymodoceaceae). *Australian Journal of Botany* 25: 67–95.
139. Dugan, J.E. and Davis, G. E. (1992) *Applications of Marine Refugia to Coastal Fisheries Management*. U.S. Department of the Interior, National Parks Service, Channel Island National Park.
140. Easton, A.K. (1970) *The tides of the continent of Australia*. Horace Lamb Centre for Oceanographic Research Paper No 37.
141. Edgar, G.J. and N.S. Barrett, (1999) Effects of the Declaration of Marine Reserves on Tasmanian Reef Fishes, Invertebrates and Plants. *Journal of Experimental Marine Biology and Ecology* 242: 107–144.
142. Edgar, G.J., Last, P.R. and Wells M.W. (1982) *Coastal Fishes of Tasmania and Bass Strait*. Cat and Fiddle Press, Tasmania.
143. Edgar, G.J., Moverley, Baret N.S., Peters D. and Reed C. (1997) The Conservation Related Benefits of a Systematic Marine Biological Sampling Programme: The Tasmanian Reef Bioregionalisation as a Case Study. *Biological Conservation* 79: 227–240.
144. Edmunds, M. (2000 in prep) Ecological status of the Central Victoria Bioregion, 2000: Macroalgae, Invertebrate and Fish populations in the Bunurong Marine Protected Area. In Ferns, L.W. (ed) (2000 in prep) *Ecological Performance Assessment and Reporting for Victoria's Marine Environment*, Department of Natural Resources and Environment, East Melbourne.
145. Edmunds, M., Chidgey, S.S. and Willcox, S.T. (1998) *Victorian Reefs: Association between Biological Communities and Rock Type*. Report to Environment Conservation Council prepared by Consulting Environmental Engineers.
146. Edmunds, M., Roob, R. and Blake, S. (2000 in prep.) Monitoring of reef biota at Port Phillip Heads. In Ferns, L.W. (ed). (2000 in prep). *Ecological Performance Assessment and Reporting for Victoria's Marine Environment*, Department of Natural Resources and Environment, East Melbourne.
147. Edmunds, M., Roob, R. and Ferns, L.W. (2000) Marine biogeography of Central Victoria and Flinders bioregions– a preliminary analysis of reef flora and fauna. In Ferns, L.W. and Hough, D. (eds.) (2000). *Environmental Inventory of Victoria's Marine Ecosystems Stage 3 (Volume 2) – Understanding biodiversity representativeness of Victoria's rocky reefs*. Parks, Flora and Fauna Division, Department of Natural Resources and Environment, East Melbourne.
148. Edwards, R.J. (1979) *Tasman and Coral Sea ten year mean temperature and salinity fields 1967–1976*. CSIRO Division of Fisheries and Oceanography Report No 88.
149. Environment Protection Authority (1997) *Policy impact assessment: protecting water quality in Port Phillip Bay. Variation of State Environment Protection Policy (Waters of Victoria) addition of Schedule F6 (Waters of Port Phillip Bay)*. Publication No. 540. EPA, Melbourne.
150. Fabris, G.J. (1981) *Effect of scallop dredging on mobilisation of heavy metals in Port Phillip Bay*. Marine Science Laboratories Technical Report No 3.



151. Fallu, R. (1991) *Abalone Farming*. Fishing News Books, London.
152. Faye D. (1999) Marine Protection – Learning to Give and Take. *Ecos* 98.
153. Fell, H.B. (1987). *Echinoidea*. McGraw–Hill Book Company, New York.
154. Ferns, L. W. (ed) (1999) *Environmental Inventory of Victoria's Marine Ecosystems Stage 4 (Part 1) – Physical classification of soft benthic habitats of the open coast*, Parks Flora & Fauna Division, Department of Natural Resources and Environment, East Melbourne.
155. Ferns, L. W. and Hough, D. (eds) (1999) *Environmental Inventory of Victoria's Marine Ecosystems Stage 3 (Volume 1) – Marine habitat mapping, classification and analysis of Victoria's nearshore marine environment with emphasis on rocky reefs*. Parks, Flora & Fauna Division, Department of Natural Resources and Environment, East Melbourne.
156. Ferns, L.W. (ed) (2000) *Environmental Inventory of Victoria's Marine Ecosystems Stage 4 (Part 2) – Towards the identification of candidate soft benthic marine protected areas*. Parks, Flora and Fauna Division, Department of Natural Resources and Environment, East Melbourne.
157. Ferns, L.W. and Catlin, J. (1999) *Australian Coastal Atlas: Victorian State Node 1998 / 1999 Annual Report*. Parks, Flora and Fauna Division, Department of Natural Resources and Environment, Melbourne.
158. Ferns, L.W and Hough, D. (eds) (2000) *Environmental Inventory of Victoria's Marine Ecosystems Stage 3 (Volume 2) – Understanding biodiversity representativeness of Victoria's rocky reefs*. Parks, Flora and Fauna Division, Department of Natural Resources and Environment, East Melbourne, Australia.
159. Ferrier–Wesson, S. (1991) *Yiruk Plant Use*. Central Gippsland Aboriginal Health and Housing Co-operative, Gippsland.
160. Fisheries Co-Management Council (1997) *Bay and Inlet Scalefish Fisheries Review*. Note: this review consists of the following 5 reports:
 - D.K.O. Services Pty Ltd., *Background Report*
 - Kinhill Pty Ltd, *Socio-economic Impacts of Future Management Options for Scalefish in Victoria's Bays and Inlets*
 - Marine and Freshwater Resources Institute, *Influence of Environmental and Habitat Features on Scalefish Catches from Victorian Bays and Inlets*
 - Read Sturgess and Associates, *Impacts on Fish Markets of Varied Scalefish Catches*
 - WBM Oceanics Australia, *Review of Scalefish Fishing Practices in Victoria's Bays and Inlets*.
161. Gabler, R.E., Sager, R., Brazier, S. and Pourciau, J. (1975) *Introduction to Physical Geography*. Reinhart Press, San Francisco.
162. Garcia-Rubies, A. and Zabala, M. (1990) Effects of Total Fishing Prohibition on the Rocky Fish Assemblages of Medes Islands Marine Reserve (NW Mediterranean). *Scientia Marina* 54(4): 317–328.
163. Gell, R.A. (1978) Shelly beaches on the Victorian coast. *Proceedings of the Royal Society of Victoria* 90: 257–69.
164. Gibbs, C.F. (1991) Oceanography of Bass Strait: implications for the food of little penguins *Eudyptula minor*. *Emu* 91: 395–401.
165. Gibbs, C.F., Arnott, G.H., Longmore, A.R. and Marchant, W. (1991) Nutrient and plankton distribution near a shelf break front in the region of the Bass Strait cascade. *Australian Journal of Marine and Freshwater Research* 41: 201–17.
166. Gilham, M.E. (1961) Plants and seabirds of granite islands in south–east Victoria. *Proceedings of the Royal Society of Victoria* 74: 21–36.
167. Gill, E.D. (1980) *Coastal processes and harbour development – an example from Warrnambool, S.E. Australia*. Proceedings 17th International Conference on Coastal Engineering, Sydney, pp 40–42.
168. Gorre, I.R.L. (ed) (1999) Getting our acts together: resolving conflicts in coastal zones. *Tropical Coasts* 6(2): 1–40.
169. Gould, S.J. (1968) *Trigonia* and the origin of species. *Journal of the History of Biology* 1: 41–56.
170. Grant, E. (1987) *Fishes of Australia*. E.M. Grant Pty Ltd, Queensland.
171. Gullan, P.K., Cheal D.C. and Walsh N.G. (1990) *Rare or Threatened Plants in Victoria*. Department of Conservation and Environment, Melbourne.
172. Gwyther, D. and McShane, P.E. (1984) *Victorian abalone stock assessment: review 1 (workshop)* Marine Science Laboratories Program Review No 33.



References

173. Hall D.A. (1986) *An Assessment of the Mulloway Agryrosomus hololepidotus Fishery in South Australia with Particular Reference to the Coorong Lagoon*. South Australian Department of Fisheries, Adelaide.
174. Hall, D. and MacDonald, C.M. (1986) *Commercial fisheries situation report: net and line fisheries of Port Phillip Bay, Victoria 1914–1984*. Marine Fisheries Report No 10.
175. Hamilton, N. (1994) *Environmental Inventory of Victoria's Marine Ecosystems – Stage Two: A Physical Classification of Bass Strait Waters*. Report to Land Conservation Council and Department of Conservation and Natural Resources.
176. Handreck, C. and O'Hara, T. (1994) *Occurrence of Selected Species of Intertidal and Shallow Subtidal Invertebrates at Victorian Locations*. Report by the Marine Research Group of Victoria Inc. to the Land Conservation Council.
177. Hargreaves, I. (1981) *Dynamics and Structure of the Ninety Mile Beach*. M.Sc. thesis, Department of Earth Science, Monash University.
178. Harmelin, J.G., Bachet, F. and Garcia, F. (1995) Mediterranean marine reserves: fish indices as tests of protective efficiency. *Marine Ecology* 16: 233–250.
179. Harris, M.P., and Norman, F.I. (1981) Distribution and status of coastal colonies of seabirds in Victoria. *Memoirs of the National Museum of Victoria* No 42: 89–106.
180. Harty, C. (2000) *Draft Coastal and Marine Planning Program, South West Estuaries Coastal Action Plan*. Report prepared for Western Coastal Board, January 2000.
181. Head, L. (1983) Environment as artefact: a geographic perspective on the Holocene occupation of southwestern Victoria. *Archaeology in Oceania* 18: 73–80.
182. Hera-Singh, G. (1992) Submission to the Industry Commission on Water Resource and Waste Water Disposal from the Southern Fishermen's Association and the Lakes and Coorong Professional Fishermen's Association. *Sqfish Magazine*, 16 (4).
183. Hickman N. (1983) *Notes for Port Phillip Bay Mussel Farmers*, Paper for workshop held in Marine Science Laboratories, Queenscliff.
184. Hickman, N. J., Forbes, D., Mantzaris, L. and Reilly, D. (1990) *Culture of Australian flat oysters Ostrea angasi in Victoria*. Marine Science Laboratories, Program Review Series No 99. Fisheries Division, Department of Conservation and Environment, Victoria.
185. Hobday, D., Officer R. A. and G. D. Parry, (1999) Changes to demersal fish composition in Port Phillip Bay, Australia over two decades, 1970 to 1991. *Marine Freshwater Research* 50: 397–407.
186. Holland, D.S. and Brazee, R.J. (1996) Marine Reserves for Fisheries Management. *Marine Resources Economics* 11: 157–171.
187. Holland, P. and Brown, D. (1999) *Aquaculture Policy: Selected experiences from overseas*. ABARE Research Report 99.7, Canberra.
188. Holloway, M. (1991) Hol Chan: marine parks benefit commercial fisheries. *Scientific American* May 1991: 11.
189. Hoy, R.D., Smith, B.K., van der Riet, P., McCowan, A.D. and Tyshing, R. (1991) *Wave energy potential of the Victorian coast*. Proceedings, Australian and New Zealand Solar Energy Society Conference 'Energy for a Sustainable World', Adelaide.
190. Hutchins, B. and Swainston, R. (1986) *Sea Fishes of Southern Australia*. Swainston Publishing, Perth.
191. Imai, T. (1980) *Aquaculture in Shallow Seas*. A. A. Balkema, Rotterdam.
192. IMCRA (1998) *Interim Marine and Coastal Regionalisation for Australia (IMCRA): An Eco-System Based Classification for Marine and Coastal Environments*. Version 3.3, June 1998, Environment Australia, Canberra.
193. Industry Commission (1991) *Cost Recovery for Managing Fisheries*. Industry Commission, Canberra.
194. IUCN (1994) *Guidelines for Protected Area Management Categories*. CNPPA with the assistance of WCMC. IUCN, Gland and Cambridge.
195. Jackson, S.E. (1995) The sea is not empty: cross-cultural issues in conceptualising sea space. *Maritime Studies* September–October 1995: 1–12
196. Jenkin, J.J. (1981) Evolution of the Victorian coastline. *Proceedings of the Royal Society of Victoria* 84: 19–28.
197. Jenkins, G.P. (1986) Composition, seasonality and distribution of ichthyoplankton in Port Phillip Bay, Victoria. *Australian Journal of Marine and Freshwater Research* 37: 507–20.
198. Jenkins, G.P., Watson, G.F. and Hammond, L.S. (1993) *Patterns of utilisation of seagrass Heterozostera dominated habitats as nursery areas by commercially important fish*. VIMS Technical Report 19.



199. Jennings, S., Marshall, S.S. and Polunin, N.V.C. (1996) Seychelles marine protected areas: comparative structure and status of reef fish communities. *Biological Conservation* 75: 201–209.
200. Johnson, D.R., Funicelli, N.A. and Bohnsack, J.A. (1999) Effectiveness of an existing estuarine no-take fish sanctuary within the Kennedy space centre, Florida. *American Journal of Fisheries Management* 19: 436–453.
201. Johnstone, P.L. (1985) *Evaluation of Mussel Culture Rigs for Research in Port Phillip Bay*. Marine Science Laboratories, Queenscliff.
202. Jones, J.B. (1992) Environmental impact of trawling on the seabed: a review. *New Zealand Journal of Marine and Freshwater Research* 26: 59–67.
203. Joyce, E.B. and King R.L. (1980) *Geological Features of the National Estate in Victoria*. Geological Society of Australia Incorporated, Victoria Division, Melbourne.
204. Kelleher G. and Recchia, C. (1998) Editorial – lessons from marine protected areas around the world. *Parks* 8: 1–4.
205. Kelleher, G. and Kenchington, R. (1991) *Guidelines for Establishing Marine Protected Areas*. IUCN, Gland.
206. Kelleher, G., Bleakley, C. and Wells, S. (eds) (1995) *A global representative system of marine protected areas*. The Great Barrier Reef Marine Authority, The World Bank and The World Conservation Union (IUCN), Washington, D.C.
207. Keough, M.J., Quinn, G.P. and King, A. (1993) Correlations between human collecting and intertidal mollusc populations on rocky shores. *Conservation Biology* 7: 378–390.
208. Kerr, E. (1983) The distribution of seagrass in Swan Bay. *Geelong Naturalist* 19: 59–73.
209. Kerr, E.A. and Strother, S. (1990) Seasonal changes in standing crop of *Zostera muelleri* in south-eastern Australia. *Aquatic Botany* 38: 369–76.
210. Kimmerer, W.J. and McKinnon, D.A. (1985) A comparative study of the zooplankton in two adjacent embayments, Port Phillip and Westernport Bays, Australia. *Estuarine, Coastal and Shelf Science* 21: 145–9.
211. Kinchington, P. (1996) *Scuba Dive Survey of Cape Grant*. Report to the Land Conservation Council.
212. Kinchington, P. (1996) *Scuba Dive Survey of Corner Inlet Selected Areas*. Report to the Land Conservation Council.
213. King, P. and Kay, D. (1980) *Land use and erosion control guidelines for the Western Port catchment, program review*. Environmental Studies Series No 296.
214. King, R.L., Ford, A.J., Stanley, D.R., Kenley, P.R. and Cecil, M.K. (1985) *Geothermal Resources of Victoria – A Discussion Paper*. Department of Industry Technology and Resources and Victorian Solar Energy, Melbourne.
215. Kingsford, M.J., Underwood, A.J. and Kennelly, S.J. (1991) Humans as predators on rocky reefs in New South Wales, Australia. *Marine Ecology Progress Series* 72: 1–14.
216. Kirkman, H. (1996) *Substrate Mapping of Victorian Coast from Satellite Imagery*. Environmental Inventory of Victoria's Marine Ecosystems – Stage 3, Parks, Flora & Fauna Division, Department of Natural Resources and Environment, Melbourne.
217. Kirkwood, R., Peinberton, D. and Copoon, G. (1991) *The Conservation and Management of Seals in Tasmania*. Departments of Parks, Wildlife and Heritage, Hobart.
218. Koehn, J.D. and O'Connor, W.G. (1990) *Biological Information for Management of Native Freshwater Fish in Victoria*. Arthur Rylah Institute for Environmental Research, Melbourne.
219. Kriwoken, L.K. and Haward, M. (1991) Marine and estuarine protected areas in Tasmania, Australia: the complexities of policy development. *Ocean and Shoreline Management* 15: 143–163.
220. Kuiter, R.H. (1993) *Coastal Fishes of South-Eastern Australia*. Crawford House Press.
221. Land Conservation Council (1994) *Sites with Important Biological and Ecological Values*. Land Conservation Council Working Paper.
222. Lane, S.G. (1979) A visit to islands off Wilsons Promontory, Victoria. *Corella* 3: 29–30.
223. Lane, S.G. and Battam, H. (1980) Seabirds of Norman and Wattle Islands, Wilsons Promontory, Victoria. *Corella* 4: 37–8.
224. Larry, B. (1998) Fisheries Bycatch: Implications for Management. *Fisheries* 23 (6): 8–16.
225. Last, P.R., Scott, E.O.G. and Talbot, F.H. (1983) *Fishes of Tasmania*. Tasmanian Fisheries Development Authority, Hobart.
226. Lauck, T., Clark, C.W., Mangel, M. and Munro, G.R. (1998) Implementing the precautionary principle in fisheries management through marine reserves. *Ecological Applications* 8(1): 72–78.



References

227. Laughlin, G. (1990) *The Complete Book of Australian Maritime Weather*. W. Gibson Group Pty Ltd, Brookvale.
228. Law Reform Commission (1986) *The recognition of Aboriginal customary law Vol. 1*. AGPS, Canberra.
229. Lawes, J. (1993) *Fishing around Warrnambool*. Sportfish Australia Publications Pty.Ltd
230. Learmonth, N.F. (1965) Mortality and breeding of short-tailed shearwater on the mainland at Portland, Vic. *Emu* 64: 232–4.
231. Levy, S. (1998) Watery Wastelands. *New Scientist* 16 May 1998.
232. Lewis, I. (1988) *Shore Dives of Victoria*. Ian Lewis, Melbourne.
233. MacDiarmid, A.B. and Breen, P.A. (1992) Spiny Lobster Population Change in a Marine Reserve, pp 47–56. In Battershill, C.N. *et al.* (eds) *Proceedings of the Second International Temperate Reef Symposium*, 7–10 January 1992, Auckland, New Zealand, p 252.
234. MacDonald, C.M. (1982) *Life history characteristics of snapper Chrysophrys auratus (Bloch and Schneider, 1801) in Australian waters*. Fisheries and Wildlife Paper No 29.
235. Mahon, G. (ed.). (1997) *Development of a Marine and Coastal Geographic Information System for Victoria Stage 2*. Parks, Flora and Fauna Division, Department of Natural Resources and Environment, Melbourne. p. 32.
236. Malcolm, M.S. (1992) *Protection of Marine and Estuarine Areas with Particular Reference to Australia's National Estate*. A report produced for VNPA under the National Estate Grants Program.
237. Man, A., Law, R. and Polunin, N.V.C. (1995) Role of Marine Reserves in Recruitment to Reef Fisheries: A Metapopulation Model. *Biological Conservation* 71: 197–204.
238. Maravelias, C.D. (1999) Habitat Selection and Clustering of a Pelagic Fish: Effects of Topography on Species Dynamics. *Canadian Journal of Fisheries and Aquatic Sciences* 56: 437–450.
239. Marchant, S. and Higgins P. (1990) (eds). *The Handbook of Australian, New Zealand and Antarctic Birds. Volume 1*. Oxford University Press, Melbourne.
240. Marine and Freshwater Resources Institute (1998a) *Value of Fishery Resources in Potential Marine Parks and Sanctuary Zones Along the Open Coast of Victoria*. Report to the Environment Conservation Council.
241. Marine and Freshwater Resources Institute (1998b) *Value of Fishery Resources in Potential Marine Parks and Sanctuary Zones in Victoria's Bay and Inlets*. Report to the Environment Conservation Council.
242. Marine and Freshwater Resources Institute (1999) *Estimates of Fisheries Resources: Open Coast and Bay and Inlet Study Areas*. Report to the Environment Conservation Council.
243. Marine Parks and Reserves Selection Working Group (1994) *A Representative Marine Reserve System for Western Australia*. CALM, Perth.
244. Marsden, M.A.H. and Mallett, C.W. (1975) Quaternary evolution, morphology and sediment distribution, Westernport Bay, Victoria. *Proceedings of the Royal Society of Victoria* 87: 107–38.
245. Mattingley, A.H.E. (1908) A night with the birds of Lawrence Rocks. *The Victorian Naturalist* 25: 12–24.
246. Maunsell Pty Ltd (1996) *Point Lillias Port and Bulk Liquid Chemical Storage Facility Environment Effects Statement*. A report prepared for the Victorian Government.
247. May, D. and Stephens, A. (eds) (1996) *The Western Port Marine Environment*. Environment Protection Authority, Publication 493.
248. McCarraher, D.B. (1986a), *Distribution and abundance of sport fish populations in selected Victorian estuaries, inlets, coastal streams and lakes. (1) Orbest region; (2) Gippsland region; (3) Otway and Geelong regions; (4) Portland region*. Fisheries Division, Technical Report Series Nos 43–46.
249. McCarraher, D.B. (1986b) *Observations on the distribution, spawning, growth and diet of Australian bass Macquaria novemaculeata in Victorian waters*. Fisheries Division, Technical Report Series No 47.
250. McCarraher, D.B. and McKenzie, J.A. (1986) *Observations on the distribution, spawning, growth and diet of estuary perch Macquaria colonorum in Victorian waters*. Fisheries Division, Technical Report Series No 42.
251. McClanahan, T.R., Muthiga, N.A., Kamukuru, A.T., Machano, H. and Kiambo, R.W. (1999) The effects of marine parks and fishing on coral reefs of northern Tanzania. *Biological Conservation* 89(2): 161–182.
252. McDougall K. (1987) *Sites of Botanical Significance in the Western Region of Melbourne*. Department of Geography, University of Melbourne, Melbourne.
253. McKinney, M.L. (1998) Is Marine Biodiversity at Less Risk? Evidence and Implications. *Diversity and Distribution* 4: 3–8.



254. McLennan Magasanik Associates Pty Ltd (1996) *Socio-economic Assessment of Draft Final Recommendations Covering Marine, Coastal and Estuarine Areas in Victoria*. Report to the Land Conservation Council.
255. McNally, J. (1957) The feeding habits of cormorants in Victoria. *Fauna Contribution (Victoria)* No 6.
256. McShane, P. (1981) *The effect of scallop dredging on the macrobenthos of a muddy environment in Port Phillip Bay*. Marine Science Laboratories, Technical Report No 4.
257. McShane, P.E. (1989) *Stock Assessment of Blacklip Abalone Haliotis rubra in Victoria – Final Report*. Marine Science Laboratories, Queenscliff.
258. McShane, P.E., Beinssen, K. and Foley, S. (1986) *Abalone reefs in Victoria – a resource atlas*. Marine Science Laboratories, Technical Report No 47.
259. McShane, P.E., Beinssen, K., Smith, M., O'Connor, S. and Hickman, N. (1986) *The reproductive biology of blacklip abalone Haliotis ruber from four Victorian populations*. Marine Science Laboratories, Technical Report No 55.
260. Medwell, G.J. (1988) *Otway Ranges*. In Clark, I., Cook B. and G.C. Cochrane (eds) *Victorian Geology Excursion Guide*, pp. 133–56. Australian Academy of Science, Canberra.
261. Melbourne and Metropolitan Board of Works and Fisheries and Wildlife Department (1973) *Environmental Study of Port Phillip Bay. Report on Phase 1, 1969–1973*. Government Printer, Melbourne.
262. Menkhorst, P. (1992) Port Phillip's unique gannet colonies. *Wildlife Australia*, Winter 1992: 13–15.
263. Menkhorst, P.W. (1987) *Working list of Victorian mammals*. Arthur Rylah Institute Technical Report Series No 50.
264. Menkhorst, P.W., Kerry K.R. and Hall E.F. (1988) Seabird islands No 181: Mud Islands, Port Phillip Bay, Victoria. *Corella* 12: 72–7.
265. Meredith, C.W. and Isles A.C. (1980) *A study of the ground parrot Pezoporus wallicus in Victoria*. Environmental Studies Series No 304.
266. Metzner, R. and Rawlinson, P. (1998) *Fisheries structural adjustment: towards a national framework*. Prepared for the Management Committee, Standing Committee for Fisheries and Agriculture Australia.
267. Ministry for Conservation (1975) *Westernport Bay Environmental Study, 1973–1974*. Government Printer, Melbourne.
268. Ministry for Conservation (1976) *Fisheries Management in Victoria*. Fisheries and Wildlife Division, Melbourne.
269. Ministry for Conservation (1980a) *Atlas of Biological and Recreational Resources of the Victorian Coast*. Government Printer, Melbourne.
270. Ministry for Conservation (1981) *The effects of scallop dredging in Port Phillip Bay: a summary*. Fisheries and Wildlife Division, Technical Report No 2.
271. Ministry for Conservation, (1980b) *Westernport Regional Environmental Study. Guidelines for water quality control: project review*. Environmental Studies Series No 309.
272. Minton, C. (1992a) Analysis of recoveries of crested terns banded as chicks in Victoria. *Victorian Wader Study Group Bulletin* No 16: 48–56.
273. Minton, C. (1992b) Tern Banding. *Victorian Wader Study Group Bulletin* No 16: 45–7.
274. Montgomery, S., and Winstanley, R. (1982) *Prawns (east of Cape Otway)*. CSIRO Fishery Situation Report No 6.
275. Morgan, G.J. (1986) *A Survey of Macrobenthos in the Waters of Corner Inlet and the Nooramunga, with Assessment of the Extent of Posidonia Seagrass*. Fisheries and Wildlife paper, No 31.
276. Moulton, P. (1995) *Marine Recreational fishing catch and expenditure in Victoria*. Report to the Land Conservation Council.
277. Moulton, P. (1996) *Fishing Techniques and their Impacts*. Report to the Land Conservation Council.
278. Mullett, C. (1994) *Consultation with Victoria's Coastal Aboriginal Communities*. Report to the Land Conservation Council.
279. Mullett, C. (1995) *Consultation with Victoria's Coastal Aboriginal Communities*. Report to the Land Conservation Council.
280. Murray, S.N., Ambrose, R.F., Bohnsack, J.A., Botsford, L.W., Carr, M.H., Davis, G.H., Dayton, P.K., Gotshall, D., Gunderson, D.R., Hixon, M.A., Lubchenco, J., Mangel, M., MacCall, A., McArdle, D.A., Ogden, J.C., Roughgarden, J., Starr, R.M., Tegner, M.J. and Yoklavich M.M. (1999) No-take Reserve Networks: Sustaining Fishery Populations and Marine Ecosystems. *Fisheries* 24(11): 11–25.
281. Natural Resources and Environment Committee (1991) *Allocation of Fish Resources in Victorian Bays and Inlets*. NREC, Melbourne.



References

282. Naylor, R. L., Goldberg, J., Primavera, J. H., Kautsky, N., Beveridge, M. C. M., Clay, J., Folke, C., Lubchenco, J., Mooney, H. and Troell, M. (2000) Effect of aquaculture on world fish supplies, *Nature* 405: 1017–1024.
283. Neale, I.M., and Bayly, I.A.E. (1974) Studies on the zooplankton of four estuaries in Victoria. *Australian Journal of Marine and Freshwater Research* 25: 337–50.
284. Neis, D.B., Schneider, D.C., Felt, L., Haedrich, R.L., Fischer, J. and Hutchings J. A. (1999) Fisheries Assessment: What Can Be Learned From Interviewing Resource Users? *Canadian Journal of Fisheries and Aquatic Sciences* 56: 1949–1963.
285. Newell, B.S. (1961) *Hydrology of south-east Australian waters*. CSIRO Division of Fisheries and Oceanography, Technical Paper No 10.
286. NOAA Technical Memorandum NMFS–SEFC–261 *The Potential of Marine Fishery Reserve for Reef Fish Management in the US Southern Atlantic*. Plan Development Team, Reef Fish Management Plan, South Atlantic Fishery Management Council, US Department of Commerce, April 1990.
287. O'Brien, D. (1999) *Aquaculture Site Investigations Corner Inlet and North West Westernport Bay*. Aquaculture, Management and Development Pty Ltd, Melbourne.
288. O'Hara, T. (1996) *Biological Observations at Sites in Capel Sound, Port Phillip Bay*. Report to the Land Conservation Council.
289. O'Hara, T. (2000) Faunal and floral assemblages associated with rocky reefs along the Victorian coast. In Ferns, L.W. and D. Hough (eds) *Environmental Inventory of Victoria's Marine Ecosystems Stage 3 (Volume 2) – Understanding biodiversity representativeness of Victoria's rocky reefs*. Parks, Flora and Fauna Division, Department of Natural Resources and Environment, East Melbourne.
290. O'Hara, T. and Barmby, V. (2000) *Victorian Marine Species of Conservation Concern: Molluscs, Echinoderms and Decapod Crustaceans*. Parks, Flora and Fauna Division, Department of Natural Resources and Environment, East Melbourne.
291. O'Sullivan, D. (1991) Status of Australian aquaculture. *Austasia Aquaculture* June: 2–13.
292. O'Toole, M. and Turner M. (1990) *Down Under at the Prom, A Guide to Marine Life and Dive Sites at Wilsons Promontory*. Field Naturalists Club of Victoria and Department of Natural Resources and Environment.
293. Palsson, W.A. and Pacunski, R.E. (1995) *The response of rocky reef fishes to harvest refugia in Puget Sound. Proceedings, Volume 1: Puget Sound Research 95*. Puget Sound Water Quality Authority, Olympia, Washington, USA. Paper given at the 2nd International Conference on Science and Management of Protected Areas, in Halifax, Canada, May 1994.
294. Parkinson, G. (ed.) (1986) *Atlas of Australian Resources. Third Series, Volume 4: Climate*. Australian Government Publishing Service, Canberra.
295. Parks Victoria (1996) *Corner Inlet and Nooramunga Marine and Coastal Parks, Draft Management Plan*. Parks Victoria, Melbourne.
296. Parks Victoria (1997) *Point Cook Coastal Park and Cheetham Wetlands Strategy Plan*. Parks Victoria, Melbourne.
297. Parks Victoria (1998) *Discovery Bay Parks, Draft Management Plan*. Parks Victoria, Melbourne.
298. Parks Victoria (1998) *Port Campbell National Park and Bay of Islands Coastal Park Management Plan*. Parks Victoria, Melbourne.
299. Parry G.D., Campbell, S.J. and Hobday, D.K. (1990) *Marine resources off East Gippsland, south-eastern Australia*. Marine Science Laboratories, Technical Report No 72.
300. Parry, G.D., Currie, D.R. and Crookes, D.P. (1997) *Exotic Marine Pests in Portland Harbour and Environs*. MAFRI, Report No 1, March 1997.
301. Parslow, J. and Jernakoff, P. (1992) *Impact of Climate Change: Fisheries Australia*. Australian Government Publishing Service, Canberra.
302. Phillips, D., Handreck, C., Bock, P., Burn, R., Smith, B. and Staples, D. (1984) *Coastal Invertebrates of Victoria*. Marine Research Group and Museum of Victoria, Melbourne.
303. Polachek, T. (1990) Year Around Closed Areas as a Management Tool. *Natural Resources Modelling* 4(3): 327–335.
304. Poore, G.C.B. (1978) *The decline of Posidonia australis in Corner Inlet*. Environmental Studies Series No 228.
305. Poore, G.C.B. (1982) Benthic communities of the Gippsland Lakes, Victoria. *Australian Journal of Marine and Freshwater Research* 33: 901–15.
306. Poore, G.C.B. and Kudenov, J.D. (1978) Benthos of the Port of Melbourne: the Yarra River and Hobsons Bay. *Australian Journal of Marine and Freshwater Research* 29: 141–55.



307. Poore, G.C.B. and Rainer, S. (1974) Distribution and abundance of soft bottom molluscs in Port Phillip Bay, Victoria, Australia. *Australian Journal of Marine and Freshwater Research* 25: 371–411.
308. Poore, G.C.B. and Rainer, S. (1979) A three year study of benthos of muddy environments in Port Phillip Bay, Victoria. *Estuarine and Coastal Marine Science* 9: 477–97.
309. Poore, G.C.B., Rainer, S.F., Spies, R.B. and Ward, E. (1975) The zoobenthos program in Port Phillip Bay, 1969–1973. *Fisheries and Wildlife Paper* No 7.
310. Port of Melbourne Authority Coastal Investigations Unit (1992) *Victorian Coastal Vulnerability Study*. Port of Melbourne Authority and Office of the Environment, Victoria.
311. Port Phillip Bay Dolphin Research Project Inc. (1992) *Interim Research Project*.
312. Porter, C. (1997) *Subtidal reef areas in Victoria's central marine biophysical region: identification, assessment and documentation of significant sites for nomination to the Register of the National Estate*. A report to the Victorian National Parks Association and the Australian Marine Conservation Society (Victorian Branch).
313. Porter, C. (1999) *Evaluation of the effectiveness of marine protected areas in temperate waters of Australasia*. Ph.D. thesis, Deakin University.
314. Povey, A. and Keough, M.J. (1991) Effects of trampling on plant and animal populations on rocky shores. *Oikos* 61: 355–368.
315. Rabinowitz, D., Cairns, S. and Dillon, T. (1986) Seven forms of rarity and their frequency in the flora of the British Isles. In Soule M.E (ed.) *Conservation Biology: The Science of Scarcity and Diversity*. Sinauer Associates Inc, Sunderland.
316. Ramm, D.C. (1986) *Ecological study of the ichthyoplankton and juvenile fish in the Gippsland Lakes, Victoria*. Ph.D. thesis, University of Melbourne.
317. Reilly, P. (1983) *Fairy Penguins and Earthy People*. Lothian Publishing, Melbourne.
318. Reinson, G.E. (1977) *Hydrology and sediments of a temperate estuary – Mallacoota Inlet, Victoria*. Bureau of Mineral Resources, Geology and Geophysics Bulletin 178.
319. Resource Assessment Commission (1993) *Coastal Zone Inquiry Final Report*. RAC, Canberra.
320. Richardson, B.J. (1983) Identifying the Australian fauna: what remains to be done? *Search* 14(11–12): 320–23.
321. Rigby, B.A. (1982) *An ecological study of the estuarine fish assemblage in the Gippsland Lakes*. Marine Science Laboratories Technical Report No 3.
322. Roberts, C. M. and Polunin, N.V.C. (1993) Marine Reserves: Simple Solutions to Managing Complex Fisheries. *Ambio* 22: 363–368.
323. Roberts, C.M. (1995) Rapid buildup of fish biomass in Caribbean Marine Reserve. *Conservation Biology* 9: 815–826.
324. Roberts, C.M. (in press). Benefits of fully-protected marine reserves for migratory species. *Reviews in Fish Biology and Fisheries*.
325. Roberts, C.M. and Hawkins, J.P. (in press) *Fully-protected marine reserves: a guide*.
326. Robertson, A.I. (1977) Ecology of juvenile King George whiting *Sillaginodes punctatus* (Cuvier and Valenciennes) (Pisces: Perciformes) in Westernport, Victoria. *Australian Journal of Marine and Freshwater Research* 28: 35–43.
327. Rochford, D.J. (1957a) The identification and nomenclature of the surface water masses in the Tasman sea (data to the end of 1954). *Australian Journal of Marine and Freshwater Research* 8: 369–413.
328. Rochford, D.J. (1957b) *The physical setting*. In M.R. Banks and T.G. (eds) *Resources of the Sea*. Dix. Symposium, Bicheno, Tasmania.
329. Rock Lobster and Giant Crab Quota Allocation Panel (1999) *Report on the Allocation of Individual Quotas for the Southern Rock Lobster and Giant Crab Fisheries in Victoria*.
330. Rock Lobster Research Group (1982) *Southern rock lobster*. CSIRO Fishery Situation Report No 7.
331. Roob, R. and Ball, D. (1997) *Seagrass: Gippsland Lakes*. Marine and Freshwater Resources Institute Report to Fisheries Victoria, Department of Natural Resources and Environment, Melbourne.
332. Roob, R. and Currie, D. (1996) *Marine and Coastal Special Investigation: Offshore survey of selected areas*. Report to the Land Conservation Council by the Victorian Fisheries Research Institute, Department of Natural Resources and Environment, Melbourne.



References

333. Roob, R. and O'Hara, T. (1996) *Marine and Coastal Special Investigation: Additional offshore survey of selected areas*. Report to the Land Conservation Council by the Marine and Freshwater Resources Institute, Department of Natural Resources and Environment, Melbourne.
334. Roob, R., Blake, S. and Parry, G. (1999) *Marine and Coastal Special Investigation: Additional offshore survey of selected areas*. Report to the Environment Conservation Council by the Marine and Freshwater Resources Institute, Department of Natural Resources and Environment, Melbourne.
335. Roob, R., Gunthorpe, L. and Turnbull, J. (1999) *Collection and physical classification of sediments*. In: Ferns, L.W. (ed.) (1999) *Environmental Inventory of Victoria's Marine Ecosystems Stage 4 (Part 1)*. Parks Flora and Fauna Division, Department of Natural Resources and Environment, East Melbourne.
336. Roob, R., Lewis, A., Thurlin, S. and Pelikan, M. (1995) *Development of a Marine and Coastal Geographic Information System for Victoria Stage 1*. Department of Conservation and Natural Resources, Melbourne.
337. Roob, R., Morris P. and Werner G. (1998) *Victorian Marine Habitat Database – Seagrass Corner Inlet and Nooramunga*. Marine and Freshwater Resources Institute, Queenscliff.
338. Ross, J. (1990) (ed.) *The Victorian Fishing Atlas*. Penguin Books, Australia.
339. Ross, J.H. (1990) *A Census of the Vascular Plants of Victoria*. National Herbarium of Victoria, Melbourne.
340. Roughley, T.C. (1968) *Fish and Fisheries of Australia*. Angus and Robertson, Sydney.
341. Rowley, R. J. (1994) Case Studies and Reviews – Marine Reserves in Fisheries Management. *Aquatic Conservation. Marine and Freshwater Ecosystems* 4: 233–254.
342. Rowley, Robert J. (1992) *Impacts of Marine Reserves on Fisheries*. Department of Conservation, Wellington, New Zealand.
343. Royal Australasian Ornithologists Union (1992) Little penguin supplement. *Emu* 91 (5).
344. Russ, G.R., Alcala, A.C. and Cabancan, A.S. (1992) *Marine Reserves and Fisheries Management on Coral Reefs with Preliminary Modelling of the Effects on Yield Per Recruit*. 7th International Coral Reef Symposium.
345. Russ, G.R. and Alcala, A.C. (1996) Do Marine Reserves Export Adult Fish Biomass? Evidence from Apo Island, Central Philippines. *Marine Ecology Progress Series* 132: 1–9.
346. Russ, G.R. and Alcala, A.C. (1996) Marine reserves: rates and patterns of recovery and decline in abundance of large predatory fish. *Ecological Applications* 6: 947–961.
347. Russell–Hunter, W.D. (1987) *Octopus: McGraw–Hill Encyclopedia of Science and Technology*. 6th ed. McGraw–Hill Book Company, New York.
348. Sanchirico, J.N. (2000) *Marine protected areas as fishery policy: an analysis of no-take zones*. Discussion Paper 00–23, Resources for the Future, Washington, D.C.
349. Schaap, A. and Green, R. (1988) *Fish communities on reefs subjected to different levels of fishing pressure*. Technical Report 31, Department of Sea Fisheries, Tasmania.
350. Schulz, M., Beardsell, C. and Sandiford, K. (1991) *Sites of Faunal Significance in the Western Wetlands of Melbourne*. Wildlife Branch, DCE, Melbourne.
351. Shapiro, M.A. (1975) *Western Port Bay Environmental Study 1973–1975*. Ministry for Conservation, Melbourne.
352. Shapiro, M.A. and Connell, D.W. (1975) The Westernport Bay environmental study. *Proceedings of the Royal Society of Victoria* 87: 1–13.
353. Shaughnessy, P.D. (1999) *The Action Plan for Australian Seals*. Environment Australia, Canberra.
354. Shepherd, S.A. and Brown, L.D. (1993) What is an Abalone Stock: Implications for the Role of Refugia in Conservation. *Canadian Journal of Fisheries and Aquatic Sciences* 50: 2001–2008.
355. Shepherd, S.A., McComb, A.J., Bulthuis, D.A., Neverauskas, V., Steffensen, D.A. and West, R. (1989) Decline of seagrasses. In Larkum, A.W.D., McComb, A.J. and Shepherd S.A. (eds) *Seagrasses: A Treatise on the Biology of Seagrasses with Special Reference to the Australian Region*. Elsevier, New York.
356. Smith, B., Coleman, N. and Watson, J.E. (1975) The invertebrate fauna of Westernport Bay. *Proceedings of the Royal Society of Victoria* 87: 149–55.
357. Smith, P., Battagene, T. and Reid, C. (1991) *Australian Fisheries Statistics 1991*. Australian Bureau of Agricultural and Resource Economics, Canberra.
358. Smyth, D.M. (1993) *A voice in all places: Aboriginal and Torres Strait Islander interests in Australia's coastal zone*. Resource Assessment Commission, Canberra.



359. Steele, J. (1991) Marine functional diversity. *Bioscience* 41(7): 470–74.
360. Steele, J. and Schumacher H. (2000) Ecosystem Structure Before Fishing. *Fisheries Research* 44: 201–205.
361. Stephens, A. (1995) *The Distribution of Seagrass in Western Port, Victoria*. Environment Protection Authority, Publication 490.
362. Stoner, A.W. and Ray, M. (1996) Queen conch, *Stombus gigas*, in fished and unfished locations of the Bahamas: effects of a marine fishery reserve on adults, juveniles, and larval production. *Fishery Bulletin* 94: 551–565.
363. Suchanek, T.H. (1994) Temperate coastal marine communities: Biodiversity and threats. *American Zoologist* 34: 100–114.
364. Tan, S.H. (1978) Heavy minerals in the beach sands of eastern Victoria. *Mining, Geology and Energy Journal of Victoria* 7(3): 25–30.
365. Taylor, R. I. and Bester, A. (1999) The response of foraging waders to human recreation disturbance at Rhyll, Phillip Island, Victoria. *Stilt* 35: 67.
366. TBA Planners Pty Ltd (1996) *Victorian Coastal Towns Survey: a Socio-economic Profile*. Report to the Land Conservation Council.
367. Tegner, M.J. (1993) Southern California Abalones: Can Stocks be Rebuilt Using Marine Harvest Refugia? *Canadian Journal Fisheries and Aquatic Sciences* 50: 2010–2018.
368. Tilzey, R.D.J. (ed.) (1992) *The S.E.T. Fishery – A Scientific View with Particular Reference to I.T.Q. Management*. Bureau of Rural Resources, Canberra.
369. Tomczak, M. Jr. (1985) The Bass Strait water cascade during winter. *Continental Shelf Research* 4: 255–78.
370. Treadwell, R., McKelvie, L. and Maguire, G. B. (1991) *Potential for Australian aquaculture*. Australian Bureau of Agriculture and Research Economics, Research Report 92.2.
371. Trush, S.F., Hewitt, J.E., Cummings, V.J., Dayton, P.K., Cryer, M., Turner, S.J., Funnell, G.A., Budd, R.G., Milburn, C.J. and Wilkinson, M.R. (1998) Disturbance of the Marine Benthic Habitat by Commercial Fishing Impacts at the Scale of the Fishery. *Ecological Applications* 8 (3): 866–879.
372. Turner, M.L. and Norman, M.D. (1998) Fishes of Wilsons Promontory and Corner Inlet, Victoria: Composition and Biogeographic Affinities. *Memoirs of the Museum of Victoria* 57(1): 143–165.
373. Twyford, K. (1992) Impacts of weeds on the seabirds of Tullaberga Island. *Australian Ranger*. Autumn.
374. Vacchi, M., Bussotti, S., Guidetti, P. and La Mesa, G. (1998) Study of the coastal fish assemblage in the marine reserve of the Ustica Island (Southern Tyrrhenian Sea). *Italian Journal of Zoology* 65 (Suppl S): 281–286.
375. Victorian Institute of Marine Sciences (1995) *Port Phillip Bay Coastal Resource Atlas*.
376. Victorian Institute of Marine Sciences (1996) *Western Port Coastal Resource Atlas*.
377. Victorian Institute of Marine Sciences, Consulting Environmental Engineers, Dames & Moore and Museum of Victoria (1994) *Environmental Inventory of Victoria's Marine Ecosystems – Stage One: Biophysical Classification*. Report to the Land Conservation Council and the Department of Conservation and Natural Resources.
378. Walker, T., Gason, A., Brown, L. and Coutin, P. (1992) *Catch and Effort in the Southern Shark Fishery during 1970–91 – Report to Australian Fisheries Management Authority*. Marine Science Laboratories, Queenscliff.
379. Walker, T.I. (1992) Fishery simulation model for sharks applied to the gummy shark *Mustelus antarcticus* Gunthur, from Southern Australian waters. *Australian Journal of Marine and Freshwater Research* 43: 195–212.
380. Wankowski, J. (1983) *East Victorian Trawl Fishery: Fourth Report to the SEFC Demersal and Pelagic Fisheries Research Group*. Department of Primary Industry, Canberra.
381. Warneke, R.M., and Shaughnessy, P.D. (1985) *Arctocephalus pusillus, the South African and Australian fur seal: taxonomy, evolution, biogeography, and life history*. In Long J.K. and Bryden M.M. (eds) *Studies of Sea Mammals in South Latitudes*. South Australia Museum, Adelaide.
382. Watson, G.F., Robertson, A.I. and Littlejohn, M.J. (1984) Invertebrate macrobenthos of the seagrass communities in Westernport, Victoria. *Aquatic Botany* 18: 175–97.
383. Watson, J.E. (1992) The hydroid community of *Amphibolis* seagrasses in south-eastern and south-western Australia. *Scientia Marina* 56: 217–27.
384. Watson, J.E. (ed.) (1971) *A Preliminary Account of the Benthic Flora and Fauna of North-western Westernport, Victoria*. Underwater Research Group of Victoria, National Museum of Victoria, Melbourne.



References

385. Watson, J.E., Hinwood, J.B. and Parrish, D. (1979) *Appendix D – Marine ecology*. In Hinwood, J.B., Watson, J.E., Mills D.A., Dandy G.C. and Burrage D.M.(eds) *Port of Melbourne Environmental Study*. Centre for Environmental Studies, University of Melbourne, Melbourne.
386. Watson, M., Righton, D. Austin, T. and Ormond, R. (1996) The effects of fishing on coral reef abundance and diversity. *Journal of the Marine Biological Association of the United Kingdom* 76: 229–233.
387. Weavers, B.W. (1992) Seasonal foraging ranges and travels at sea of little penguins *Eudyptula minor*, determined by radiotracking. *Emu* 91: 302–17.
388. Western Port Regional Planning and Co-ordination Committee (1992) *Western Port Bay Strategy : A Strategy Plan for the Protection and Development of Western Port, Victoria*. Westernport Regional Planning and Co-ordination Committee.
389. Weston, K. (1992) *Minerals of Victoria*. Geological Survey of Victoria Published Report No 92.
390. Wheeler, R.W. (1964) Black-faced cormorant in Victoria. *Australian Bird Watcher* 2: 89–90.
391. Wilcox, E. (1994) Haiti Fishermen Plan a Marine Park. *People and the Planet* 3 (1): 28.
392. Williams, H. (1991) Tasmanian shark nursery areas – is gillnetting a threat? *Australian Fisheries* 51 (1).
393. Wilson R.S., Poore G. and Gomon M. F. (1990) *Marine Habitats at Wilsons Promontory and the Bunurong Coast, Victoria: Report on a Survey*. Technical report No 73, Fisheries Division, Department of Conservation and Environment.
394. Wilson, B.R. and Allen, G.R. (1987) Major components and distribution of marine fauna. In G.R. and D.W. Walton (eds) *Fauna of Australia*. Australian Government Publishing Service, Canberra.
395. Wilson, G. (1992) *Fishing Geelong and the Bellarina Peninsula*. Sportfish Australia Publications Pty Ltd.
396. Wilson, G. (1993) *Fishing South Gippsland*. Sportfish Australia Publications Pty Ltd.
397. Wilson, R.S. and Poore, G.C.B. (1987) The Bass Strait Survey: biological sampling stations, 1979–1984. *Occasional Papers Museum of Victoria* 3: 1–14.
398. Wilson, R.S., Heislars, S. and Poore, G. (1998) Changes in Benthic Communities of Port Phillip Bay, Australia, Between 1969 and 1995. *Marine Freshwater Research* 49: 847–61.
399. Wilson, R.S., Poore, G.C.B., and Gomon, M.F. (1990) *Marine habitats at Wilsons Promontory and the Bunurong coast, Victoria: report on a survey, 1982*. Marine Science Laboratories Technical Report No 73.
400. Winstanley, R. (1996) Issues in the Victorian marine environment In Zann L.P. and Sutton D.P. (eds) *State of the Marine Environment Report for Australia, Technical Annex 3: State and Territory Issues*. Published by the Great Barrier Reef Marine Park Authority for the Department of the Environment, Sport and Territories.
401. Winstanley, R.H. (1981) Fisheries resources of Victoria's coastal and offshore waters. *Proceedings of the Royal Society of Victoria* 92: 81–92.
402. Winstanley, R.H. (1982) *The fishery and stocks of blue mussels Mytilus edulis planulatus (Lamarck) in Port Phillip Bay*. Fisheries and Wildlife Division, Commercial Fisheries Report No 5.
403. Winstanley, R.H. and Kearney, J. (1982) *Experimental and Exploratory Octopus Trapping in Port Phillip Bay, December 1980 – April 1981*. Fisheries and Wildlife Division, Commercial Fisheries Report No.7.
404. Winstanley, R.H., Potter, M.A. and Caton, A.E. (1983) Australian cephalopod resources. *Memoirs of the National Museum of Victoria* 44: 243–253.
405. Womersley, H.B.S. (1981) Marine ecology and zonation of temperate coasts. In Clayton M.N. and King R.J. (eds) *Marine Botany – An Australasian Perspective*. Longman Cheshire, Melbourne.
406. Yamasaki, A. and Kuwahara, A. (1990) *Preserved area to effect recovery of over-fished Zuvai crab stocks off Kyoto Prefecture*. In the Proceedings of the International Symposium on King and Tanner Crabs, November 1989, Anchorage, Alaska. Alaska Sea Grant College Program, University of Alaska, Fairbanks, Alaska, USA, pp. 575–585.
407. Yugovic, J. (1998) *Vegetation dynamics of a bird-dominated island ecosystem: Mud Islands, Port Phillip Bay*, Ph.D. thesis, Monash University.
408. Yugovic, J., Jaremovic, R., Costello, C. and Meredith, C. (1993) *Terrestrial Component of Biological Resources*. Report to the Land Conservation Council by Biosis Research Pty Ltd.
409. Zann, L.P. (1995) *Our Sea, Our Future. Major findings of the State of the Marine Environment Report for Australia*. Published by the Great Barrier Reef Marine Park Authority for the Department of the Environment, Sport and Territories.



Glossary

adequate	With reference to the CAR system, adequate means parks and other conservation reserves that have practical boundaries, are of a sufficient size to ensure that physical and biological values can be protected and the impact of adjacent activities minimised, and that more than one example of each environment is protected.
aquaculture	The commercial growing of animals and plants in water.
arthropod	Member of the phylum <i>Arthropoda</i> , consisting of animals with hard jointed exoskeleton.
ascidian	Sessile chordate animal of the class <i>Ascidacea</i> , may be solitary or colonial and there is usually a free-swimming larva.
ballast water	Water carried in a ship's tank for stability; normally discharged to the sea when the ship is loaded and can be contaminated with pollutants or exotic organisms.
benthos, benthic	The flora and fauna of the seabed.
biomass	As measured by ecologists, the dried weight of all organic matter in the ecosystem.
biodiversity, biological diversity	The variability among living organisms and the ecological complexes of which they are part; this includes the diversity within species, between species and of ecosystems.
bioregion, biogeographic region, biophysical region	An area defined by a combination of biological, social and geographic criteria, rather than by geopolitical considerations (Commonwealth of Australia 1966).
biota	Collectively, the plants, micro-organisms and animals of a region.
bommie	An outcrop sharply rising from the seabed.
broken reef	Patches of usually low profile reef interspersed with sand. Broken reef can be worn bed-rock or calcified sediments and/or hard coral growths. Non bed-rock reef may be vulnerable to impact by some fishing methods.
bryozoan	Sessile colonial animal of the invertebrate phylum Bryozoa, sometimes known as 'moss animal' which form tuft-like or moss-like aggregate masses.
by-catch	Species that are also caught when fishing for a particular species (or size). It may be retained or discarded.
CAMBA	China Australia Migratory Bird Agreement. An intergovernmental agreement for the protection of Migratory Birds (1986).
CAR	Comprehensive, adequate and representative in relation to a system of protected areas.
catchment	The area of land that drains to a watercourse.
cephalopod	Mollusc with a distinct tentacled head including octopus, squid, cuttle-fish.
chordata	Phylum of animals with a hollow dorsal nerve cord.
community	An assemblage of plant and animal species living together in a defined area or habitat.
comprehensive	With reference to the CAR system, comprehensive means a system which protects examples of the full range of habitats and biological communities within each of Victoria's marine biophysical regions.



conservation	The management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations, while maintaining its potential to meet the needs and aspirations of future generations; the maintenance of conditions or features in a sound or unimpaired state.
cultural heritage	Knowledge, places and things, including those made or changed by humans, that have aesthetic, historic, scientific, social or spiritual significance or other special value for future generations as well as the present community.
diatom	Microscopic unicellular alga with silicified cell-walls, found as plankton and forming fossil deposits.
ecologically sustainable development (ESD)	Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased (National Strategy for Ecologically Sustainable Development 1992).
ecology	The study of living organisms and their relationships to one another and the environment.
ecosystem	A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit (Convention on Biological Diversity 1992).
endemic	Native to a particular area and found nowhere else in the world.
estuary	The tidal mouth of a river where salinity is usually less than that of the sea.
exotic organisms	Animal or plant species that are not native to an area.
filter-feeding	A feeding strategy sieving plankton from the water. It is used by many molluscs and a few species of finfish.
gorgonian or sea-fan	An animal belonging to the invertebrate phylum Cnidaria with sea-whips and soft corals.
extensive marine aquaculture	In sites with support structures floating in, or on, the water or submerged and resting on the seabed, usually shellfish.
fecundity	Of high fertility.
habitat	The place or type of site where an organism or population naturally occurs (UNEP 1994).
heavy reef	Continuous unbroken reef, usually of protruding bed-rock, often deeply dissected.
high energy coastline	Areas of coast subject to the effects of storms and large waves.
hydroid	Animal of the invertebrate phylum Cnidaria, possessing stinging cells, often occurring as sessile colonies of polyps. Cnidaria also include corals and sea anemones.
intensive marine aquaculture	In deeper sites with support structures floating in, or on, the water or submerged and resting on the seabed, usually finfish.
Interim Marine and Coastal Regionalisation for Australia (IMCRA)	An ecosystem-based classification for marine and coastal environments. It provides ecologically based regionalisations at the meso-scale (100-1000km) and at a provincial scale (greater than 1000km). IMCRA is the bioregional framework for the planning and management of the NRSMPA.
indigenous species	Species that occur naturally in a region.
intertidal	Area between low and high tide which is subject to daily changes in physical and biological conditions from tide movement.



invertebrates	Animals without an internal skeletal structure. Range from protozoans to sea squirts.
JAMBA	Japan Australia Migratory Bird Agreement. An intergovernmental agreement for the protection of Migratory Birds (1974).
kelp	Large brown seaweed.
land-based marine aquaculture	Where activities take place to the shoreward side of the high tide line, usually with the crop in artificial containers and with seawater pumped from nearby sea or estuarine areas.
low profile reef	Relatively flat reef which does not rise at a steep gradient. Low profile reef may be subject to sediment inundation.
macrophytes	Visible, relatively large, aquatic plants, especially marine plants, large enough to be visible to the naked eye.
marine aquaculture, mariculture	A form of aquaculture where the crop is grown in marine or estuarine waters.
molluscs	Group of soft bodied animals which usually have a hard shell (includes snails, bivalves, limpets, tooth shells as well as cephalopods).
NRSPMA	The National Representative System of Marine Protected Areas is a national system of marine protected areas which aims to contain comprehensive, adequate and representative samples of Australia's marine ecosystems.
OCS	Offshore Constitutional Settlement – an agreement between the States and the Commonwealth in relation to the territorial sea.
pelagic	Living in the water column as distinct from near the seabed or bottom.
phylum	High level taxonomic division, containing plants or animals of the same general form, ideally reflecting common ancestry.
phytoplankton	Planktonic plant organisms collectively.
planktonic	Mostly very small animals and plants of the sea which float or drift almost passively.
precautionary principle	Where there are threats of serious or irreversible environmental damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
protected area/marine protected area (MPA)	An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means (IUCN 1994).
Ramsar site	A site listed under the Convention on Wetlands of International Importance (the 'Ramsar Convention'). The convention on Wetlands was signed in Ramsar, Iran, in 1971.
ranching	A form of aquaculture where juveniles are released into the wild, allowed to grow and harvested at a later date.
representative	With reference to the CAR system, representative means that parks and other conservation reserves reflect the diversity of the flora and fauna within each of the protected habitats and biological communities.
seagrass	Flowering plants adapted for life submerged in marine or estuarine environments.
seaweed	Any algae (red, brown or green) growing in or by the sea.
seine	A fishing net which hangs vertically in the water, the ends being brought together to enclose the fish.



seining shot	One cast of a seine net.
sessile	Attached to the substrate, immobile.
shellfish	Animals living within biologically produced shells and exo-skeleton: molluscs and arthropods.
species	Populations of animals or plants that are able to interbreed and produce fertile offspring.
sponge	Aquatic animal of phylum Porifera with pores in the body-wall and a tough elastic skeleton.
subtidal	Below the low-water mark.

ACRONYMS

AAV	Aboriginal Affairs Victoria
ANZECC	Australian New Zealand Environment and Conservation Council
CaLP	Catchment and Land (Protection) Management Board
CAMBA	China Australia Migratory Birds Agreement, 1986
CBA	Cost benefit analysis
CMA	Catchment management authority
DNRE	Department of Natural Resources and Environment
ECC	Environment Conservation Council
EPA	Environment Protection Authority
ILO	International Labour Organisation
IUCN	World Conservation Union (formerly known as International Union for the Conservation of Nature)
IMCRA	Interim Marine and Coastal Regionalisation for Australia
JAMBA	Japan Australia Migratory Birds Agreement, 1974
LCC	Land Conservation Council
MPA	Marine protected area
NRE	Department of Natural Resources and Environment
NRSMPA	National Representative System of Marine Protected Areas
OCS	Offshore Constitutional Settlement
SECV	State Electricity Commission of Victoria
SEPP	State Environment Protection Policy
TAC	Total allowable catch
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VCA	Victorian Channels Authority
VCC	Victorian Coastal Council
VCS	Victorian Coastal Strategy



Appendix 1

List of submissions received on the Draft Report (December 1999)

Appendix 1: Submissions from groups

Group	Sub no
1st Beaumaris Sea Scouts	539
Abalone Committee of Seafood Industry Victoria Inc	760
Abalone Fishermens Cooperative Ltd	265
Eastern Zone Abalone Fishery	
Aboriginal Affairs Victoria	1040
Aboriginal & Torres Strait Islander Commission (Vic)	1041
Adobe (Mudbrick) Flats	198
Aireys Inlet & District Association Inc	635
Aireys Inlet Foreshore Committee Of Management	636
Allansford Angling Club	359
Alp Green Network	618
Angair	43
Angair Inc	357
Anglesea Coast Action	279
Anglesea Coast Action	43
Anglesea Motor Yacht Club Inc	1058
Apollo Bay Fishermen's Co-Operative Society Ltd	781
Aquatic Naturalists Inc	724
Australian Anglers Association	48
Australian Democrats Deakin Branch	538
Australian Fisheries Management Authority	987
Australian Labor Party, Portland Branch	420
Australian Marine Conservation Society	43
Australian Marine Conservation Society, Great Ocean Road Branch	248
Australian Marine Sciences Association Victorian Branch	1050
Australian National Sportfishing Assoc, Victorian Branch	490
Australian Sea Urchins Pty Ltd	273
Auswide Fishing	383
Barwon Coast Committee of Management Inc	762
Barwon Heads Primary School	696
Bass Coast Shire Council	731
Bayside City Council	118
Beaumaris Conservation Society Inc	761
Beaumaris Motor Yacht Squadron	11
Bellarine Light Game & Sport Fishing Club	1184
Berwick Angling Club Inc	1076
Bird Observers Club of Australia	723
Bird Observers Club of Australia, Mornington Peninsula Branch	176
Birds Australia	695
Black Rock & Sandringham Conservation Association Inc	512
Board of Works Angling Club (Bowac)	642
Boating Industry Association Of Victoria Ltd	652
Bookmark Biosphere Reserve, Bookmark Programs	356

Group	Sub no
Briargolong Angling Club Inc	732
Brighton Central Angling Club	1042
Bushland Research Council	765
Camperdown Angling Club	1143
Cape Woolamai Progress Association	264
Capella III Fishing Adventures	570
Cardinia Environment Coalition Inc	649
Cardinia Shire Council	32
City of Casey	637
City of Greater Geelong	2302
Cobden Angling Club	749
Colac Angling Club	551
Colac Otway Shire	730
Corangamite Shire Council	733
Corinella Boating & Angling Club Inc	354
Corner Inlet Habitat Association / WBM Pty Ltd	86
Coronet Bay Progress Association Inc	31
Coronet Bay Ratepayers & Residents Association Inc	241
Coronet Bay Reserves Committee of Management	64
Cowes Yacht Club Inc	613
CPSU	1103
Curdievale Angling Club	290
Dandenong Club Sportsfishing Club	19
Department of Infrastructure	1037
Department of Natural Resources & Environment	387
Devils Elbow Amateur Fishing Club	158
Dolphin Research Institute Inc	619
Drysdale Sportfishing Club	297
East Gippsland Shire Council	459
Eastern Zone Rock Lobster Association	545
Elwood Angling Club	296
Environment Protection Authority	614
Esso Australia Ltd	1018
Fisheries Co-Management Council	323
Framlingham Aboriginal Trust	2341
Frankston Anglers & Boat Owners Club Inc	170
Frankston Beach Association Inc	1079
Friends of Abbott Street - Sandringham	38
Friends of Bass Valley Bush Inc	1174
Friends of Bass Valley Bush Inc / Landcare & Coast Action Group	341
Friends of French Island National Park	116
Friends of Mallacoota Inc	215
Friends of Tamboon Inlet	200

Appendix 1: Submissions from groups (continued)

Group	Sub no
Friends of The Bay of Islands Coastal Park	427
Friends of The Bluff	748
Friends of The Otway National Park	734
Friends of The Prom	994
Friends of Walkerville	292
Friends of Watkins Bay	22
Fynleen Pty Ltd	1057
Game Fishing Association of Victoria	257
Geelong & District Angling Club & Fish Protection Society	240
Geelong & District Angling Clubs Association	93
Geelong Bluewater Sportsfishing Club	537
Geelong Bushwalking Club	475
Geelong Environment Council	43
Geelong Environment Council Inc	1128
Geelong Field Naturalists Club	43
Geelong Field Naturalists Club Inc	735
Geelong Fly Fishing Club Inc	343
Geelong Gun & Rod Association	99
Geelong Sport & Fishing Club Inc	360
Gippsland Angling Club Association Inc	388
Gippsland Aquaculture Industry Network Inc	725
Gippsland Coastal Board	422
Gippsland Development Ltd	106
Gippsland Lakes Fishing Club Inc	428
Gippsland Water	650
Glen Eira Environment Group Inc	35
Glenelg Shire Council	763
Golden & Paradise Beach Ratepayers & Residents Association Inc	352
Gould League	L89
Greenvale Sport & Game Fishing Club	2347
Hallam Angling Club	1183
Hamilton Field Naturalists Club	517
Hayden Reels / Recreational Fishing Alliance	20
Hobsons Bay City Council / Parks Recreation & Culture	L52
Iluka Conservation Inc	488
Inverloch Residents & Ratepayers Association Inc	1013
Inverloch Residents Development Association	189
Jan Juc Action Group	80
Jan Juc Coast Action	43
Keysborough Angling Club	79
Knox Boat Fishing Club Inc	747
Koo Wee Rup Boat Club	L14
Koroit & District Angling Club Inc	573

Group	Sub no
Kororoit Creek Angling Club Inc	689
Laburnum Angling Club Inc	400
Lakes & Wilderness Tourism Australia Inc	299
Lang Lang Coast Action Group	1177
Latrobe University, Dept Of Genetics	266
Leongatha Angling Club Inc	339
Maffra Angling Club Inc	258
Mallacoota Coast Care / Coast Action	535
Mallacoota Inlet Business & Tourism Assoc Inc	991
Marengo Coast Association Inc	2346
Marine & Coastal Community Network	17
Marine Education Society Of Australia	1019
Marine Research Group	396
Marlo Diversity Pty Ltd	394
Melbourne Museum, Children's Museum	770
Melbourne Water	1017
Melton Sport Fishing Club	344
Metropolitan Anglers Association	294
Modewarre & District Angling Club	661
Mordialloc Beaumaris Conservation League Inc	540
Mornington Environment Association Inc	764
Mornington Peninsula Shire Council	295
Moyne Shire	1059
Mt Eliza Association For Environmental Care	370
N.A.G. Inc.	1036
National Herbarium	716
National Party of Australia Vic	324
Natural Environment Association	92
Newhaven Yacht Squadron Inc	1100
Nsw Fisheries	23
Oakdale Angling Club & Fish Protection Society	220
Orbost Angling Club	1178
Orbost Chamber of Commerce	746
Orbost Womens Awareness Group	1078
Otway Planning Association Inc	256
Otwild Adventures	572
Pakenham Angling Club	455
People For Progress	19
Phillip Island Conservation Society	345
Phillip Island Nature Park Australia	162
Polperro Charter Service	1221
Port Campbell Boat Charters	1039
Port Campbell Boat Club	1038

Appendix 1: Submissions from groups (continued)

Group	Sub no
Port Campbell Environment Group	759
Port Fairy Coast Action Group	154
Port Phillip & Western Port Bay Professional Fishermens Association Inc	321
Port Phillip Conservation Council Inc	610
Port Phillip Regional Catchment & Land Protection Board	1113
Portland Angling Club Inc	507
Portland Professional Fishermans Association Inc	615
Portland Sport & Game Fishing Club	766
Preston Angling Club & Fish Protection Society Inc	84
Project Jonah Victoria Inc	222
Prospectors & Miners Association of Vic Inc	569
Queenscliffe Community Association Inc	1098
Recreational Anglers Using Westernport	489
Rex Hunt Future Fish Foundation	1477
Rhyll Angling Club	L62
Rhyll Phillip Island Angling Club	454
Rhyll Phillip Island Angling Club Inc	40
Rhyll Progress Association	27
Safety Beach Sailing Club	L102
Sale Angling & Sports Fishing Club	792
Scuba Divers Federation Of Victoria	992
Seafood Industry Victoria	372
Seahawke Fish Distribution Centre	L15
Shoreham Foreshore Reserve	611
Sou'west Seafoods Pty Ltd	165
South Eastern Peninsula Residents Association Inc	612
South Gippsland Angling Clubs Association	101
South Gippsland Conservation Society	L69
South Gippsland Conservation Society, Foster Branch	496
South Gippsland Conservation Society Inc, Inverloch Branch	745
South Gippsland Game Fishing Club Inc	298
South Gippsland Shell Discussion Group	728
South Gippsland Shire Council	726
South Gippsland Water	1075
South Gippsland Working Group	214
South West District Association of Angling Club	355
South West Water Authority	399
South Western Fly Fishers	287
Southern Aquaculture Corporation Pty Ltd	1096
Sportspower	993
State Boating Council	687
Stratford & District Angling Club Inc	9
Surfcoast Shire	L83

Group	Sub no
Surfcoast Shire	990
Surfers Appreciating Natural Environment	88
Surf Coast conservations groups	43
Surfrider Foundation, Mornington Peninsula Branch	230
Surfrider Foundation	43
Surfrider Foundation Australia, Surf Coast Branch	395
Surfrider Foundation Melbourne Inc	621
Surfrider Foundation of Australia	63
Swan Bay Caravan Park	457
Swan Bay Environment Association Inc	55
Swan Bay Integrated Catchment Management Committee	544
The Australian Marine Conservation Society, Melbourne Branch	392
The Field Naturalists Club Of Victoria Inc	571
The Southern Fly Fishers Aust Inc	620
The Southern Peninsula Flora & Fauna Association Inc	L31
The Toora & District Community Progress Assoc Inc	30
The Victorian Fishing Tackle Association	L70
Timboon Field Naturalists Club	660
Tooradin Angling Club	342
Toorak Angling Club & Fish Protection Society	110
Torquay Coast Action	43
Torquay Coast Action Inc	727
Torquay Motor Yacht & Angling Club Inc	744
Torquay Public Reserves Committee of Management	555
Tourism Victoria	607
Trentline Pty Ltd	112
Upwey Angling Club	85
Victorian Abalone Divers Association Inc	81
Victorian Abalone Processors Association Inc	651
Victorian Aquaculture Council In	606
Victorian Channels Authority	58
Victorian Coastal Council	376
Victorian Fishing Charter Association	458
Victorian Metropolitan Anglers	87
Victorian National Parks Association	18
Victorian National Parks Association	43
Victorian Piscatorial Council	83
Victorian Wader Study Group	988
VRfish	24
VUT Scuba Club	989
WA Marine Parks & Reserves Authority	6
Walkerville Blue Water Boat & Angling Club	462
Walkerville Foreshore Reserve Committee of Management	333

Appendix 1: Submissions from groups (continued)

Group	Sub no
Walkerville Ratepayers & Residents Association	65
Waratah Bay Caravan Park	1102
Waratah Bay Ratepayers & Progress Assoc. Inc	217
Warneet North Boat Club Inc	686
Warneet Yacht Club	L68
Warrnambool City Council	609
Warrnambool Field Naturalists	120
Warrnambool Offshore & Light Gamefishing Club	659
Waverley & District Anglers	1308
Wellington Shire Council	353
Werribee & District Anglers Club Inc	L95
Western Abalone Divers Association	358
Western Abalone Pty Ltd	111
Western Coastal Board	1099
Western Port Rent-A-Boat & Marine Centre	729

Group	Sub no
Western Province Environment Users Association	414
Western Region Environment Centre Inc	L94
Western Zone Wrasse Association Inc	L61
Westernport & Peninsula	536
Westernport Angling Club	497
Westernport Bird Observers Club	157
Westernport Safety Council	697
When Australia	1077
Williamstown Newport Anglers Club	1188
Williamstown Sportfishing & Game Club Inc	401
Wonthaggi Angling Club	L20
World Wide Fund For Nature Australia	608
Wyndham City Council	1101
Yarram & District Traders & Tourism	L33

Appendix 1: Submissions from individuals

Name		Sub no
Adams	Geoff	1223
Adams	Shirley	1479
Adams Family	Christopher	804
Afedakis	George	2120
Agar	Ron	967
Agg	Wayne	1001
Agnew	G.	3
Aherne	Dion	1480
Aikman	Chris	1481
Ainmouras	George	1822
Albery	Simon	2121
Alcock	Rob	425
Alderson	Brian	2122
Alekovki	Bill	1482
Alexander	P.	145
Alexanderson	Brion	1081
Alexopoulos	John	506
Algeri	Robert	1483
Aliss	George	1484
Allan	David	1486
Allan	Robert	1485
Allan	W.R.	1055
Allan	William J.	327
Allen	Graeme B.	485
Allen	William	1242
Alsop	Tony	752
Altas	P.	1487
Altson	Jonathon	2123
Ambrosini	A.	1488
Amies	B.C.	1054
Amman	Peter	842
Amos	Fred	1311
Anastasios	Kladis	1289
Anderson	Con	2125
Anderson	D.	1489
Anderson	Jan	1244
Anderson	Louise	1030
Anderson	Mark	602
Anderson	Ross	980
Anderson	William	1243
Andreadis	Nick	2124
Andresen	Noel	1241
Andrews	David	253
Andrews	Garry	1216
Andrews	Helen	1312

Name		Sub no
Andrews	Neville	1313
Andrews	Phillip	249
Andrews	Rosemary	305
Andrews JP	Chris	329
Andrus	Peter	2310
Angelo	Chiodo	2311
Angelos	Costa	1884
Angelos	M/-	1883
Angelucci	P.	1139
Answer	Adam	2126
Antill	J.	1490
Antonioslontis	A.	1491
Antonopoulos	E. & E.	313
Aqualina	Damien	829
Aquilina	Damien	828
Arambatzidis	Daniel	2116
Arambatzidis	Nick	2119
Arambatzidis	Theresa	2117
Arambatzidis	Z.	2118
Archer	James	1492
Arendtse	Roger	1493
Ariens	J.	28
Arklay	Gavin	318
Arlove	J.	1494
Armstead	J.	1495
Armstrong	John	1044
Arnold	DB,GD,SA.&KL	524
Arnold	P.	100
Arnoldson	Greg	1496
Arter	C.	1136
Arthvilla	Mark	1497
Arundel	Helen	1186
Asbury	Graeme	1499
Asbury	S.	1498
Ashman	Brad	1500
Atkinson	K.	1501
Atkinson	Robyn	151
Attard	Charles	1502
Attard	Laurie	1314
Attilio	Francis	2127
Aumann	Dean	923
Aurisch	Des	276
Avaro	David	501
Avery	Linda	413
Avery	Philip	306

Name		Sub no
Avram	Alex	1503
Avram	Steve	2128
Aylett	Greg	1504
Aziz	S.	44
Aziza	A.	1505
Backx	J.	1506
Bacon	Kevin	1432
Baenziber	Tony	2130
Bagley	L.J.	699
Bailey	B.	1509
Bailey	Peter	423
Bailey	T.	1508
Baillie	T.	854
Bain	Geoff	1315
Bain	George	2280
Baird	Bob	552
Baird	D.W.	1510
Baird	Justin	900
Baker		180
Baker	Charles	1511
Baldacchmo	Victor	1512
Baldovivo	Shane	1513
Balfour	Tim	2279
Ball	Dudley	1316
Ball	Hartley M.	586
Ban	Dean	1515
Banfield	Ray	901
Banks	Corrie	1089
Banks	Jason	1215
Bannuck	Karen	974
Barbar	K.	1516
Barbuto	F.	1516
Barcellona	Michael	1517
Barcellona	Robert	1518
Barclay	Daniel	1433
Barclay	David	1436
Barclay	Mark	1435
Barclay	Meredith	199
Barclay	Robert	1434
Barker	John	232
Barling	Wayde	2312
Barnard	G.	1519
Barnes	Vince	191
Barone	Michael	1520
Barr	M.	862

Name		Sub no
Barrett	John	205
Barrie	Bob	1521
Barwick	Brendon	844
Barwick	David	843
Barwick	Russell	719
Barwick	S.	667
Barwick	W.A.	666
Bass	Tim	191
Bassett	Willilam	1317
Bateman	George	855
Bathgate	Rachael	1000
Batter	D.	778
Battista	John	2313
Battye	Jeffrey	1522
Baxter	Brendan	1193
Baxter	Brendan	998
Baxter	G.	1523
Baxter	Rohan	1080
Baydar	Omer	1524
Bayes	Scott	1525
Beardwood	Brian	663
Beare	John	1407
Beaton	Brad	384
Beaton	Sheryl	385
Beazley	J.R.	82
Beck	Paul	1526
Beech	David	1527
Beekhuizer	Craig	567
Beer	Graeme	2129
Beeson	R.	1529
Beeson	R.	1528
Begg	Graeme	1318
Begg	Gwenda	1319
Beilby	Geoff	1109
Belcher	L.	1507
Belinic	Dario	1408
Belissimo	Piero	1530
Bell	Barbara	130
Bell	Bill	187
Bell	Bill & Anne	160
Bell	C.	1114
Bell	Navarre	1052
Bell	O.	1070
Benn	Keith	281
Bennett	R.	61

Appendix 1: Submissions from individuals (continued)

Name		Sub no
Benton	Wayne	2131
Berglez	Ivan	1531
Berrill	Glenn	1043
Bertone	David	924
Bertram	D.	1532
Bews	S.R. & H.A.	1175
Bibby	Ezra	2132
Binding	Mark	541
Bird	Fiona	211
Bishop	Elise	775
Bishop	Stephen	1533
Bitsakis	Con	1534
Bitton	Glynn	1437
Bjorksten	M.	1535
Bjorksten	M.	1536
Blake	Damien	1012
Blake	T. & B.	47
Blakey	Adam	673
Blegl	Sergio	2133
Blethyn	Brian	2316
Bleumink	Rien	1116
Blewitt	Donald	1537
Blignaut	Leon	2134
Blunden	Neale	503
Board	Karen	131
Bodill	Robert	2135
Bodilly	J.	1538
Bohan	Brian	190
Bolitho	B.	2274
Bolza	Joe	111
Bond	Clive	1217
Bone	P.K.& S.	76
Bone	Peter	2271
Bonica	T.	1290
Bonner	Garry	513
Bonner	Marc	1539
Booth	Bob	380
Booth	Doug	1310
Booth	Doug	177
Booth	J.A.	1097
Booth	Margaret	304
Borg	Daniella	1542
Borg	John	1541
Borg	Mark	1544
Borg	Peter	1545
Borg	Thomas	1543
Borrell	Greg	1321

Name		Sub no
Bottari	Margaret	1061
Bouboulis	Andrew	1540
Boughton	E.J.	681
Boulan	Anthony	1546
Bour	Bryan	2136
Bourne	Luke	965
Bowden Mlc	Ron	1101
Bowman	John	148
Boyd	Anne	1106
Boyd	Len	1547
Bradley	P.	1145
Bradley	Susan	1144
Bradshaw	Keith	2317
Brandi	Phillip	1548
Brassey	Stuart	1409
Breen	Jarrod	1320
Brennan	G.	1549
Brennan	L.	1552
Brent	Kate	658
Brideson	Ian	597
Brierty	Ray	1550
Briffa	Frank & Linda	753
Briffa	Tony	2137
Briggs	M.	1551
Brittain	T.	1553
Broadfoot	Andrew	132
Broadfoot	Elizabeth	972
Bromfield	G.	2139
Bromley	T.	817
Brooks	Charles	463
Brooks	F.W.	1555
Brooks	Roger	1554
Brosche	C.	1556
Brosche	Lyn	1085
Brown	Dean	1245
Brown	Jayne	664
Brown	L.	26
Brown	L.	133
Brown	M.J.	1056
Brown	Robert G.	2318
Brown	Thoma	2138
Browning	Bill	1558
Browning	Tracey	1557
Bruce	D.M.	371
Bruce	R.	375
Brunton	Maggie	125
Bubulj	Mel	1559

Name		Sub no
Buchan	Ron	1560
Buckingham	Trevor	134
Buckland	Peter	1438
Buettner	Robert	1298
Bulakowski	M.	1561
Bull	Norm	1478
Burchell	Lynette	819
Burchell	Norman	815
Burhop	John	2314
Burhop	Wayne	2315
Burns	Andrea	954
Burns	Andrew	925
Burnside	Shelley	1562
Burton	Bronwyn	754
Burton	S.	656
Bushell	E.	882
Bushell	George	289
Bussey	Glendon J.	2319
Bustard	C.	204
Butcher	R.	2140
Butcher	W.	903
Butera	Anthony	1563
Butler	Robert	1564
Byass	Rosalind	1065
Byrne	Terry	1565
Cain	Eunice	566
Cain	John	531
Caio	Lorenzo	1566
Calaby	Jan	174
Calaby	Ray	175
Calafiore	Adrian	926
Caldecott	K.	1578
Calleja	Frank	1567
Callinan	T.	904
Cambereri	Rosa	1568
Cameron	James	135
Cameron	John	777
Cameron	Ken	927
Cameron	R.	136
Camilleri	Alfred	1570
Camilleri	G.	1569
Camilleri	M.	1439
Camp	Scott	1571
Campbell	David	1580
Campbell	Frank	164
Campbell	Geoff	1246
Campbell	Noel	1147

Name		Sub no
Cannizzaro	S.	1572
Cannon	Shane	1573
Capoulas	Caris	1584
Carabott	V. & A.	319
Caram	W.	1582
Cardinal	Belinda	776
Carfura	Kevin	1574
Carlile	Max	1322
Carlsson	Mike	1579
Carpenter	Brian	983
Carpenter	Patsy	12
Carr	Michael	1440
Carr	Richard	1581
Carracher	Matthew	971
Carrroll	Ian	639
Carrucan	Shane	2320
Carson	Linda	134
Carson	Robert	707
Carter	James	1576
Cartwright	James	1575
Caruana	Ray	1577
Casey	Robert	1323
Cassar	Charlie	2115
Cassar	Daniel	1441
Cassar	J.	412
Castle	Maree	1068
Castledine	C.	1583
Cavaggion	Marco	2321
Cayley	Vyvyan	461
Celeste	J.	1324
Ceniti	Joe	1585
Cerisara	R.	1442
Chalmers	B.	448
Chamma	Taher	1593
Chandler	Gil	312
Chapman	Jeffrey	2141
Charallam	K.	1590
Cheah	Daphne	986
Cheah	Greg	2142
Cheetham	Greg	518
Chiron	Anthony	1284
Chiron	Paul	1285
Chominak	George	1588
Chote	David	2143
Chrislets	W.H.	591
Christensen	L.	1586
Chu	Y.	1587

Appendix 1: Submissions from individuals (continued)

Name		Sub no
Cipri	Peter	1591
Clark	David	1082
Clark	G.	2305
Clark	Jennifer	953
Clark	Lloyd	1326
Clark	Russell	1327
Clark	Russell	2144
Clark	Tracy	1325
Clarke	Donna	135
Clarke	Ian	905
Clarke	J. & J.	449
Clarke	Kenneth	1589
Clarkson	M.	1148
Clayton	C.	1410
Clifford	Graham	430
Clipsham	John	1592
Clohesy	Peter	688
Coates	Tony	1599
Cobbledick	Cliff	288
Cochrane	Deidre	1026
Cockman	Paul	1612
Coe	Gavin	1607
Coghlan	Michael K.	336
Cogo	Luciano	1328
Cohn	Simon	1598
Cole	Babriele	136
Cole	Rodney	2146
Coley	Graeme	2150
Collins	Peter	601
Collison	James	1152
Colombani	Raymond	2151
Colosimo	Frank	1594
Comito	David	2149
Conde	J.	1609
Condello	Phillip	1606
Connelly	Scott	2145
Connizarro	John	1608
Connley	Kerrie	188
Conte	Alfredo	1329
Conte	Dolores	1330
Conte	Fortuna	1334
Conte	Mario	1333
Conte	Roberto	1331
Conte	S.	1332
Cook	Anthony	2152
Cooke	Alison	2147
Cooke	Garry	1601
Coon	Anthony	1596

Name		Sub no
Coon	D.R.	1595
Cooper	Alex	1603
Cooper	John	1335
Cooper	Steve	750
Cooper	Steven	107
Coote	Modesty	L106
Copley	Caroline	331
Cormick	Shaun	1605
Costa	J.	1597
Costa	Ronald	1309
Costello	Mark	701
Cott	C.	558
Cotton	R.H.G.H.	1086
Couch	T.	883
Coucounaras	D.	154
Coulsen	Shane	1611
Coulthard	R.	793
Coulton	Rodney	528
Courtenay	Georgette	196
Cousland	R.	1600
Coutt	Andrew	1411
Cowah	Stephen	1336
Coward	G.J.	1604
Cox	Cheryl	1602
Cox	Stephen	1610
Craig	Ian	1613
Crawford	Paul	1614
Creffield	John	671
Crewes	Michael R.	1337
Cridland	B. & C.	1135
Cripps	Alan	514
Cripps	Brett	378
Cripps	Don G.	174
Cripps	M.E.	260
Cripps	Violet	515
Cripps	Wayne	379
Cripps	Wendy	668
Croatto	R.	1617
Crocker	Robin	767
Croft	John	1618
Crofts	Margrit	221
Crook	Lance	1619
Crothers	Neil	1155
Cruikshank	John	1616
Cruikshank	John	1615
Culbard & Tinker	Ian & Kaylene	315
Cullen	G.	440
Cullen	K.	1621

Name		Sub no
Cuming	Brian	982
Currenti	Angelo	1620
Currer	Peter	1015
Curtis	F.	57
Cusworth	Steve	1247
Cutler	Bruce	645
Dacombe	Craig	1625
Dagher	Youseff	1623
Dahlberg	B.	906
Dalavekis	John	2154
Daley	Kevin	1107
Dalla Costa	Mark	2148
Dalla Rosa	John	1626
Dalton	Peter	1423
Dance	Barry	616
Danges	Daryl K.	782
Daniel	Chris	435
Daniels	Greg	961
Danks	Kerry	137
Dann	Peter	600
Darlington	F.	1622
Darmanin	E.	1624
Darmody	Shane	2153
Dashper	Stuart	243
Davenport	Max	1627
Davey	Arthur	1338
Davidson	Rosemary	742
Davies	Barry	1104
Davies	Christopher	1214
Davies	Harry	159
Davies	Richard	1224
Davis	A.	434
Davis	Doug	1053
Davis	Harry	176
Davis	Mark	184
Dawson	A.	1630
Dawson	Brad	1629
Dawson	R.	1631
Dawson	Travis	1628
Deathe	Alan	L6
Deathe	Diane	L5
Deaville	K.	160
Degran	Chris	1635
Deleyev	Julia	L63
Delisle	Paul	1638
Demara	Robert	1637
Dempsey	Gordon	1639
Dendle	Neil	138

Name		Sub no
Deran	Sedat	1633
Desquale	Anthony	1636
Deveson	John	1632
Dew	W.	60
Dexter	Tod	190
Dezilwa	Laar	1634
Di Cori	Atilio	1640
Dib	Danny	1641
Dicic	Andrew	2270
Dickinson	Jeffrey	2156
Dickson	Stephen	1643
Didio	John	1248
Difuccio	Ida	156
Difuccio	Rick	157
Difuccio	Robert & Amanda	155
Dimakis	Angelo	1339
Dipietro	Josh	1213
Dipietro	Phil	1212
Dispirito	Joe	1642
Dixon	David	997
Dixon	Kraig	2155
Dixon	Raymon	445
Dobson	B.G. & K.	46
Dobson	F.A.	1225
Doddrell	R.A.	1291
Dodds	Donald	1424
Dodkins	Dulcie	1443
Dodkins	Tom	1218
Dodsworth	Pam	1095
Doherty	Kerry	1444
Dohnt	Sharon	2281
Dolente	Paul	1645
Domm	David	2157
Don	Graham	2100
Donaldson	Blair, Ewen & Dorothy	409
Donia	Peter	1644
Donnaly	A.	188
Donnan	C.J.	139
Dooley	Warwick	2158
Doran	John And Andrea	654
Doran	Kevin W.	381
Dorell	R.	226
Dorey	G.	71
Dougall	I.	856
Douglas	Grace	1341

Appendix 1: Submissions from individuals (continued)

Name		Sub no
Douglas	Ian	1343
Douglas	J.	29
Douglas	K.& R.	907
Douglas	Zaydn	1342
Dow	Graham	1340
Dowall	Keith & Jim	590
Dowell	Gavin	1166
Downes	James	999
Downey	Richard	672
Downton	Peter	1162
Dowsett	Athol H.	144
Dowsett	L.	1412
Doyle	Mark & Eva	705
Draper	J.	1646
Dreyfus Qc	Mark	132
Drummond	R.	67
Duffin	J.	1157
Duffy	Noel	806
Duke	Jennifer J.	736
Duncan	Greg	126
Duncanson	Ross	526
Dunn	Fay	477
Dunn	Norman	2306
Dunn	William	2307
Dunphy	B.J.	743
Duranou	Paul	1652
Durbali	Albert	1651
Durham	Geoff	277
Dusenjko	Ivan	1649
Dusenjko	Michael	1650
Dutka	A.	1648
Dutka	George	1647
Dwyer	A.	836
Dyson	Brian	2322
Dyson	Jill	481
Ea	Leang-Ty	419
Eadie	Lyn	465
Ealey	E.H.M.	53
Easton	Dorothy	181
Easton	E.R. & J.B.	525
Eddie	Martin	1250
Eddie	Ross	1249
Edmonds	Adam	708
Edney	G.	54
Edwards	G.	349
Edwards	Graham	808

Name		Sub no
Edwards	Kellie	1344
Edwards	Paul	1659
Egan	Gerald	820
Eichler	John	533
El Hassan	Tala	2095
Elayoubi	Walid	1653
Eldred	Ross	690
Elliot	C.J.	521
Elliot	Daryl	1299
Elliot	J.A.	1654
Elliott	Eric	269
Elliott	W.R.& G.M.	185
Elliott	Wally	293
Ellis	J.B.	42
Ellis	Michael	1445
Ellis	Michelle	633
Elmes	Christopher	1655
Elsworth	G.	529
Elton	Bruce	802
Elzein	Rachelle	L105
Emilan	P.	1658
Emmerton	Dale	2159
Emmins	J.J.	2098
Emmuncal	Danielidis	2160
Engel	Clinton	1656
Esparon	E.	2161
Estcourt	Mike	547
Estoppey	Dave	2282
Evans	Amanda	114
Evans	Gary	2162
Evans	Ken	1211
Ewinger	Helmuth	1657
Facchi	Roger	1662
Fagone	Fran	1663
Fagone	Joe	1665
Fagone	Linda	1666
Fagone	Vince	1664
Falla	Steven	1194
Fallow & Hayward	John & Rebecca	713
Falvo	Pino	1660
Falzan	Michael	1345
Family	Joynson	911
Farmer	Glen	1667
Farquhar	M.J.	178
Farrugia	Derek	1661
Fary	Anthony	790

Name		Sub no
Fary	Ray	588
Fay	Marilyn	1348
Febo	P.	1668
Feltham	Adrian	1346
Fergita	Joe	1446
Ferrari-Mela	M.	1131
Ferretto	J.	1669
Feruglio	Brian	2283
Fierro	Enzio	835
Filipendin	Boris	928
Filippatus	Napoleon	1671
Filippone	Anthony	2114
Fillmore	Peter	738
Fincher	Cyril	286
Fink	R.	788
Finlay	Thomas	845
Finn	Rod	2284
Finn	Shane	2285
Fisher	James	677
Fisher	Mathew	676
Fisk	S.R.	784
Fitzgerald	Gus	589
Fitzsimmons	Brendan	234
Fitzsimmons	James	364
Fitzsimons	Elizabeth	712
Flaassen	Frank	1455
Flanders	Bruce	885
Flanders	M.	884
Fleming	Anthony	929
Fletcher	S.	848
Fletcher	Susan	847
Florio	C.	1670
Flower	Tonya	L104
Fodor	Robert	2163
Fontana	Jon	L38
Fonzant	I.	1674
Foote	Doug & Inez	634
Footit	Wayne	2164
Ford	F.	70
Ford	Robert	1672
Ford	Russell	155
Formosa	J.	36
Formosa	Patrick	1673
Forrest	John	1675
Forrest	John S.	159
Forster	Mike	186

Name		Sub no
Foster	Matthew J.	1210
Foster	Shaun J.	347
Fowler	B.	97
Fox	Michael	2286
Francini	Robert	1195
Francis	Anthony	1676
Francis	Kevin	1425
Franjic	R.	1681
Frayman	Leon	2166
Frazer	C.	1133
Frazer	Paul	2323
Frederiksen	Kerin	1678
Free	Norman J.	2165
French	Helen	122
Friend	Barney	930
Friend	Brian	1679
Frost	Martin	1347
Fry	Chris	1680
Ftohogiannis	John	1682
Fuller	Don	2272
Funnell	Peter	1349
Furlong	Brian	1677
Fyfe	Adrian	274
Fyfe	David	1251
Gage	Cameron	1219
Gale	Darren	1683
Galloway	Hector M	1350
Garbuio	M.	68
Gardiner	Andrew	282
Gardiner & Buchanan	Beth & Andrew	1084
Gardiner	Craig	1688
Gardiner	N.	139
Garnham	Janet	121
Gasparotti	Carlos	1685
Gauci	George	1686
Gaunt	Russell	1352
Gaunt	Walter H.	1351
Gaylard	Dean	1684
Gaylard	John	1185
Gazan	J.	103
Gazis	Kathy	2112
Gazis	Tas	2113
Gazzo	Joe	1687
Geff	Peter	1692
Gemin	Michael	1691

Appendix 1: Submissions from individuals (continued)

Name		Sub no
Gemmell	Adrian	1689
Genoni	Lewis	908
George	Herman	2094
George	Nanette	1021
Georgiou	G.	1690
Gereige	George	1292
Gerum	Anton	140
Geyhan	Michael	2168
Giblett	Brett	310
Giblin	Karen	886
Giblin	Marie	887
Giblin	Terry	888
Giblin	Tony	889
Gibson	Allan	2167
Giddins	Jeff	426
Gilchrist	G.	1694
Gilchrist	W.	1693
Giles	Karri	181
Giles	Leigh	1696
Gilhome	Chris	225
Gilks	A.J.	141
Gilks	B.F.	142
Gillett	John	1447
Gillies	Honor	605
Gilligan	John	2278
Giudici	Bianca	973
Giuliano	John	250
Glass	Geoffrey	367
Glentkes	George	1695
Godfrey	Terry	1698
Goff	Martin C.	300
Goldsmith	Warren	2101
Goldsworthy	Anika	722
Goodfellow	Alexander	2096
Goodier	Phillip	109
Goodwin	G.	800
Goodwin	Graham	280
Gordye	Peter	141
Gore	John	1240
Gorencic	Ivan	1700
Gorgorinis	Michael	966
Gorman	Barry	1699
Gorman	Julie	755
Gorman	Robert	1697
Gosbell	Ken	436
Gough	Stephen	13
Graham	Doris M.	171

Name		Sub no
Graham & Davids	Doug & Rosemary	617
Graham	Ruth	720
Granovac	Ivan	1705
Grant	Helen	1006
Grant	Max	1125
Grant	Ray	1702
Grant	Tony	655
Grass	L.	1704
Gration	Mel	161
Gray	A.	2173
Gray	Ian	909
Gray	Jake	2171
Gray	James	2172
Gray	Michael	1701
Grayden	Jodi Ann	L12
Grayden	Maurice	L13
Grech	A.	798
Grech	C.D.	1706
Grech	Joe	2260
Green	Michael	831
Greene	Michael	1353
Greenhow	R.R.	628
Greening	Jon	1035
Greening	Lelia	1354
Gregson	Keith	2169
Griffiths	Lindsay	563
Griffiths	N.H. & M.J.	216
Grigoriou	Jim	2170
Grisha	Frank	2324
Gross	John	484
Grossi	A.	1703
Groves	Paul	561
Gruber	Hanns	1449
Gueresk	Dominic	1710
Guest	Darryl	1707
Guli	Catherine	981
Gunday	Hakan	469
Gurmesevic	Neno	1708
Gusman	Tony	1709
Guy	Charles	453
Guy	Korral	452
Haack	Peter	1239
Hagstrom	Eloise	2174
Hahnel	Dean	1296
Haines	R.J.	73
Halil	T.	1714

Name		Sub no
Hall	D.	74
Hall	Mark	194
Hallem	Barry	1448
Hamilton	Paul	1252
Hammell	William	1355
Hammond	B.P.	437
Hammond	Chloe	441
Hammond	Kayla	438
Hammond	Megan	439
Hancock	Allan	1196
Handley	George W.	2175
Hands	Edward	931
Hanegraaf & Driscoll	Wayne & Lyndell	739
Hanna	Ken	1181
Hannan	Nicholas	1719
Hansen	Evelyn	271
Harbeck	Karl	1711
Harerecht	Wendy	683
Hargreaves	Paul	1717
Hargrove	M.	98
Harlond	Ann I.	751
Harmat	Adam	504
Harmon	J.	1720
Harper	Allan	1716
Harris	B.	1712
Harris	Greg	2176
Harris	P.	2102
Harris	Wayne	1713
Harrison	Annette	1450
Harrison	Don	2177
Harrison	Keith	1356
Harrison	Malcolm	932
Harrison	Robert	330
Hart	Leigh	812
Harvey-Prinselaar	M.	51
Harwood	Mark	2178
Haslam	John	113
Hastings	Ken	704
Hateley	Chris	1721
Hateljan	G.	1715
Hatzis	Paris	952
Hausegger	Elizabeth	1357
Hawkins	Richard	431
Hayden	T.	102
Hayes	Gary	L10
Hayes	Jeremy	1718

Name		Sub no
Hayes	John & Diane	678
Haynes	Jay	1723
Heaney	Travis	1727
Heath	Rick	460
Hebbard	Wendy	386
Heffernan	D.W.	15
Heine	John & Christine	443
Heintz	Rick	1728
Heislars	Arnis	647
Henderson	Donald	703
Hennessy	T.	1724
Henry	Danielle	143
Henry	Steve	1451
Henshaw	David	L78
Henson	A.C.	L93
Hepburn	Tony	1359
Hepner	Michelle	632
Herd	Robert	1726
Hereaka	Dominic	1358
Heron	John	382
Heuser	W.H.	1725
Hichisson	Derek	195
Hicks	Thelma	317
Hill	David	2268
Hill	Faye	L24
Hill	I.	864
Hill	Louis	1027
Hill	Nicola	956
Hill	Richard	1729
Hillebrand	D.B.	1722
Hilvert	Linda	373
Hinchliffe	Ian	832
Hinds	R.	2099
Hines	K.	2179
Hipwell	Phill	267
Hiraga	Izumi	1730
Hoad	David	482
Hobbs	Michael	769
Hobday	Ian N.	1360
Holderness	A.	207
Holland	Murray	1361
Hollingsworth	Des	1733
Holmes	Gary	2180
Holmes	Gillian	756
Holzfeind	Christian	2181
Holzfeind	Rudi	363
Holzfeind	Rudy	2182

Appendix 1: Submissions from individuals (continued)

Name	Sub no
Homes	657
Honan	550
Hore	1362
Hornby	2183
Horne	1452
Horwill	224
Hose	14
Hose	556
Hose	115
Hotchin	1049
Houben	958
Hourakis	1731
Howard	1105
Howard	166
Howell	1129
Howell	1732
Hoyle	332
Hoyles	592
Hughes	338
Hughes	1754
Hugi Lin	1755
Hume	2184
Humphrey	168
Hunt	90
Hunt	527
Hunter	2185
Hunter	692
Hunter	1759
Hunter	714
Hunter	2187
Hunter	2186
Hunyh	1760
Hurford	2304
Hurst	456
Hussey	144
Hutcheon	1756
Hutchinson	1476
Huther	1168
Huther	823
Huxham	1758
Hyde	1064
Hyslop	1124
Igen	1761
Ilil	1762
Iluk	1763
Imbesi	1764
Indelope	1364

Name	Sub no
Ingram	405
Ingram	404
Ingram	740
Interlandi	1765
Ireland	933
Irving	910
Irving	10
Isidro	1363
Iskra	837
Israel	1766
Italiano	1453
Jackway	254
Jacobson	626
Jakobovic	1253
James	1254
James	1767
Jamieson	2267
Jansson	424
Jayawardene	1107
Jeans	2188
Jenkins	166
Jennings	1303
Jennings	822
Jessop	603
Jewell	193
Jitnah	1083
Johannesen	1092
Johannesen	1073
John	1769
Johnson	846
Johnson	1187
Johnson	2277
Johnson	464
Johnson	955
Johnston	1768
Johnston	2287
Johnston	219
Johnston	2288
Johnston	1454
Jones	66
Jones	795
Jones	41
Jones	1368
Jones	368
Jones	1365
Jones	1367

Name	Sub no
Jones	1771
Jones	1366
Jones	1770
Jones	410
Jones	796
Juiett	863
Jung	2189
Jungwirth	244
Kachakojus	2191
Kakavoules	2190
Kampean	1772
Karakatsanis	1773
Karakatsanis	1775
Karalis	1774
Karge	33
Kay	1165
Kay	1163
Kay	1164
Kazakas	37
Kealy	1777
Kean	1108
Keegan	1778
Kele	1780
Kelley	587
Kells	1776
Kelly	1779
Kelsall	912
Kemmler	2192
Kendell	78
Kennedy	1134
Kennedy	785
Kenny	2289
Kenwood	108
Kettels	18
Khodr	1782
Khoury	1781
Kibria	979
King	1413
King	1192
King	1783
Kingston	913
Kinsella	522
Kirkwood	984
Kirsop	95
Kitching	1784
Klimcrak	1369
Knibbs	1785

Name	Sub no
Knight	1370
Knight	2325
Knights	890
Kober	1426
Kokken	1786
Kolby	865
Komen	794
Konur	1787
Koop	653
Kosinski	1788
Kotzasiannidis	1789
Kouso	1790
Kouts	1456
Krafft	145
Krakoeur	1792
Kudrenko	1286
Kuit	700
Kunkel	1791
Kurrl	328
La Fontaine	1167
La Grant	146
Labb	1797
Laing	325
Lamont	1799
Lamont	1800
Langdon	1796
Langley	682
Larsen	165
Latchford	147
Lavandiera	1795
Lawless	2291
Lawless	2290
Lawn	1457
Lawrence	1798
Lawrence	1794
Lawson	1793
Lay	1005
Lay	2193
Le Page	509
Lea	2197
Leary	2194
Leckie	245
Leditschke	1427
Lee	1804
Lee	1805
Lee	391
Lee	1428

Appendix 1: Submissions from individuals (continued)

Name	Sub no
Lee	850
Lee	2195
Lee	1371
Leeming	2196
Leen	1066
Lefoe	2326
Legione	1372
Leguier	1803
Leibhardt	1150
Leibhardt	1151
Leigh	878
Leitherdt	516
Lett	505
Lewandowski	104
Lewis	625
Lewis	1801
Lewis	362
Lewis	450
Lewis	1802
Lewis	393
Lewis	L18
Lewis	197
Librio	1373
Liebscher	557
Linardos	1806
Linder	1256
Linder	1255
Lindsay	1807
Lindsey	1034
Linford	163
Linguey	2343
Linguey	2342
Linskens	574
Little	142
Little	1458
Livingston	2198
Loftus-Hills	183
Long	498
Longo	1808
Lonsing	1257
Lord	285
Loughrey	75
Love	246
Loveless	866
Lovell	1087

Name	Sub no
Loving	546
Loving	737
Low	1809
Luchetta	1238
Lucht	1258
Lucht	1259
Lucht	1260
Lupson	2327
Luttin	2199
Lynch	1810
Lyons	1226
Macarthur	121
Macdonald	622
Mace	1459
Macfarlane	2200
Macgibbon	2328
Macgregor	596
Maciulis	146
Mackay	1816
Mackiewicz	1117
Mackley	308
Mackley	309
Mactaggart	789
Madden	25
Maddigan	365
Maddigan	1220
Maddox	809
Madgziarz	914
Madley	960
Madsen	208
Mahoney,	641
Naylor &	
Dickinson	
Main	594
Maiolo	1811
Malby	1237
Male	1825
Mallios	1824
Malloy	1130
Malone	1826
Mammos	2203
Mandic	1294
Mann	1460
Manna	1820
Mantz	1823
Mara	934
Marasco	1813

Name	Sub no
Maratzinis	2110
Marendaz	1461
Margeridis	1817
Marino	1227
Marion	2201
Markulin	1814
Markulin	1815
Marpets	870
Marples	1812
Marr	1738
Marriott	935
Marriott	1020
Marsden	1374
Marsh	1821
Marshall	L108
Marshall	478
Martin	1818
Martin	2103
Martin	2275
Martin	1827
Martin	2202
Martin	1072
Martino	1819
Maruzza	825
Maruzza	826
Marx	21
Mason	710
Mason	959
Mason	1828
Mason	599
Matarczyk	411
Matheson	1022
Mathews	326
Mathews	1283
Matthews	416
Mauderer	242
Maxwell	604
May	361
Mcalpine	849
Mcbride	158
Mcbride	1170
Mcbride	1169
Mccomb	791
Mccracken	2292
Mccrohan	212
Mccubbin	2104

Name	Sub no
Mccubbin	128
Mcculloch	2204
Mccully	564
Mcdonald	1090
Mcdougall	500
Mcdougall	1375
Mcewan	39
Mcfee	1122
McGaw	838
McGifford	861
McGough	1138
McGowan	1830
Mcgrath	1376
Mchale	1834
Mchutchison	1757
McInnes	803
McInnes	797
Mcintosh	201
Mckage	821
Mckay	530
Mckee	595
Mckellar	1414
Mckendry	1197
Mckenzie	213
Mckenzie	199
Mckenzie	623
Mckeown	1111
Mekie	1831
Mckinnell	119
Mckinnon	202
Mckinnon	578
Mclaughlin	1832
Mclaughlin	1829
McLeod	801
McLeod	574
Mcmahon	2206
Mcmahon	2205
Mcmasters	487
Mcmasters	421
McNabb	314
McNabb	123
Mcnamara	780
McNulty	771
Mcpherson	1833
Mcquade	1377
Medlin	1837
Medwin	1835

Appendix 1: Submissions from individuals (continued)

Name		Sub no
Mee	H.	52
Melchionna	Michele	1836
Menhennet	M.	89
Menkhorst	Peter	1011
Menzel	Jan	675
Meredith	Leslie	1236
Merrett	Michael	415
Merrillegs	Jim	2207
Micallef	Darrel	1840
Micallef	John	1839
Michod	Kim	1462
Miglionico	Nicholas	2111
Mihai	John	1843
Mihai	Kristen	1844
Mildren	R.	1415
Miles	B.	1416
Miles	Lesley	717
Miles	Robert	1841
Miliadis	G.	1842
Millard	H.	1378
Millard	Joyce	1379
Milledge	W.	871
Miller	Cameron	2345
Miller	William	2208
Millican	K.	811
Mills	Daniel	1261
Mills	Gary	1262
Mills	Kade	757
Mills	Kerry	2209
Mills	Margo	1263
Mills	Nicole	1264
Mills	Ray	259
Minear Oam	Terence V.	167
Minehan	John	172
Mirza	R.	1847
Mitchell	Brian	251
Mitchell	C.	5
Mitchell	C.	1846
Mitchell	Jennifer	996
Mitchell	Lindsay	1838
Mitchell	Simon	350
Mitreviski	Slobodan	1845
Moait	Ronald	177
Moerkerk	Marc & Elizabeth	1010
Molan	Luke	374
Molnar	Peter	813
Mons	Steven	1380

Name		Sub no
Montebello	Harry	936
Montgomery	Eric	1429
Moodie	Neil	834
Moore	Allan	2329
Moore	G.	869
Moore	James	868
Mordoukhaev	Arkadi	2210
Morgan	Glenys	1850
Morgan	John	1381
Morgan	L.I.	1851
Moroney	Stephen	577
Morris	Jeff	2293
Morris	Kevin	2294
Morris	Neville	337
Morrison	Christine	1265
Morrison	D.J.	4
Morrison	Ron	1266
Morrison	Steve	1848
Morrow	Philip	841
Morton	Andrew	1182
Moses	Gaye	1852
Mounsey	A.E.	444
Mountt	Daniel	2295
Mousaferiadis	John	1382
Mouskeftaras	Effie	2211
Mouskeftaras	Frank	2212
Moutchis	George	1849
Muir	David	1856
Muirfield	E.	1288
Mulholland	Kathy	1858
Mulholland	Rod	1859
Mullins	A.W.	1857
Mullins	Frank	1855
Munro	Lyn	532
Murfett	Doug	1383
Murn	Chris	2214
Murn	Graeme	2213
Murphy	Rohan	1854
Murray	Mal	852
Murray	Peter J.	235
Murray	Rick & Lori	122
Musolino	Frank	1853
Muszczyk	A.	867
Mynott	C.	1153
Nastos	Paul	1860
Nathan	Richard	818
Nathan	Steven	L67

Name		Sub no
Neale	Kevin	1463
Neill	Robyn	1865
Neilsen	Colin	1863
Nelson	Don	680
Nelson	James R.	598
Nermin	Murtagic	1861
Neubauer	Wayne	1126
Neuchat	Michel	263
Nevill	Jon	1004
Newstead	N.	1862
Newton	George	184
Nicholls	B.	2215
Nichols	John	1464
Nicholson	Ken	272
Nicholson	R.	56
Nido	Lou	1866
Nido	Matt	1917
Nikolovski	Tony	1867
Norris	I.	96
Norris	M.	34
Norton	Kylie	957
Nottage	H.S.	1465
Nowak	Peter	L7
Noyes-Brown	Darren	684
Nunn	Geoff	1267
Nuoleun	George	1864
O'borne	Maragaret	510
O'borne	Neil	511
O'brien	Darren	2269
O'bryan	R.J.	72
O'callaghan	P.	1118
O'connell	Bob	1869
O'connell	Leon	559
O'connor	Daniel	124
O'donohue	Craig	1871
O'donohue	Dean	1870
O'farrell	John	1384
O'farrell	Lee	1386
O'farrell	Mark	1385
O'leary	Matthew	891
O'mealy	John	L19
O'meara	J.	1873
O'neill	P.	1874
O'neill	Stephen	1875
O'reilly	J.	1235
O'reilly	Jenni	1876
O'shannassv	Kevin	549

Name		Sub no
O'toole	Marg	491
O'Brien	Shane	1868
Occhipinti	V.	1466
Oddo	Greg	468
Ogilvie	Harold	520
Oliver	Lindsay	2216
Oloughlin	Therese	147
Olsiewsig	Jolanta	1872
Orgill	R.	397
Orlando	T.	1877
Osborne	A.	231
Osborne	G.	229
Overgaauw	Amy	874
Overgaauw	Gerry	872
Overgaauw	Jeanie	875
Overgaauw	Marie	873
Ozolins	J.	1878
Pakham	L.	2217
Palise	Paul	1887
Pallins	M.	783
Palmarella	Ettoire	1888
Pandelidis	Con	2218
Pandelidis	Pandelis	2220
Pandelidis	Vicki	2219
Pannell	John	1886
Paoletta	Vito	1882
Papatua	Theresa	1885
Pappas	James	937
Parker	Graeme	1387
Parker	S.	830
Parnis	Ray	1879
Parr	A.	787
Parr	E.R.	669
Parsons	Billy	1228
Parsons	K.	1140
Parsons	Leslie	893
Parsons	Shane	892
Parsons	Stephen	1141
Pascoe	Bruce	210
Pascoe	Charlie	718
Pascoe	Vivien	148
Passmore	Michael	1234
Patane	Mario	1889
Paterson	John	1171
Patkin	Tim	494
Patterson	Peter	1890
Patterson	Ross	1881

Appendix 1: Submissions from individuals (continued)

Name	Sub no
Pearson	J.W. 206
Pease	Richard 175
Pedrina	Bill 1191
Pedrina	William 149
Peel	Graeme 408
Peel	Joanne 407
Peel	Pat 406
Pegkerois	P. 1880
Pell	John 508
Pemberton	Bill 709
Penney	John 239
Penrose	B.L. 1892
Penrose	L.J. 1895
Penrose	V. 1891
Pepperell	G. 403
Pernek	Frank 1894
Perry	Raymond & Margaret 209
Peschel	Wally 2221
Petho	Les 1268
Petrie	Mark 2105
Petrovic	C. 1893
Philips	Priscila 1109
Phillippousis	Steve 1897
Phillips	Peter & Mary 171
Phillips	Thomas J. 2330
Phipps	S. 1421
Piazza	Salvatore 1899
Pickett	D. 301
Piggott	Michael 1307
Pike	Ian 1896
Pinto	Salvatore 1198
Pitzer	Robert 1898
Place	B. 857
Planinic	Milan 1900
Plecas	J. 62
Plowright	J. 1901
Plozza	Kevin J. 348
Plummer	Garry J. 2331
Plummer	Phillip 486
Plummer	Tim 1229
Plunkett	Alan 2222
Politini	S. 1903
Pollard	Barry 418
Polson	Chris 499
Pook	Stephen 2223
Portaro	B. 1904

Name	Sub no
Porter	Christine 568
Potter	E. 2333
Potter	Huebert A. 1468
Potter	John 2332
Poulter	Tom 2224
Poulton	Maurice 238
Powell	Paul 1902
Pratt	Tim 938
Preston	Michael 963
Preston	Wayne 492
Price	Barrie 1906
Price	L. 773
Primmer	Alan 1048
Probert	B. 1069
Pulham	Colin 629
Pulman	B. 902
Pulvirenti	Tony 1190
Puskaric	Marty 1905
Pye	Warren 125
Quinn	R. 270
Quirk	K. 1936
Quirk	Terry 1938
Quoc Nanh	Lieu 1937
Radley	C. 1908
Rambridge	Ian 1388
Ramsay	Carole 1123
Ramsay	Kenneth 1127
Ramunno	T. 1912
Randell	Peter 156
Rankin	Greg 1911
Rankin	W. 1417
Rantall	Alan 858
Rantall	Roy & Shirley 442
Ratcliffe	Barbara 471
Ratcliffe	David 474
Ratcliffe	Frank 470
Ratcliffe	Mark 472
Ratcliffe	Peter 473
Ravanello	Michael 1910
Rawlins	David 223
Rawson	Brendan 130
Rawson	Julie 129
Rawson	Matthew 1051
Ray	John 1909
Rayner	Lee 1907
Rea	Heath 1915
Rebbechi	Elizabeth 876

Name	Sub no
Rebbechi	Paul 877
Rees	Gillian 1149
Reichman	Charles 1914
Reid	James 2226
Reid	Kevin 1913
Reid	Malcolm 173
Reinisch	Frank 185
Relecker	Harry 975
Rennick	S. 7
Rennie	J. 1132
Ribic	Marko 1269
Richardson	Andrew 1063
Richardson	Bill 1916
Richens	Timothy P. 369
Ridgway	Bruce 1179
Ridley	D. 1270
Rigby	Kevin 2225
Rigoni	Robert 1919
Riordan	P. 1301
Rippon	Glenn 519
Ritchie	Arthur 2264
Ritchie	Damian 2265
Ritchie	David 630
Rivalland	A. 1918
Roach	Graham 1923
Robbins	Terrence C. 565
Roberts	Patricia 366
Roberts	R. 1922
Roberts	Steve 554
Roberts	Wayne 1926
Robertson	Mark 1928
Robertson	Peter 640
Robinson	Albert 117
Robinson	Andrew 2227
Robinson	Fred 2308
Robinson	G.L. 149
Robinson	George 2309
Rock	Jon 779
Rock	Michael G. 137
Rockford	A.D. 575
Rodrigue	Mark 646
Roes	Rayma J. 228
Rogala	Richard 1927
Rogers	Steve 1470
Rolekakis	Tony 1924
Rolland	Thierry 1003
Rolls	Trevor 2228

Name	Sub no
Romanin	David 1921
Romans	Robert 105
Rooney	Stephen 1271
Rose	Barry 1920
Rose	Carolina 150
Rosenfield	David M. 169
Ross	Anthony 1389
Ross	Don 1091
Ross	Ian 2229
Ross	James 691
Rossi	Daniel 2230
Rossi	Franco 1199
Rout	Stephen, Anne & Kate 627
Rowbury	D. 1925
Rowe	M.I. 77
Rowe	Steve 1287
Rowlands	Dennis 2334
Rowsell	M & H 1024
Rozich	Eddy 1929
Rudge	James 1930
Rudge	Tony 1931
Russell	Alan 1932
Rust	Ray 1390
Ryan	1933
Ryan	Dennis 2231
Ryan	Hugh 894
Ryan	Neil 2232
Ryan	R. 1272
Rzecki	George 1934
Rzeszutek	M. 1935
Sacco	Ralph 1200
Sahin	Remzi 1947
Sahin	Sefa 1948
Sainsbury	Ian 585
Sainter	David 151
Sakkas	Jim 534
Salameuser	R.F. 179
Sam	P. 1944
San Giorgio	Angelo 1940
Sandham	J. 1946
Sandon	Karen 398
Sanguinetti	Geoff 643
Santmaria	R. 584
Sartori	Angelo 1945
Sass	Michael 1943
Saunders	N. 50

Appendix 1: Submissions from individuals (continued)

Name	Sub no
Saunders R.	1964
Savage Peter	1941
Sayegh Saud	1942
Scale Heather	2335
Scale Tim	2336
Scarlota E.	1956
Schadendorff Edith	1222
Scheipers V.	1950
Schicuna Leo	2276
Schilg Lindsay	116
Schleibs F.	1954
Schleibs Kathleen	1953
Schleibs Paul	1955
Schlupalius Neil	2262
Schmidt Raymond	1189
Schnelle E. Guenter	1306
Schwaar T.	1949
Scoble Andrew	968
Scott Ashleigh	1951
Scott Ashley	939
Scott E.R.	741
Scott Michael	941
Scott Troy	940
Sculac David	1952
Scullin Ben	2233
Seaman Mark	1469
Searl Charles M.	548
Seddon A.	1962
Sedelies H.K. & A.L.	275
See Vernon	1959
Semmens Gary	1961
Serap Rodney	1957
Servello Tony	833
Setford Geoffrey	1431
Setiawan Ferny	1201
Sette Luigi	1958
Setters Tony	1016
Setters Yvonne	1025
Sevastas Manny	1960
Seward Bryan	523
Shamsabadi Walter	1965
Sharman Marion	480
Sharman Paul	483
Sharp Geoff	2234
Sharp Trevor	12
Shaw Bryan	1208
Shaw Graeme	853

Name	Sub no
Shaw Melanie	1968
Shea Paul	1046
Shearer Heather	237
Shearer Keith	236
Sheehy Kathleen	283
Sheils K.C.	12
Shepherd Louise	196
Sheppard J.	1967
Sheppard Norm	252
Sheppard T.	1966
Sherlock Simon	1391
Shields Don	1963
Shields Tony	1154
Shiels Steve	799
Shomaly Glenda	711
Short Dwayne	1422
Shotton John	1295
Sibley B. & L.	451
Silva Dave	2097
Simestar Graham	1969
Simmonds R.	255
Simon Leslie	2235
Simpkin Luke & Julie	774
Simpson Bill	1274
Simpson Peter	1275
Simpson Rhonda	1273
Simyanoski S.	1970
Sishivanousic	1939
Skaftouros E.	1971
Skapetis Jenny	1972
Skidmore Matthew	944
Slight J.	1973
Sliwczynski Paul	1392
Sluiter Adam	942
Smart John	665
Smenda Beryl	1975
Smenda Greg	1974
Smith A.J.	182
Smith B.M.	479
Smith Brad	1233
Smith C.P.	1067
Smith Celia	995
Smith Colin G.	553
Smith David	1396
Smith Ian	1232
Smith John E.	1276
Smith Ken	2296

Name	Sub no
Smith Michael	1394
Smith P.S.	69
Smith Paul C.	1277
Smith Ron	1393
Smith W.	1110
Smock Clark	1033
Snow Doug	839
Snow Gavin R.	351
Snowden Kevin	1302
Soeto Kin	2236
Sokor Don	2297
Solopitas Jim	1976
Sortino Paul	1977
Spafford John	2237
Spasovski C.	1980
Spaven J.W.	123
Speakman Robert	1395
Spence Anthony	1100
Spiby Andrew	1978
Spitaleri Salv	1180
Spiteri Charles	1979
Spiteri Mick	702
Spyrou Michael	2237
Stafford Don	1172
Stafford Lyn	1173
Stankoski Gordon	1202
Stantiaris Tommy	2337
Stanton Jamie	261
Stapleton Kate	192
Stav Steve	943
Stavrou	1418
Steel Ian	1142
Steele Gary	1987
Stegley & Scally Lucy & Brian & Anne	247
Stella Joseph	1984
Stenner B.	91
Stephen Paul	1981
Stephens Charles	814
Stephens Margaret	810
Stephenson Irene	179
Stephenson R.A.	180
Stern Norm	1430
Stevens Jo	638
Stevens M.I.	706
Stevenson Jonathon	542
Stevenson Kenneth	429

Name	Sub no
Stevenson Phil	1985
Stewart Barry	824
Stewart June	2273
Stockton Philip	1029
Stokes Graham	2239
Stokes J.	859
Stone G.E.	1982
Stoppa Laurie	945
Storey Melissa	768
Storto Sam	1986
Straford L.	1007
Stratford Viv, Damien & Bernard	721
Strauss Reinhard	1060
Strickland E.H.	2106
Strickland J.L.	2107
Strickland R.	2108
Stronglos John	1988
Stroud J.	150
Stubbs William	2240
Stuber John	1471
Sturrock Garry	1983
Styles H.	1990
Styles Mark	1989
Sumarac A.	1991
Summers Gary	758
Sung Oh Jae	1992
Sutherland Warren	1094
Sutton Colin	1993
Swarbrick John A.	493
Sydow E. & M.	583
Tabacco John	1998
Tabone Celie	346
Tabone Henry	417
Tamburro A.	2000
Tan K.P.	1994
Tangey Chris & Louise	694
Tannahill Colin	946
Tanner Andy	2241
Tanner Norm	2344
Taranto Sam	128
Taranto Steve	127
Taylor Bruce	1997
Taylor C.	140
Taylor Duncan	2242
Taylor George	562
Taylor James	1297

Appendix 1: Submissions from individuals (continued)

Name		Sub no
Taylor	Kimberly	1176
Taylor	Len	1999
Taylor	Matt	827
Taylor	Pam	2243
Taylor	Stephen	1996
Taylor	Yvonne	715
Tazieks	C.	1995
Teasdale	Ian	970
Teasdale	V.E.	1062
Tedcastle	W.	2
Tesoriero	Steve	1397
Teuma	John	1278
Theo	Dan	2005
Theophanous	Theo	2001
Thomas	A.	1
Thomas	Anthony	L87
Thomas	Barry	L27
Thomas	C.	L3
Thomas	Lindsay	1398
Thomas	Paul	2003
Thomas	Ray	L26
Thomas	Tom	2298
Thompson	Arthur	262
Thompson	Greg	698
Thompson	J.	580
Thompson	M.	2004
Thompson	Mark	L4
Thompson	Neville	227
Thompson	Sarah	915
Thomson	James	291
Thomson	N.	579
Thomson	Peter	153
Thornber	Roger	2244
Thorpe	Gary	2002
Tillock	William	2007
Tinkler	G.	670
Tipping	H. & R.	284
Tirchett	Neil	2006
Tonin	Fred	2014
Toohey	Adrienne	880
Toohey	Narelle	879
Toohey	Robert	881
Topalidis	Les	1472
Torca	G.	2013
Torgersen	Danny	2109
Tornello	Vince	2012
Torossi	Walter	2008

Name		Sub no
Tortul	Danny	2009
Tortul	Italia	2010
Tortul	Sergio	2011
Tran	Cuong	2020
Tran	H.L.	2019
Trapani	F.	2021
Trask	R.	916
Treadwell	David	2245
Treble	Phil	2022
Tregurtha	S.	2015
Trewavis	Curt	2017
Trewavis	Kylie	2016
Trewin	Len	1399
Trezise Mp	I.	49
Tribe	Graeme	679
Trickey	Norm	2018
Trifonopoulos	Stylios	2246
Trikius	John	2247
Trinham & Crawford-	Mark & Fiona	1028
Trinham		
Truscott	Ivan	390
Tsiakmakis	Nick	2023
Tsonis	Peter	2024
Tsuchida	Susan	1014
Tucker	Neil	685
Turner	Andrew	L53
Turner	Gary	1300
Turner	Roy	311
Turvey	Mark	2248
Turville	P.	2025
Turville	Robert	947
Tutt	James	L103
Tyers	Bessie	432
Tyrrell	Julie	1115
Tzifos	Con	2026
Urquhart	Leanne	334
Urquhart	Ron	335
Valenjc	Fedele	2031
Vallay	Andrew	2029
Van		2032
Van Unen	Lynette	2263
Van Vliet	John	268
Vandeligt	Anthony	1400
Vandeligt	Glenn	1401
Vandeligt	Luke	1402
Vanderkram	Keith	2030
Vanschynel	Ward	1279

Name		Sub no
Varcoe	R.	233
Vasilevski	Josif	2027
Vasilik	Michael	2028
Vaughan	Pat	895
Vavladellis	Con	1475
Vegh	F.	2033
Velardo	Tony	964
Venn	Alan	2034
Verga	Joe	2036
Vergis	Steve	2035
Vergoli	E.	1207
Vesco	Gino	446
Vesco	John	447
Videion	Hugh H.	L72
Videni	Louise	495
Vigliotti	C G	2039
Villani	Mark	2037
Virgona	Dawn	897
Virgona	Frank	898
Virtue	A T	2038
Visilik	Michael	969
Vogel	John	1419
Volonbello	Ben	2041
Voss	Ivan	899
Voss	Lynette	896
Voulgaris	Peter	2040
Wadsworth	Steve	1009
Waixel	Stephen	2249
Wakefield	David G.	1473
Wales	Mathew	962
Walker	Andrew	1023
Walker	Col	674
Walker	Craig	543
Walker	Greg	948
Walker	James	1230
Walker	Jason	377
Walsh	B.	467
Walsh	Kale	2299
Walsh	Kerry	1304
Walton	Anthony	816
Wandersmith	Leo	2044
Ward	Andrew	2045
Ward	Fred G.	218
Ward	J.	2042
Ware	Chris	1280
Ware	Janis	1281
Ware	Seana	1282

Name		Sub no
Ware	Steven	1008
Warfe	Len	192
Warneke	J.	45
Warrant	N.	786
Wartnaby	Chris	2250
Waspe	Margaret	2261
Waters	Leonard	2043
Watson	Dennis	1047
Watts	Bruce	1161
Webb	David	2047
Webb	Margaret	1293
Webster	S.	L97
Weedon	Robert	129
Weir	David R.	2338
Weir	Ian	466
Weir	Jeff	624
Weir	Warren	L1
Welding	P. & S.	2266
Wells	B.	2046
Welsford	David	1403
Welsford	Pam	1074
Wentzel	B.	2048
Wescott	Geoff	693
Wesolowski	John	1119
Wesolowski	Steven	1121
Wesolowski	Trent	1120
Westaway	Glen	2049
Westney	John	2254
Wheatley	J.	917
Wheatley	John	805
Wheatley	R.J.	978
Wheeler	D.	919
Whitaker	A.	2051
White	Peter	2251
White	Peter	433
White	William	2050
Whitelaw	Anthea	631
Whiteway	Bob	173
Whitfield	John	2339
Whitford	Andrew	278
Whitford	Heath	1203
Whittaker	K.F.	16
Whittam	B.	581
Whittam	F.	918
Whittam & Nicholls	W. & N.	920
Whittingham	Ron	152
Whyte	Stephen	1404

Appendix 1: Submissions from individuals (continued)

Name		Sub no
Wickett	Peter	2062
Wiggins	Craig	828
Wignall	Clint	117
Wignell	Glen	1231
Wilkins	F.B.	582
Wilkinson	Colin	2052
Wilkinson	Edward	302
Wilkinson	Graham	2253
Wilkinson	R.L.	340
Wilkinson	Rae	316
Wilkinson	Ray	402
Wilkinson	Stuart	198
Will	Phillip	2057
Williams	D.M.	2304
Williams	G. & S.	922
Williams	Ian	2056
Williams	Ian	1002
Williams	M.	921
Williams	Nick	2055
Williams	P. & D.	1137
Williams	Patricia	2061
Williams	Peter	2060
Williams	Robert	2255
Williamson	Allan	1156
Williamson	Kylie	1160
Williamson	Michael	949
Williamson	Ron	560
Williamson	Ross	985

Name		Sub no
Willmott	Colin	1031
Willmott	Pamela	977
Wilson	D.	1420
Wilson	G.	8
Wilson	Geoff	648
Wilson	Juliet	772
Wilson	K.	840
Wilson	Loch	476
Wilson	Robin	644
Wilson	T.	2053
Wing	Brendan	2258
Winstanley	Ross	164
Wirth	Gerry	2058
Wirth	Vince	1735
Wise	Christopher	2257
Wise	Ken	2256
Wishart	R.	2054
Wissell	E.	2059
Withers	Philip	2252
Wittick	Ros L.	303
Wloch	Darren	2063
Wloch	Mark	2064
Wolfe	Ross	2066
Wong	Neil	389
Wood & Family	Anthony	1071
Wood	Dianne	182
Wood	Mark	2259
Wood	R.	2068

Name		Sub no
Wood-Ingram	Jill	1045
Woodhouse	E.	2067
Woodhouse	Norm	2065
Woolley	Carol	662
Woolley	John	1032
Worboyes	Lynda	1405
Worboyes	Neil	1406
Wright	Al	1204
Wright	Andrew	2301
Wright	Arthur	2340
Wright	Daniela	1206
Wright	J.	2069
Wright	Mark	951
Wright	Michael J.	186
Wright	Phillip	2070
Wright	Ray	2071
Wright	Russell	950
Wright	S.	2300
Wright	Tania	1205
Wykes	Clint	2072
Wylie	Jenny	976
Xuereb	Alfred	2073
Yaloussis	Theo	2074
Yelland	R.	860
Yin	Greg	2076
Yin	Rod	2075
Young	C.V.	59
Young	David	2303

Name		Sub no
Young	K.	1146
Young	Ron	807
Young	Stephen	2077
Young	Tom	1474
Zabielsk	Richard	2087
Zahir	T.	2081
Zakhour	Tony	2083
Zammit	Chris	2085
Zammit	Darren	2084
Zammit	David	2086
Zanca	Sam	203
Zarifis	J.	2082
Zeine	E.	2088
Zerafa	Michael	2089
Zimmer	Steven	143
Zinnenburg	C.	94
Zivkovic	Miladin	2090
Zolziech	Arthur	2091
Zoroje	Boris	2092
Zufty	Clarrie	2093
Zurawiecki	Ben	2079
Zurawiecki	Jan	2080
Zurawiecki	Julie	2078
Zuydwyk	Johannes	1305

Note: Submissions received with no name or where the name was illegible are not included. Some submissions were in the form of signed petitions.

Appendix 2

ECC's response to major issues

Throughout the investigation, the ECC has carefully considered all submissions and views expressed. At each stage of the LCC and the ECC investigation these views have been summarised in relevant reports. This section summarises only the major issues raised after the release of the Draft Report in December 1999, and Council's response to these issues. Key issues raised through the investigation are also addressed.

Establishment of highly protected marine national parks areas

Many submissions from the recreational and commercial fishing sectors believed that marine parks were only necessary where there was inadequate fisheries management and that this was not the case for Victoria. The view was expressed that appropriate regulation of the commercial and recreational fishing sectors would be sufficient to protect fish stocks and all other values. No-take areas were considered particularly inappropriate for protection of highly mobile fish. There was low acceptance by many (but by no means all) recreational and commercial fishers of the need to set aside representative areas in as undisturbed a state as possible for future generations. These fishers did not generally distinguish between the objectives of biodiversity protection and fisheries management.

Other submissions supported the creation of highly protected areas for biodiversity protection. They commonly stressed the need for large areas within which natural ecological processes could occur. They also saw no-take areas as imperative in

sustaining depleted fish stocks. Many submissions proposed specific areas for no-take areas along the coast. Most conservation groups and scientists believed approximately 6% of Victoria's waters to be an inadequate proportion of the marine environment to be set aside free from extractive uses, although most conceded it was a good start. Many believed that the marine protected areas system should incorporate larger marine national parks and sanctuaries and incorporate a greater percentage of the Victorian coastline to ensure the maintenance of biodiversity.

The likelihood of adverse social and economic impacts of highly protected areas on recreational and commercial fishers, associated industries and local communities and towns was often raised in submissions and consultations. The commercial fishing sector maintained that the values of commercial fisheries in some marine national parks recommended in the Draft Report were seriously underestimated. There were others who considered that highly protected areas could, in many cases, be a tourist drawcard, bringing in revenue to local economies, especially over the longer term.

Response

The ECC strongly believes that, not only is it necessary, but that it would be irresponsible not to set aside a proportion of Victoria's marine area to be maintained in as natural state as possible (see also section below, *Multiple-use approaches to marine protected areas*). Protected areas on land, such as national parks, established to preserve representative examples of ecosystems in perpetuity, have long been accepted by the community as a key component in the overall good management of the environment. In Victoria, approximately 15% of land is in highly protected parks or conservation reserves.

Continued next page



Continued from previous page

The ECC believes that where implementation of recommendations for marine national parks and marine sanctuaries may result in displacement effects on adjoining fished areas as fishers shift effort to accommodate the new restrictions, or where a sector of the industry or a local community is disproportionately affected, industry adjustment may be required (see Recommendation R1 on page 15 of this report). The ECC acknowledges that there are social and economic implications arising from the establishment of highly protected areas and has responded to concerns regarding specific areas by reassessing the commercial fishing estimates in consultation with industry (see sections 1.5, 2.6 and Appendix 5), and altering some locations and boundaries of recommended marine national parks and sanctuaries in order to minimise social and economic impacts. In particular, changes from the Draft Report were made to reduce the impact on Central Zone commercial abalone fishing and recreational fishers (see tables on pages xiv and xvi of the Executive Summary).

Multiple-use approaches to marine protected areas

In recent discussions with stakeholders and in many submissions from the commercial and recreational fishing sectors, the ECC was questioned about why it was proposing to recommend highly protected areas, instead of multiple-use parks in which harvesting is allowed to continue in much or all of the area. A belief was often expressed that fishing and harvesting activities do not harm the environment and that a multiple-use management regime can therefore be effective in meeting conservation objectives. Other comments were made that protected areas will be ineffective in protecting highly mobile fish species, and that other impacts on the marine environment are so great as to make establishment of marine parks futile. It was frequently said that the marine environment should be managed as a whole and that it is unnecessary to “lock up” areas as marine national parks.

However, the ECC also received consistent input from commercial and recreational fishers that large multiple-use parks were not viewed favourably, largely because of the perceived potential for future restrictions on fishing, but also because of the difficulty of communicating complex regulations restricting various categories of fishing in different parts of the park.

Conservation and environment groups also criticised large multiple-use parks because of the perceived absence of clear conservation objectives and measures for the areas. Existing multiple-use parks such as Corner Inlet were sometimes cited as evidence of the lack of clear management intent. Some scientists commented on the difficulty of assessing the performance of large multiple-use parks. The overwhelming number of submissions supporting marine protected areas endorsed the system of “no-take” areas, in preference to multiple-use parks.

Response

There is an ongoing global debate about the relative merits of highly protected areas and multiple-use areas. Much of the dispute arises from the misconception that these are two fundamentally different approaches. In fact nearly all large multiple-use marine parks encapsulate highly protected zones, which form the core of the park; for example, a proportion of the Great Barrier Reef Marine Park is designated as highly protected Marine National Parks Zones. This approach leads to essentially similar outcomes to the system proposed in this report.

Australia’s Oceans Policy is often cited in support of the multiple-use approach. Nowhere, however, in the Oceans Policy is it stated or even implied that multiple uses of the oceans means that all areas are available for all industries all the time. In fact, not dissimilar to National Forests Policy, the Oceans Policy explicitly states that “multiple use planning and management of the oceans should incorporate as a central component a comprehensive, adequate and representative national system of marine protected areas.” One of the Commonwealth Government’s commitments in the Oceans Policy is to accelerate development of the National Representative System of Marine Protected Areas, which in turn has an aim, signed off by all Australian governments, of “including some highly protected areas in each bioregion”.

Continued next page



Continued from previous page

Under the comprehensive, adequate and representative system of marine protected areas proposed by the ECC, Victoria's marine environment as a whole is managed for multiple uses. Marine protected areas are only one component of marine environmental management, and the ECC highlights existing and developing programs addressing critical environmental issues such as catchment management, fisheries management, introduced marine pests and marine pollution.

The ECC is persuaded that large multiple-use marine parks, in which fishing and other harvesting and extractive uses are permitted in most of the zones, send confusing messages to the community about the purpose of the parks. In order that the purpose of the parks can be clearly communicated and the management regime simply explained and implemented, a system of highly protected marine national parks is proposed. Monitoring of the performance of the parks will also be simplified.

It is essential that the marine environment be managed as a whole, in a way that maximises benefits to present and future generations of Victorians. As on land, this may involve setting aside different areas for different uses, such as aquaculture, ports or biodiversity protection. Balanced use is achieved by having a mix of uses over the whole of Victoria's marine environment, and not by allowing every use in every area. The recommendations in this report will ensure that nearly 94% of waters will remain available for sustainable uses such as fishing, oil and gas exploration and extraction, aquaculture, ports and shipping.

Although many fishing techniques do not damage the environment, it is clear that targeted harvesting of fish or any marine species alters the ecosystem of which they are part. The only way in which these effects can be objectively assessed is to set aside areas in which there is no harvesting, for long-term comparison with harvested areas.

Some fish and other marine species are highly mobile, others less so. Even some highly mobile species have stages when they are relatively sedentary and protected areas can provide major benefits. For example, Logan's Beach near Warrnambool is a nursery area for Southern Right Whales and it is widely recognised that shallow inlets and bays such as Western Port and Swan Bay in Port Phillip Bay are critical habitat for juvenile fish. This is analogous to the situation on land where some birds that nest in protected coastal wetlands in Australia fly to and from Siberia every year.



Scientific basis for marine protected areas

Throughout the investigation a number of issues were raised, by recreational and commercial fishing sectors, relating to the scientific basis for the recommendations. A belief commonly expressed was that recreational line fishing and some commercial fishing activities have no ecological impacts, and therefore the scientific basis for excluding them from marine parks is non-existent.

A common question is whether or not there are sufficient data to confidently make recommendations about the location of marine parks and conservation reserves. A related observation is often made that there is no scientific evidence demonstrating that marine parks are effective in protecting marine ecosystems.

Response

While it is true that the marine environment is generally less well understood and documented than the terrestrial environment, a large amount of information is available in Australia to describe marine regions on their biological and physical characteristics, including habitat types and species distributions. Individual marine scientists and their professional association, the Australian Marine Sciences Association, fully supported the scientific basis of the report. In a recent global overview of marine protected areas, IUCN The World Conservation Union (1998) commented that it is a mistake to postpone action because biophysical information is incomplete, and that there is usually sufficient information to indicate whether marine protected areas are justified ecologically and to set reasonable boundaries.

There is solid scientific evidence that highly protected marine parks can play an important role in good overall marine management and protection of biodiversity and other natural values. There is also substantial documentation of the differences in diversity and abundance of fish and other marine species that emerge following the creation of highly protected areas (for reviews see References 313, 325 and 341). While much of the early research in this area was conducted in tropical ecosystems (eg see References 91, 199, 200, 322, 346, 362 and 386), there is now ample demonstration of similar effects in temperate waters such as in New Zealand, Tasmania and South Africa (eg see References 16, 32, 33, 34, 79, 80, 87, 141, 162, 293, 354, 367 and 406). In Victoria, there are almost no highly protected areas in which such research can be conducted. However even a casual underwater observation at the Popes Eye Marine Reserve (at the southern end of Port Phillip Bay), which has been highly protected for many years, will indicate that fish numbers and diversity are far greater than for comparable areas in Port Phillip Bay. Likewise, in the existing sanctuary of Bunurong Marine Park, recent monitoring data indicate the sanctuary is acting as a reserve for the male blue-throated wrasse population (Edmunds 2000).

Arguably, there is no scientific evidence that the existing level of use of the marine environment is sustainable and it is sometimes suggested that the ecological sustainability of commercial fisheries should be demonstrated before they be able to proceed. Where information is available in the form of fish catch data, the indications are that harvesting of some species is not sustainable at current levels. For example, as a result of the average size of rock lobster declining, and rock lobster egg production being a matter of concern, the need to rebuild stock to ensure long-term sustainability was identified in the Victorian rock lobster fishery (Rock Lobster and Giant Crab Quota Allocation Panel 1999).

There have been major reductions in other fish stocks for reasons that are not fully understood, such as the once major cotta fishery outside Port Phillip Bay. Recreational line fishing has also been identified as affecting marine ecosystems. For example, the major decline of populations of tiger flathead, sand flathead and the common gurnard perch in Port Phillip Bay between the early 1970s and the 1990s is linked both to recreational and commercial fishing (Hobday *et al.* 1999, and see section 3.1 for further details).



Enforcement

A common concern expressed throughout the investigation is the belief that marine national parks will become havens for fish thieves. This concern reflects the reality that stealing fish and shellfish, in particular abalone, is a significant and ongoing problem in Victoria.

Many groups and individuals have expressed the view that the current level of field management, including enforcement, is unsatisfactory and they doubt that sufficient management resources will be made available to manage newly established marine parks. There have been frequent claims that the existing highly protected sanctuary zone of the Bunurong Marine Park has been stripped bare of abalone.

Response

Illegal harvesting of marine resources is a significant problem, and in some fisheries (eg abalone) is a major threat to sustainable management of the stock. Nonetheless, there is no concrete evidence that stealing is any more prevalent in marine parks than in other areas. The argument is often put that the presence of legitimate users discourages illegal users. Once again there is no evidence that this claim is valid, and it is unclear how this would affect night-time activity when much theft occurs and legal users are mostly not present. Illegal activities are often masked as legal harvesting, and enforcement officers have stated that policing is actually simpler in highly protected areas where no harvesting at all is allowed.

Monitoring within and outside the sanctuary zone of the Bunurong Marine Park, indicates that there is no basis to claims that abalone populations in existing highly protected areas have been decimated (Edmunds 2000).

It is important to remember that field enforcement is not an end in itself, but is one of several means of ensuring compliance with regulations designed to protect the resource and the environment. Education and changing community views can also be of long-term benefit in ensuring compliance.

The appropriate level of enforcement is a matter which is continually under review by the responsible agencies. A package of measures was recently introduced to increase emphasis on fisheries enforcement. All of Victoria's marine waters are subject to a complex regulatory regime (for fisheries, shipping and navigation, boating, pollution control, oil and gas extraction) which is enforced at present. However, with the introduction of protected areas, there will be additional costs associated with publicity, education and compliance, as is the case with the introduction of any new management regime, and ongoing compliance monitoring and management costs. The ECC acknowledges the strong community concern resourcing of marine compliance programs, and stresses the need to provide sufficient financial and human resources to effectively manage marine and coastal areas, both within and outside marine protected areas.

Sound, implementable and properly funded compliance programs are essential to address non-compliance, including fish theft. Consequently the ECC has recommended that implementation and management issues be addressed, including adequate sufficient resources for effective compliance and enforcement (see sections 1.5, 2.7 and recommendations R29 to R33).



Boundary identification

Concerns have been expressed relating to the perceived difficulty in identifying boundaries at sea of marine protected areas. Many fishers, both commercial and recreational, commented on the likely difficulty in identifying boundaries, and expressed concern about the problems they thought they would experience with compliance.

For example, identifying boundaries without equipment such as the global positioning system (GPS) was considered to be almost impossible, and marker points on land and buoys at sea were thought insufficient. Concerns were also voiced that GPS would not enable accurate identification of positions with respect to boundaries or that it was too expensive.

Response

While it is necessary to address issues relating to boundary marking, it is worth remembering that fishers must already comply with many regulations and restrictions which require them to identify areas at sea, such as Victoria's coastal waters limit at three nautical miles (about 5.5 km) from the coast, and major shipping channels. Approaches currently used include use of markers on the land, buoys and markers in the sea, and the distribution of maps and charts. Strong visual landscape features, depths, longitude and latitude reference and distances from shore all assist users. Electronic navigation aids such as GPS are increasingly used as their cost reduces, and enable boat-based commercial and recreational fishers to accurately determine their position.

The ECC has endeavoured to recommend boundaries that are as identifiable and practical as possible. A number of changes have been made to many areas recommended by the ECC to provide for easier identification of boundaries (see tables on pages xiv-xvi of the Executive Summary for further details).

With respect to the accuracy of GPS systems, recent changes to the system mean that positions can be relied upon to be accurate within 30 metres.

Threats to the marine environment

Many submissions raised the issue of other major threats to the marine environment such as introduced pest species, catchment run-off laden with sediments, nutrients, contaminants and freshwater, and sewage-

linked water quality problems. It was submitted that all of these critical environmental issues cause damage and have not been adequately addressed by the ECC. Some also claimed that there was no point creating marine parks until these other problems were solved.

Response

The ECC considers environmental issues such as catchment management, introduced marine pests and marine pollution are clearly in need of appropriate management. Activities such as coastal development, shipping and tourism must be planned for and managed together so they are compatible with each other and the environment. Integrated planning is essential across the whole of Victoria's marine and coastal environment, including the bays, inlets and estuaries, as well as the adjacent foreshore land and catchments that drain to the coast. Many of these issues are already the subject of targeted programs involving partnerships of government, industry and the community. For example, every sewage outfall in Victoria now has at least secondary treatment before being discharged to marine waters, and management of agricultural land to reduce erosion and fertiliser runoff is being addressed by catchment authorities, Landcare groups and regional coastal boards.

Threats to the marine environment have been addressed in detail in this report, including issues of catchment management (section 2.4), water quality (section 2.5), marine pests (section 2.5) and tourism (section 2.6).

The ECC's view is that while management of these issues is critical to the long-term health of the marine environment, there is no reason to delay creation of marine parks which in fact assist in enhancing overall management of our marine resources. It also needs to be understood that most of these problems will never be totally solved, but rather will be managed so that negative effects are minimised.



Establishment of marine aquaculture zones

Many submissions viewed aquaculture as a mechanism for reducing pressure on natural fish stocks while conferring economic benefits on operators and the wider community. A number of submissions supported the selection criteria and principles as long as conservation principles were upheld in the planning process, but others felt that the ECC investigation was impeding the development of Victoria's aquaculture industry by not identifying suitable areas. The suitability of some areas was questioned in relation to parameters such as depth, water quality and proximity to areas of environmental significance.

Victoria has a high energy coastline and was considered by some to be generally less suitable for marine aquaculture than other states such as Tasmania with its many protected inlets and embayments.

The majority of submissions that commented on aquaculture were critical of open water systems because of the inherent environmental risks. There were many calls for tighter controls on offshore aquaculture operations, but there was clearly a strong preference for land-based aquaculture with the appropriate environmental safeguards.

Response

Aquaculture has the potential to provide a wide range of benefits to the community. The development of a strong and healthy aquaculture industry is supported by the ECC. Open-water aquaculture is reliant upon the health of the surrounding environment, and it is in industry's interest to ensure that they adhere to strict environmental guidelines. Nevertheless, open-water aquaculture has inherent environmental risks which need to be carefully monitored and addressed as necessary (see section below, *Environmental issues related to aquaculture*). For these reasons, and in the response to community's strong preference, the ECC believes that a high priority should be placed on the development of land-based aquaculture (see section 4.5). Open waters, however, in appropriate situations should also be available for aquaculture.

It is a matter of some concern to the ECC that this investigation has sometimes been portrayed as an impediment to aquaculture development. In fact, the establishment of new aquaculture enterprises has been very slow in Victoria, and the ECC investigation is part of the process of facilitating marine aquaculture through nominating suitable sites. There is no doubt that delays in finalising the investigation have caused some frustration, but it is important to note that aquaculture proposals can be, and are, being dealt with under the existing guidelines prior to the Government's consideration of, and response to, the final ECC recommendations.

Economic issues related to aquaculture

Economic issues raised during consultation and in submissions include the benefits to local communities of aquaculture operations and positive and negative impacts on tourism.

Concerns were also expressed that there may be a negative impact on tourism because of the potential visual intrusion of aquaculture farms.

Response

There can be significant benefits to local economies associated with aquaculture including the attraction of investment capital, direct employment, development of support services and multiplier effects.

Tourism and local marketing opportunities also exist for aquaculture operations. Educational and information tours are run on a regular basis in aquaculture areas in other states. Submerged technologies are now available that, along with careful site selection, reduce the visual impact of aquaculture farms (also see *Environmental issues related to aquaculture* below and section 4.7).



--



Environmental issues related to aquaculture

A number of environmental issues related to aquaculture were repeatedly raised throughout the investigation. In fact environmental risk was the most often cited concern. Some sites such as the sensitive inlet environments of Western Port and Corner Inlet (Ramsar areas) were considered by many to be highly inappropriate for aquaculture. Other sites were considered unsuitable due to proximity of industrial port facilities, shipping and boating traffic, and associated anti-fouling compounds. Concerns also were expressed about:

- the potential for introduction of diseases;
- transport of exotic animals and plants;
- impacts on marine communities beneath aquaculture farms;

- predator interactions with fish farms;
- increased nutrients; and
- the visual impact of aquaculture operations.

Concern about the risks of introducing diseases or exotic species through aquaculture of marine species was strongly expressed.

A potential environmental benefit that was often raised during consultation was that aquaculture would reduce pressure on wild fisheries, for example, on the declining wild snapper fishery. Some suggested that shellfish farms have minimal environmental effects, adding that they have the potential to reduce nutrient (especially nitrogen) concentrations in marine waters.

Response

The ECC believes that the strong community concerns about environmental sensitivity of the Ramsar-listed Western Port and Corner Inlet environments are justified and consistent with the ECC's principle that aquaculture development should generally not be permitted in or adjacent to sites with significant environmental values, including sensitive or threatened habitats. For these reasons and in view of the fact that the nominated sites were not strongly supported by the industry, the ECC decided to remove them from recommendations (see table on page xvi of the Executive Summary). The new Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 increases the scrutiny that new developments such as marine aquaculture operations will undergo if they are proposed to be located in sensitive environments such as Ramsar wetlands. The new Act requires determining whether any activities are likely to have a significant impact on wetlands of international importance (as one of the six matters of national environmental significance). Any such proposals must be referred to the Commonwealth Environment Minister for determination as to whether the proposal is a controlled action and requires Commonwealth approval.

To the widely-expressed concern about the risks of introducing diseases or exotic species through aquaculture of marine species, the ECC has responded by adopting an additional principle for selection and management of marine aquaculture areas (see section 4.5). Prevention of introduced diseases will be addressed in AQUAPLAN, which is being developed by the Commonwealth government and the aquaculture industry. Risks associated with imported feed are subject to Import Risk Analyses (IRAs) to be developed by AQIS for processed aquatic animal feeds, aquatic meals and other aquatic animal products (see section 4.7, recommendation R44). The translocation of exotic animals and plants and non-indigenous stock will be covered in the Victorian Translocation Policy (see section 4.7, recommendation R42). Specific local issues, for example the translocation of exotic animals from Port Phillip Bay to Western Port, is being addressed by protocols being developed by Fisheries Victoria, and the Marine and Freshwater Resources Institute is currently assessing effective treatment of mussel spat ropes to rid them of fouling organisms and exotic species.

The Victorian Aquaculture Strategy (1998) outlines monitoring procedures to be followed for aquaculture operations including baseline studies. With effective monitoring and appropriate management, including fallowing, the impact on flora and fauna beneath aquaculture farms, while it could be significant in the short term, should be negligible in the longer term. Monitoring of aquaculture operations has been addressed in detail in the recommendations (see section 4.7, recommendation R43).

Continued next page



Continued from previous page

Predator interactions with finfish farms are of two kinds: (a) predator entanglement in nets; and (b) fish stock losses through stress due to the proximity of predators, predator entry to the stock enclosure, or stock escapes through damaged nets. Potential predators in Victoria are sharks, Australian fur seals and dolphins. Heavy gauge predator nets surrounding fish pens are used in other states to prevent predator attacks, and advice to the ECC indicates that these systems are effective. The Marine Animal Interaction Working Group workshop, convened by the South Australian Department of Primary Industries and Resources, has developed reporting procedures for cases of predator attacks and entanglement. Advice from Fisheries Victoria and industry is that problems related to predator entry to, or entanglement with, finfish farms are now virtually non-existent due to upgraded enclosure systems.

It is Victorian Government policy – through the State Environment Protection Policy, Waters of Victoria, to reduce nitrogen inputs to Port Phillip Bay by 1000 tonnes per annum (approximately 15%) by 2006. Because finfish farming in the bay would require supplementary feeding (which would result in increased nitrogen input), the establishment of any proposed farms would need to be done with caution. The conditions of nutrient management and finfish culture in Port Phillip Bay, both on a trial basis and as commercial operations, are discussed in detail (see section 4.4) and have been addressed in recommendation R40.

Fisheries management plans for aquaculture zones will address the issue of visual impact, but experience in other states indicates that with appropriate site selection visual impacts are generally minor. This has been demonstrated even in highly scenic environments such as the Derwent estuary in Tasmania. The ECC has responded to community concerns, however, where visual amenity was a critical consideration. For example, the Waratah Bay aquaculture zone was removed from the final recommendations because of the potential visual impacts, amongst other reasons (see table on page xvi of the Executive Summary).



Planning issues

Many planning and procedural issues have been raised in relation to preferred areas for marine aquaculture. Siting of aquaculture zones, their sizes, whether or not aquaculture should be permitted in

marine parks, and potential conflicts with recreational boating, and commercial and recreational fishing, are some of the frequently raised points. Many considered that access for fishing and recreational boating would be reduced by aquaculture farms.

Response

The proposed aquaculture zones were developed with the input of industry, Fisheries Victoria and community groups. The recommended areas are those that best meet the needs of all groups. New technologies exist for open ocean sites which offer potential for Victoria. However investors need to develop confidence with this technology, and there is limited availability for sheltered sites because of existing uses or environmental reasons (see section Establishment of marine aquaculture zones and above).

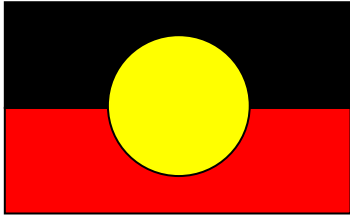
A number of aquaculture investigation areas (relatively large areas where further investigation was required) were recommended in the Draft Report. None have been recommended in this final report. In most cases further evaluation has been carried out and, together with input from industry and the community following release of the Draft Report, the ECC has decided that the site does not have any immediate potential, or a smaller aquaculture zone is recommended within the former investigation area. Aquaculture zones are areas that have demonstrated successful aquaculture performance or growth of target species in the past or, on advice from Fisheries Victoria and industry, will almost certainly be suitable for target species (for details of changes see table on page xvi of the Executive Summary).

Zones have been chosen in areas where conflict with other uses is minimised, and aquaculture is not allowed in the fully protected marine national parks or marine sanctuaries.

Recreational boating and fishing will be allowed in aquaculture zones provided that the aquaculture operation is not adversely affected (see section 4.7, recommendation R46). Commercial fishers are unlikely to be significantly affected by the proposed aquaculture zones. Consultation with the responsible navigation authorities has determined the level of risk to commercial shipping and recreational vessels to be low provided aquaculture operations are marked clearly and notice is given to mariners.



Appendix 3



Mirimbiak
Nations
Aboriginal
Corporation



OUTCOMES OF CONSULTATION WITH VICTORIAN ABORIGINAL COMMUNITIES ON THE ECC MARINE, COASTAL & ESTUARINE INVESTIGATION DRAFT REPORT (1999)

REPORT TO THE ENVIRONMENT CONSERVATION COUNCIL

MAY 2000



Consultation process	3
Invited groups	3
Communities involved in consultation	3
Cultural heritage programs	4
Documentation	4
Workshops.....	5
Workshop timeline	5
VACC's group workshop	5
VACC's statement	6
Legislative framework	6
<i>Aboriginal And Torres Strait Islander Heritage Protection Act 1984 - Section 4.....</i>	<i>6</i>
<i>Archaeological & Aboriginal Relics Preservation Act 1972 (Vic).....</i>	<i>7</i>
<i>Native Title Act - Future Act Regime</i>	<i>7</i>
Additional provisions.....	8
Communication of legislation.....	8
General recommendations.....	9
Consultation.....	9
Aboriginal culture	11
Protocols.....	11
Consultation.....	11
Additional information	11
Site visits.....	12
Resources	12
Acknowledgment	12
On-shore infrastructure & access.....	12
VACC's consultation process	13
Traditional rights	14
Access to land and waters.....	14
Exploitation of knowledge sites and resources	14
Tourism.....	15
Fisheries management	15
Land and water management.....	15
Water quality.....	16
Closing of rivers and lakes	16
Land and water groups (voluntary).....	17
Marine protected areas.....	17
Cultural heritage zones.....	17
Economic sustainability	17
References.....	18
Acknowledgments	18

Please Note:

The final report from Mirimbiak Nations Aboriginal Corporation (Mirimbiak) also contained specific recommendations related to recommended areas in the ECC Marine, Coastal and Estuarine Investigation Draft Report. These comments are not included in this appendix but have been addressed in the area specific recommendations of the ECC's Final Report.



Consultation process

Following the release of its Marine, Coastal and Estuarine Investigation Draft Report in December 1999, the ECC wrote to the relevant native title claimant groups, regional cultural heritage program co-ordinators and Aboriginal communities (lists were provided by Aboriginal Affairs Victoria (AAV) and Mirimbiak) requesting their input on the draft recommendations. One response was received.

In order to ensure Aboriginal participation in the public consultation process, the ECC met with representatives from AAV, ATSIC (Vic) and Mirimbiak to determine an effective way to consult with Aboriginal people in the investigation area. As a result of that meeting, the Environment Conservation Council (ECC) commissioned Mirimbiak to facilitate consultation with Aboriginal groups along the Victorian coast. Mirimbiak is recognised as being a central contact point as it is the native title representative body (NTRB) for Victoria and peak advocacy group for Aboriginal people in Victoria. Mirimbiak selected a facilitator, Janelle Everitt, to perform the following tasks over a six week period from mid April to the end of May 2000:

- consult with appropriate Aboriginal people and groups (see below);
- meet with ECC staff to provide an oral progress report;
- workshop the outcomes of the consultation process, and include representatives from AAV, ATSIC (Vic) and the ECC; and
- prepare a written report for ECC.

Invited groups

All groups from the Victorian coast were invited to submit comments through the consultation process, and efforts were made to ensure that everybody was represented during the consultation process. The people who were invited to attend were:

- traditional coastal owners;
- native title claimant groups;
- relevant cultural heritage officers; and
- relevant community organisations.

Communities involved in Consultation

Aside from specific claimants, representatives from the following Victorian Aboriginal coastal communities (VACC's) were invited to provide comments on the draft report.

- | | |
|---|---|
| • Boonerwung Land Council | • Moogji Aboriginal Council East Gippsland Inc. |
| • Central Gippsland Aboriginal Health and Housing Cooperative Ltd | • Ramahyuck District Aboriginal Corporation |
| • Framlingham Aboriginal Trust | • West Gippsland Aboriginal Community Cooperative |
| • Far East Gippsland Aboriginal Cooperative | • Winda-Mara Aboriginal Corporation |
| • Gunditjmara Aboriginal Cooperative | • Wathaurong Aboriginal Cooperative Ltd |
| • Lake Tyers Aboriginal Trust | • Wathaurong Traditional Owners |
| • Kerrup Jmara Elders Corporation | • Wurundjeri Tribe Land Compensation and Cultural Heritage Council Incorporated |



Cultural heritage programs

The following cultural heritage programs were also consulted:

- South West & Wimmera Cultural Heritage Program;
- Kulin Nations Cultural Heritage Program; and
- Gippsland & East Gippsland Cultural Heritage Program.

Documentation

The following documentation was available to all involved in the consultation.

Marine Coastal and Estuarine Investigation (MCEI) Draft Report for Public Comment

Copies of this document were provided by the ECC.

Marine Coastal and Estuarine Investigation Brochure

This brochure was also provided by ECC. This displayed the recommended areas on a map and a brief summary of what the investigation involved.

Mirimbiak MCEI Summary paper

This summary paper contained the following information to provide a clearer outline of the investigation:

- Who is the Environment Conservation Council (ECC)?
- What is Mirimbiak's role in the investigation?
- The investigation process so far
- Who is affected by the ECC investigation and who should be involved in the consultation process?
- What is your group's role in the investigation?
- What happens after the consultation?

All attendees received a copy of this paper at the workshops.

1994 LCC consultation with Victoria's coastal Aboriginal communities paper

This paper was written in 1994 by Collon Mullet for the Land Conservation Council (LCC), after consultation with Victoria's Aboriginal coastal communities, in response to a previous draft report. This paper was reviewed by the relevant groups to determine its relevance to today.

1995 LCC consultation with Victoria's coastal Aboriginal communities paper

This paper was written in 1995 by Collon Mullet for the LCC, after further consultation with communities following the release of LCC marine and coastal draft recommendations. This paper was also reviewed by the relevant groups to determine its relevance to today.

Also available to Mirimbiak were copies of written submissions made to the LCC and the ECC by various Aboriginal communities and peak groups throughout the nine year investigation.



Workshops

Workshops were held with various Victorian Aboriginal groups from 19th April 2000 to 19th May 2000. The same agenda was followed for all workshops.

Agenda Item	Objective
Investigation Overview	To increase knowledge of the investigation and what has been involved
Review of LCC consultation paper 1994	To review and verify the current relevance of the issues raised in the LCC consultation paper.
Review of LCC consultation paper 1995	To review and verify the current relevance of the issues raised in the second LCC consultation paper.
Review MCEI Draft Report	To review the recommendations (site specific) in the ECC Draft Report.
Protocol for implementation of recommendations	To identify protocols in which Aboriginal interests are incorporated in the implementation of State government approved recommendations.

Workshop timeline

The following workshops were held throughout Victoria. Due to time constraints, Aboriginal people could not be consulted on an individual basis. This made it difficult to address all individual issues and recommendations.

MTG001	MCEI CONSULTATION – GUNDITJMARA	19/04/00
MTG002	MCEI CONSULTATION – WATHAURONG CO-OP	04/05/00
MTG003	MCEI CONSULTATION – GUNAI-KURNAI	05/05/00
MTG004	MCEI CONSULTATION – WATHAURONG TRADITIONAL OWNERS	01/05/00
MTG005	MCEI CONSULTATION – WURUNDJERI	15/05/00
MTG006	MCEI CONSULTATION – KERRUP-JMARA	03/05/00
MTG007	MCEI CONSULTATION – BOONERWRUNG	05/5/00
MTG008	MCEI CONSULTATION – KULIN NATIONS CULTURAL HERITAGE	12/05/00
MTG009	MCEI ECC & MIRIMBIAK MEETING	09/05/00
MTG010	MCEI VACC GROUP WORKSHOP	19/05/00

VACC's group workshop

At the request of some coastal Aboriginal communities, a workshop was held for the VACC's to come together and discuss a submission to the ECC. Two representatives from all of the VACC's were invited to attend. All groups were represented by the attendees. This allowed the VACC's to emphasise the importance of consultation to the ECC. Representatives of the ECC were also in attendance to answer any questions raised by the attendees.



VACC's statement

The groups represented at the VACC's workshop on the 19th May agreed to make the following statement and asked that it be included in the report to the ECC.

"Detailed recommendations could not be provided as there was too little time and a lack of resources for further investigation into the recommendations for the Draft Report. Victorian Aboriginal communities are dissatisfied about being consulted at the end of processes which have already been signed off by the Government and non-government organisations. It is a breach of legislation to do this and organisations should be made aware of this situation. When legislation is breached the Government must ensure that penalties are enforced.

If the Government continues to deny the Aboriginal people of their culture and interests there will be a continuance of illegal and unacceptable activities which will have a detrimental and destructive effect on:

- *Aboriginal culture;*
- *the environment; and*
- *the reconciliation process.*

The Government and relevant organisations must not allow this destruction to continue. All parties who share an interest in the land and water should share the same view."

Legislative framework

It was decided that the legislative framework should be stated at the beginning to emphasise the importance of the legislation that is currently in place, specifically in relation to consultation and implementation processes. The following are examples of current State and Commonwealth legislation:

- *Native Title Act 1993 (Cth);*
- *Aboriginal Torres Strait Islander Heritage Protection Act 1975 (Cth); and*
- *Archaeological & Aboriginal Relics Preservation Act 1972 (Vic).*

* Common law may also be useful in identifying the rights and obligations of Aboriginal coastal communities and traditional owners.

Aboriginal And Torres Strait Islander Heritage Protection Act 1984 - Section 4

The purposes of this Act are the preservation and protection from injury or desecration of areas and objects in Australia and in Australian waters, being areas and objects that are of particular significance to Aboriginal people in accordance with Aboriginal tradition.



The Archaeological & Aboriginal Relics Preservation Act 1972

Archaeological areas are protected by State legislation (*The Archaeological & Aboriginal Relics Preservation Act 1972*). The Archaeological Relics Advisory Committee advises the Government about the preservation of relics and areas. Aboriginal sites are also protected under the Commonwealth Act – the *Aboriginal Torres Strait Islander Cultural Heritage Protection Act 1975*.

If a person wilfully defaces or damages or otherwise interferes with a Aboriginal object or place, penalties have been put in place, the following maximum penalties may apply:

Under Commonwealth Legislation

1. - Individuals; there is a fine of \$10,000 and or imprisonment for 5 years.
2. - Corporate Bodies; a fine of \$50,000 and or imprisonment for 5 years,

Under Victorian Legislation

3. a fine not exceeding \$1000 and or not more than three months imprisonment. A person can be imprisoned for a number of different offences relating to Aboriginal archaeological relics and areas.

Native Title Act - Future Act Regime

Government and non-government organisations must be aware that under the Native Title Act's Future Act regime there are obligations to notify, receive and consider comments and in some cases, negotiate with Aboriginal people in relation to acts which may affect native title. While the obligations under the Native Title Act may vary according to the type of activity proposed, whether the area to be affected is land or sea and the tenure of the area to be affected, the basic proposition is that Aboriginal people must be consulted about activities proposed to be undertaken on their traditional lands and/or waters.

The VACC's consider that 'best practice' consultation would necessarily involve comprehensive notification and negotiation towards an agreement between the relevant community and the proponent such that the activity may proceed.

In the event that the obligations under the Native Title Act are not observed, activities are 'invalid' to the extent that they effect native title. This means that the proponent does not have the certainty that they can proceed with their proposals if they do not observe this legislation.

Below is the list of the relevant Future Act provisions in relation to marine, coastal and estuarine land and waters, which will need to be observed in order that activities are valid under the Native Title Act.

The provision of primary importance is:

Section 24HA (management of water and airspace)

This section applies to a future act consisting of the making, amendment or repeal of legislation in relation to the management or regulation of:

- (a) surface and subterranean water; or
- (b) living aquatic resources; or
- (c) airspace.



In this subsection, "water" means water in all its forms and "management or regulation" of water includes granting access to water, or taking water.

Leases, licences etc.

(2) This section also applies to a future act consisting of the grant of a lease, licence, permit or authority under legislation that:

(a) is valid (including because of this Act); and

(b) relates to the management or regulation of:

(i) surface and subterranean water; or

(ii) living aquatic resources; or

(iii) airspace.

In this paragraph, "water" means water in all its forms and "management or regulation" of water includes granting access to water, or taking water;

Additional Provisions

The following provisions may also be relevant:

- Section 24FA (future acts where procedures indicate absence of native title);
- Section 24IA (acts involving renewals and extensions etc. of acts);
- Section 24JA (acts involving reservations, leases etc.);
- Section 24KA (acts involving facilities for services to the public);
- Section 24LA (low impact future acts);
- Section 24MD (acts that pass the freehold test--but see subsection (5); and
- Section 24NA (acts affecting offshore places).

Communication of legislation

It is imperative that Government notify organisations of legislation that must be adhered to. The Government must also communicate to organisations the relevant Acts and the penalties that can be enforced when breaching these Acts.

These Acts provide for regimes whereby Victorian Aboriginal people take part in the preservation of their cultural heritage by being members of committees that advise Ministers, as inspectors with wide-ranging powers, and as members of Aboriginal community organisations that are responsible for managing cultural heritage issues within their areas. Unless the ECC can propose a similar regime for the management of marine and coastal issues, then Aboriginal people will not have a say in caring for their country.



General recommendations

The following recommendations have been collated as a result of consultation with Aboriginal groups and communities. Detailed recommendations could not be provided due to the various limitations of the Aboriginal groups and communities, both in terms of time and resources.

Consultation

Continuing consultation on decisions regarding marine and coastal areas has been identified as a major priority. Consultation processes so far have been interpreted by the VACC's as 'tokenistic', mainly due to their experiences (past and present) of consultation between various Government agencies and Victorian Aboriginal people; for example, during the Regional Forest Agreement processes. Unfortunately, Aboriginal people and communities have been required to take part in these consultation processes:

- in their own time;
- with little/no resources;
- in extremely limited time frames; and
- with limited information.

Detailed recommendations are unable to be given under these circumstances. The Government and relevant organisations do not take Victorian Aboriginal communities recommendations and requests seriously. No formal responses have been provided to previous submissions to the LCC/ECC, or recommendations implemented. There was little indication in the ECC Draft Report that recommendations from the 1994/1995 Mullet reports had been considered.

Despite the *Aboriginal and Torres Strait Islander Cultural Heritage Protection Act 1975* and *Native Title Act 1993*, consultation has not been undertaken adequately by government agencies and other organisations. Without proper (and early) consultation Aboriginal culture and the environment are being destroyed throughout Victoria's land, marine, coastal and estuarine areas. Without direct consultation, fair and effective protocols and policies cannot be achieved.

Organisations constantly request input with extremely limited timeframes. These timeframes prevent Aboriginal groups and communities providing detailed recommendations. This period of consultation, on the Marine, Coastal and Estuarine Investigation Draft Report, has been conducted over a six week period and was meant to include Aboriginal communities along the entire Victorian coastline (SA border to NSW border). This time period was clearly insufficient to produce detailed recommendations signed off by all communities.

Development can have a devastating effect on Aboriginal cultural heritage sites. Recognition is not given to the need for Aboriginal input and involvement in the process of planning and implementation. Generally there are no specific provisions for Aboriginal consultation or involvement in these processes. All VACC's agree that any planning and development by any organisation (State,



Commonwealth, private and public) must involve consultation with the relevant VACC before decisions proceed.

In summary:

- Not enough time was available for this ECC consultation. Site visits and additional information needs to be available for accurate decisions to be made.
- Further consultation should be held directly between the Government and Victorian Aboriginal groups and communities on future decision-making, planning and implementation processes.
- Consultation protocols should be developed between Government, marine and coastal management bodies and Aboriginal groups and communities.
- Indigenous land, marine and coastal concerns should be integrated into relevant Commonwealth and State legislation. This is a fundamental objective of the *Aboriginal Torres Strait Islander Cultural Heritage Protection Act 1975* which should be adhered to along with the roles and responsibilities of the cultural heritage officers and inspectors.
- All organisations involved in land and water management must work together with Aboriginal communities to achieve these common goals. This cannot happen without effective communication and consultation. Dealing directly with Aboriginal communities can benefit everybody. The Government needs to communicate and promote this to agencies and other organisations. It is important that protocols on a local level be established. The recognition of existing management plans on cultural heritage sites in local areas has already been established and implemented in some areas.
- It is essential that the Government encourage co-operation and negotiation between communities and other organisations with VACC's. This should include development of principles, protocols and procedures for negotiation and liaison with indigenous people, and for handling key sensitive issues. The establishment of local agreements will be to the benefit of all Victorians.



Aboriginal culture

It is imperative that the social, spiritual, traditional rights, customs, practices and socio-economic opportunities (land and sea) of the Aboriginal people and their culture be recognised and acknowledged by the Government and non-government organisations.

Aboriginal culture is being desecrated and destroyed due to lack of recognition of the Aboriginal people and culture by Government and non-government organisations. Aboriginal culture is not given sufficient priority by the Government and non-government organisations. Physical and spiritual connections must not be taken away from Aboriginal people.

The Government must recognise, accept and acknowledge Aboriginal culture. The Government should promote Aboriginal culture and integrate it into future developments.

The Government and other agencies should provide information, advice and assistance on environmental concerns as they relate to management of traditional lands and waters, natural and cultural resources, and on native title.

Protection of the environment is a continued and interactive practice by Aboriginal people. The practice of land and water care is carried out by Aboriginal people because of their strong connection and sensitivity to the environment. Conservation practices by Aboriginal people contribute to the survival of Aboriginal culture and are a form of paying respect to the land and what it provides.

Protocols

The Government must create and enforce legislation that provides protocols for consultation and involvement between land and water organisations and Aboriginal communities. The following protocols apply to all areas under the ECC investigation and for future areas of development.

Consultation

Consultation with the relevant Aboriginal community should be part of the process for all planners, developers and management groups. Consultation protocols must be followed prior to any planning and development of any area.

Additional information

For Aboriginal communities to make informed decisions, all relevant information should be provided at commencement of the process. This information should also be available upon request and adequate resources provided. The types of information which need to be provided are:

- site reports (eg. salinity levels, vegetation, visitor numbers, erosion levels etc. of the proposed site);
- any relevant archaeological surveys;
- any relevant cultural heritage surveys;



- financial statements (stakeholders, economic gains);
- licence/lease numbers and types; and
- supporting infrastructure to be developed (where, when and purpose).

Reports on a regular basis on the status of areas (eg vegetation growth, number of visitors to the area, flora, fauna and marine life status) are also important.

The request for additional information should be defined at the commencement of the project/plan before any decisions/recommendations are made. Archaeological surveys must be performed prior to any planning and development.

Site visits

Site visits must be performed before a recommendation can be made, as decisions cannot be made purely in a boardroom. Site visits provide opportunities for the affected people to obtain a clearer understanding of the proposed plan/development and be able to make more informed decisions. Site visits must also be resourced by the developer and authorised by the traditional owners. This will then prevent adverse impacts on:

- Aboriginal cultural heritage; and
- the environment.

Resources

Government departments (State and local) must fund Aboriginal liaison officers so representatives are in attendance at all stages of planning, development, implementation and ongoing management of any areas. It is imperative that these representatives also be recognised by other relevant organisations and resources made available.

Acknowledgment

Acknowledgment of the traditional owners and the traditional names (signage) should be included in the ECC's Final Report and also throughout Victoria's land, marine and coastal areas (this educates non-Aboriginal people about the areas they are entering into and about the Aboriginal people of that area).

On-shore infrastructure & access

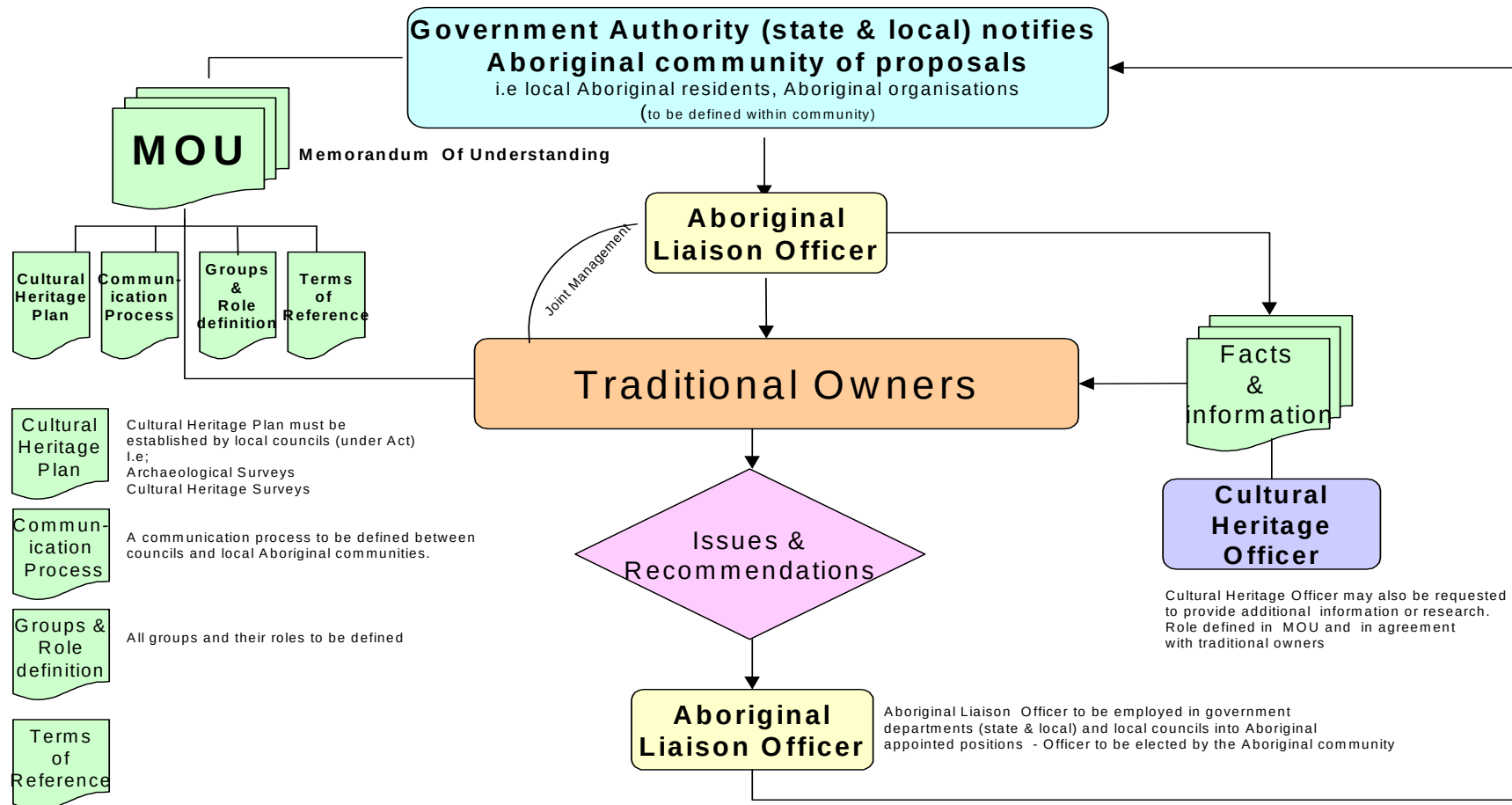
Where there is recommended off-shore areas the Government needs to provide information on any facility or infrastructure that will be developed adjacent or nearby to support these areas.

Where areas are difficult to access there needs be further investigation on the alternative methods of access; for example, Are people going off the walking tracks and over sand dunes to access these areas?



Consultation process

The VACC's proposed a future consultation process similar to the one below. This process is already working successfully with various local councils in Western Victoria.





Traditional rights

The Government needs to recognise Aboriginal culture and integrate it into their protocols by way of amending the relevant legislation if necessary. Changes need to occur to legislation to give protection to Aboriginal people and their culture that will allow them to go onto traditional land without fear of prosecution. Recognition of Victorian Aboriginal peoples' traditional rights to access the resources for family, economic and ceremonial practices without incurring prosecution or having to acquire a permit is critical. Other states, notably New South Wales, have already given recognition to this right.

At present, Aboriginal traditional practices may infringe upon existing legislation. Aboriginal people should not be required to have a permit/licence to conduct Aboriginal practices on traditional land. Many areas recommended in the ECC Draft Report are of cultural significance and cultural practices are carried out within the immediate locations. A major traditional practice for Aboriginal culture is to respect and nurture the environment. Aboriginal people are prevented from performing this tradition due to legislative restrictions and lack of consultation and involvement from the organisations involved.

Access to land and waters

Acquiring a licence to access land and waters should not be necessary given that Aboriginal people have been accessing these areas for thousands of years. Aboriginal people continue to perform traditional practices on traditional land.

Exploitation of knowledge sites and resources

Despite the Section 24 notices (under the Native Title Act) submitted by various groups (such as tourism groups, Government departments, professional and commercial fisherman) focussing their activity around coastal areas, exploitation still occurs along Victoria's coastline. Not all groups are adhering to the Section 24 process. Various forms of exploitation such as the building of walking tracks, boat ramps, roads, caravan parks, toilet blocks and other various facilities are continuing. Preference and priority is given to activities of this nature without consideration of Aboriginal peoples' views about such commercial or recreational exploitation and its impact on cultural heritage within these areas.

No interpretation by Government and non-government organisations has been provided on Aboriginal occupation or their activities along coastal zones.

Virtually no areas give precedence to Aboriginal community needs and requirements over other uses and users.



Tourism

Tourism is increasing in Victoria. There are far more developments being conducted for tourism purposes eg aquariums, marine parks etc. With the increase of tourism, there is higher risk of damage and destruction to Aboriginal culture.

There is significant exploitation of Aboriginal culture in tourism. Too many tourism companies are promoting and exploiting Aboriginal culture to increase their financial gains. The local Aboriginal community must be the authorising body in any instance where there is promotion of Aboriginal culture. Aboriginal people want to share their culture but also need to be able to control the promotion of it.

Any cultural interpretation (intellectual and physical) must be authorised by the local Aboriginal community.

Only Aboriginal people should be authorised to conduct traditional practices. Non-Aboriginal organisations should not be benefiting financially from something that is not theirs. Aboriginal people want to provide opportunities to negotiate with the relevant organisations.

Tourism organisations should employ Aboriginal tour guides to conduct cross cultural tours etc.

Where there is an increase in tourism (eg Bells Beach), there are detrimental effects on the environment and Aboriginal culture (sites, middens etc). Areas need to be assessed to avoid damage and destruction to Aboriginal culture and the environment. A percentage of the financial gains made from tourism could be spent on preventing the destruction of these areas.

Fisheries management

Aboriginal people are excluded from being involved or participating in fisheries management. Aboriginal people must have involvement and be given opportunities for employment within fisheries.

Aboriginal people have been involved in cultivating the resources, similar in many ways to present day mariculture, for thousands of years. Managing the coastal resources plays a major role in Aboriginal peoples' survival and their conduct of ceremonial practices.

Land and water management

Currently there are very few Aboriginal people involved or employed in land and water management. Opportunities for employment should be provided for Aboriginal people to work in identified positions by Government and non-government organisations. These positions should also be resourced by these organisations. For a consultation process to work effectively it is imperative that Aboriginal people are involved in the decision-making and actual management of land and water areas. It would



be futile having an Aboriginal representative if they have no impact on decisions to be made. There should also be:

- Government and non-government organisations consideration of ways in which land, marine and coastal bodies (such as the ECC and NRE) can assist in the progression towards indigenous ownership of traditional lands, waters and natural resources, eg through regional agreements;
- establishment of a land and water management structure that:
 - enables Aboriginal people to be directly involved as an equal partner
 - provides Aboriginal people with an equal share, and
 - allows direct representation in the management and use of these areas; and
- special places managed by Aboriginal people.

Water quality

Aboriginal people have major concerns over water quality in many areas. Consultation with and involvement of Aboriginal people in developing plans for better management of catchment areas is essential along with serious consideration being given to the monitoring of the use of chemical products (and other pollutants), eg the sewage pipe running into Gunnamatta Beach.

Ecologically sustainable development is a continued practice by Aboriginal people. The healthy state of the environment is due to the effective management of the land and water by Aboriginal people. Aboriginal peoples' knowledge of balanced resource management should be identified, acknowledged and utilised.

Environmental degradation such as the devastation of water tables, silting of bays, inlets, rivers, creeks and streams have all been affected. This then filters down through the food chain (eg to small fish) and degrades the environment of the catchment areas, to eventually create the problems we now have (eg blue-green algae).

The current practice of diversion of waterways through catchments by NRE and local shires requires the involvement, direction and endorsement of local Aboriginal communities. Changing the course of water has a detrimental effect on the environment.

Closing of rivers and lakes

Aboriginal people must be given as much right and recognition as non-Aboriginal people in making decisions regarding the resources and activities that occur within rivers and lakes throughout the State of Victoria. Examples of some strategies for rivers and lakes:

- the closing of rivers and lakes for periods of 6-12 months gives the natural resources time to rebuild their stocks and eliminates exploitation of these resources by commercial and non-commercial practices or activities;



- rivers and lakes need access to old flood plains for replenishment of their nutrients required for the natural resources that live in and around the waterways; and
- Aboriginal people have much relevant knowledge regarding the resources and activities that occur within rivers and lakes and this knowledge is currently not being utilised.

Land and water groups (voluntary)

There must be direct consultation by voluntary land and water groups with local Aboriginal communities. Although the Victorian Aboriginal people support these groups' roles in conservation and environment they still need to consult directly with the Aboriginal people. They should also be required to follow consultation protocols. These land and water groups could also assist in identifying and protecting Aboriginal cultural heritage sites/areas that they may infringe upon.

Marine protected areas

The implementation of marine protected areas and their objectives have the potential to obstruct Aboriginal people in the carrying out of their cultural practices. Aboriginal people should continue to be consulted in determining the location of parks. It should also be made clear where there are commercial benefits in the establishment of these areas.

Cultural heritage zones

Within the Aboriginal boundaries there are areas of cultural significance that are highly sensitive. These areas should be zoned off similar to marine protected areas. These should be called Cultural Heritage Zones. There should not only be protection of the environment but protection of Aboriginal culture. The Government should introduce legislation to establish this and enforce this to all relevant land and water organisations.

Economic sustainability

There should be sharing in the economic benefits in the various land and water areas, such as tourism and commercial fishing. Economic sustainability for Aboriginal people should be a priority for the Government. Sharing in the economic benefits could provide funding for programs run by Aboriginal communities such as:

- cultural heritage management;
- environmental management; and
- land and water management.



References

ECC (1999) *Marine, Coastal and Estuarine Draft Report*. Environment Conservation Council, Melbourne.

LCC (1994) *Consultation with Victoria's Coastal Aboriginal Communities paper*. Land Conservation Council, Melbourne

LCC (1995) *Consultation with Victoria's Coastal Aboriginal Communities Proposed Recommendations paper*. Land Conservation Council, Melbourne

Mirimbiak MCEI Summary paper, Mirimbiak Aboriginal Nations Corporation, Melbourne.

VACCs workshop minutes.

List of meetings

MEETING NO.	MEETING TITLE	DATE
MTG001	MCEI CONSULTATION – GUNDITJMARA	19-04-00
MTG002	MCEI CONSULTATION – WATHAURONG CO-OP	04-05-00
MTG003	MCEI CONSULTATION – GUNAI-KURNAI	05-05-00
MTG004	MCEI CONSULTATION – WATHAURONG TRADITIONAL OWNERS	01-05-00
MTG005	MCEI CONSULTATION – WURUNDJERI	15-05-00
MTG006	MCEI CONSULTATION – KERRUP-JMARA	03-05-00
MTG007	MCEI CONSULTATION – BOONERWRUNG	05-05-00
MTG008	MCEI CONSULTATION – KULIN NATIONS CULTURAL HERITAGE	12-05-00
MTG009	MCEI ECC & MIRIMBIAK MEETING	09-05-00
MTG010	MCEI VACC GROUP WORKSHOP	19-05-00

NB: Copies of minutes are available upon request from Mirimbiak Nations Aboriginal Corporation.

Acknowledgments

Thank you to all members of the Victorian Aboriginal coastal communities who put in a great amount of time and effort into this submission with limited resources. Your participation has been essential to this process.

Appendix 4

Potential Social and Economic Effects of Recommendations for Victoria's Marine, Coastal and Estuarine Areas

A Review of the Recommendations in the Environment Conservation Council's Marine, Coastal and Estuarine Investigation Final Report

Prepared for the
Environment Conservation Council

By
Essential Economics Pty Ltd

September 2009

Table of Contents

EXECUTIVE SUMMARY	i
INTRODUCTION.....	1
1. APPROACH	2
2. OVERVIEW OF ECC RECOMMENDATIONS.....	2
2.1 Introduction	2
2.2 Marine national parks	3
2.3 Marine sanctuaries	7
2.4 Special management areas	7
2.5 Aquaculture zones	8
3. POTENTIAL IMPACTS.....	8
3.1 Change in coastal towns	8
3.2 Impacts on activity levels	8
3.3 Impacts on geographic areas	9
3.4 Environmental benefits	10
3.5 Limitations in the analysis	10
4. COMMERCIAL FISHING	10
4.1 Introduction	10
4.2 Abalone and rock lobster – annual catch for Victoria	11
4.3 MAFRI estimates of catch and value from areas affected by ECC recommendations	11
4.4 Industry estimates for abalone and rock lobster catch	13
4.5 Potential impacts of commercial fishing on individual towns	13
4.6 Potential impacts associated with commercial fishing	14
4.7 Conclusions	15
5. RECREATIONAL FISHING	17
5.1 Economic contribution of recreational fishing	17
5.2 Likely impact of the ECC recommendations on recreational fishing	17
5.3 Specific locations	18
5.4 Summary	19
6. TOURISM ACTIVITY IN COASTAL TOWNS.....	20
6.1 Introduction	20
6.2 Tourism as an economic component for towns	20
6.3 Likely impact of ECC's recommendations	21
7. AQUACULTURE POTENTIAL.....	22
8. MANAGEMENT AND IMPLEMENTATION OF THE ECC RECOMMENDATIONS.....	22
9. SOCIO-DEMOGRAPHIC AND ECONOMIC TRENDS SINCE 1991 IN THE SELECTED TOWNSHIPS.....	23
9.1 Introduction	23
9.2 Change in Victorian coastal towns	23
9.3 Apollo Bay	24
9.4 Cann River	25
9.5 Foster, Port Franklin, Port Welshpool, Toora	25
9.6 Lakes Entrance	26
9.7 Mallacoota	26
9.8 Port Campbell	27
9.9 Portland	27
9.10 Rhyll	28
9.11 Seaspray	28
9.12 Torquay/Anglesea	29
9.13 Summary	29
10. CONCLUSIONS.....	31
REFERENCES.....	34
ATTACHMENT A.....	35

EXECUTIVE SUMMARY

Background

This report provides an assessment of potential social and economic impacts which may arise from implementation of recommendations arising from the ECC's *Marine, Coastal and Estuarine Investigation Final Report*. This report draws on existing data to assess the likely implications of the ECC's recommendations for marine national parks, marine sanctuaries and aquaculture zones, and identifies the potential net costs and benefits for the State and for the coastal communities located in proximity to the nominated areas.

Whilst this assessment was primarily based on a review of existing data, contact was also made with commercial fishing industry representatives, individual fish processing operators, and government agencies including Fisheries Victoria and Tourism Victoria.

In terms of commercial fishing a major limitation in measuring the potential effects of the ECC recommendations is that there is no complete or consistent data base for the fishing industry, from numbers of boats and processing plants in particular locations, to employment levels and seasonality factors. This is an area where information on an industry-wide basis is a necessity if potential impacts are to be effectively measured.

We note that in some cases there are differences between the Marine and Freshwater Resources Institute (MAFRI) catch data from recommended marine protected areas and industry estimates of catch. However the MAFRI catch data are derived from official fisheries catch and effort data supplied by fishers themselves as a legal requirement. In the absence of a consolidated industry database on the value of commercial fishing, our position for this present study is to adopt MAFRI figures as per the ECC Final Report.

Potential impacts arising from ECC recommendations

It is important to note that the socio-economic impacts likely to flow from implementation of the ECC recommendations are generally not measurable in specific quantifiable terms. This report identifies that the socio-economic impacts arising from implementation of the ECC recommendations will be experienced in two ways:

- in terms of activity levels (for commercial and recreational fishing, aquaculture, tourism, and park and resources management); and
- in terms of geographic area, depending on the strength of impacts on activities.

In terms of activities, impacts arising from the ECC recommendations may be experienced in:

- commercial fishing and related processing activities
- recreational fishing activities
- tourism growth potential
- marine aquaculture operations
- park management and management of marine resources.

These potential impacts are summarised below.

1. *Commercial fishing and related processing activities*

Adverse impacts on commercial fishers are potentially significant in some cases. There may or may not be job losses in fishing, depending on whether or not the catch can be secured from other areas. In the unlikely event that none of the lost catch is sourced from other areas, the possible loss of employment for fishers could involve up to 39 jobs but in reality we do not believe this would be the case. This potential for some 39 lost jobs in fishing is equivalent to just 0.3% of all employment in the towns that are located near to the proposed marine parks and sanctuaries. It is expected that individual incomes will be reduced (unless other areas are fished), rather than whole jobs lost. The towns providing fishers to these areas would be expected to experience these reduced incomes.

2. *Marine aquaculture*

Drawing on experiences of aquaculture development in Tasmania, the likely employment generation for the State if the 12 areas nominated as aquaculture zones are operated by commercial interests could be as high as 1 200 jobs, but this is only a broad estimate and should only be used as an upper limit. This is an area for further research and analysis.

Of the regional coastal communities assessed, Portland is likely to be a primary beneficiary, with some level of commercial interest in the recommended site already evident.

3. *Recreational fishing*

The introduction of restrictions on recreational fishing in the selected coastal areas is unlikely to have any significant adverse effect on recreational fishing expenditures in the State. For local towns, there may be some isolated impacts where visits may decline and therefore associated spending levels would be reduced. However, these would be limited as accessible alternative fishing areas are available in proximity to areas designated for protection.

4. *Tourism*

The primary benefit likely to flow from the ECC recommendations in a tourism context is the opportunity for increased tourism marketing for the new marine national parks and sanctuaries. Generally, there would be no negative impacts arising from the ECC's recommendations as they may affect the tourism market. Tourism numbers would be unlikely to increase in any significant way in the short term as a direct result of the designation of marine national parks or sanctuaries. As a result, additional costs in the provision of new or expanded infrastructure to meet visitor needs would not be anticipated.

Increased marketing activity and product development generated through the creation of the national parks and sanctuaries may, in the long term, create additional jobs and income for the surrounding communities. Thus over time the marketing of the sites as part of the destination image of the towns and regions within proximity to the parks and sanctuaries, may lead to increased overall visitor demand.

5. *Implementation and management*

Employment generation is likely to occur with jobs created in the management of the marine protected areas, and in other aspects associated with the implementation of the ECC recommendations (such as in park patrols, enforcement, etc). However, numbers of such jobs are not yet available.

6. *Impact on towns*

Adverse impacts on towns would be experienced if processing plants and/or fishing co-operatives have to close due to reduced levels of product. Although it is unlikely that such closures would occur, this study suggests that of all the coastal towns Mallacoota, Portland and Apollo Bay would be most vulnerable to any such impacts. These impacts could be reflected in a reduction in existing employment levels, with multiplier effects feeding through the community. However the outcome is more likely to be a reduction in individual incomes of fishers, rather than a loss in jobs.

Moreover, any adverse effects on commercial fishing are unlikely to have a lasting adverse effect on the coastal towns, because most towns do not have a strong reliance on commercial fishing or recreational fishing and are generally reliant on a wider servicing role for local and surrounding resident populations and for tourists.

Overall, while the potential loss of commercial fishing activities in a town is important for the individual fishers, the net effect on a town's economy is not expected to be significant, with probably the only exception being Mallacoota where the fishing industry (in both harvesting and processing) is the main economic activity after tourism. Mallacoota is also a town that is distant from large centres or other generators of visitor trips (unlike, say, Torquay, Anglesea, Apollo Bay), and is therefore relatively more dependent on the fishing industry than other towns.

In our view, any net tourism benefits arising from the ECC recommendations are, in the short term, likely to be negligible in terms of generating new jobs and incomes. It is also likely that any loss in jobs associated with fishing and processing would be more than countered by potential growth in jobs in aquaculture, as well as in the management and implementation of the ECC recommendations.

7. *Social impacts*

The principal negative social impact is expected to be the potential loss of fishing jobs. Another important social impact is that which falls on fishing communities – these communities have generally survived many generations in difficult but challenging conditions. The potential loss of work is therefore a new and threatening change for those involved and for their close-knit communities.

The structural change that is evident in many of Victoria's regional communities is driven by the on-going shift from resource to service economies. For some coastal communities (usually those that are more distant from major population centres) the net result has been population decline which, in turn, has led to a reduction in demand for services such as banks, schools and the like. Flowing from such structural shifts are community perceptions of loss and isolation. Additional change through policy implementation could further entrench the negative community sentiment which may be evident in some towns.

8. *Environmental benefits*

The ECC recommendations recognise what is described as the “existence value” of Victoria's coastal and marine environment, and the recommendations provide the necessary framework within which to ensure conservation and preservation of the State's unique asset.

Environmental benefits flow from the preservation of the State's coastal and marine biodiversity. Increased scientific understanding, access to education opportunities and preservation of the State's unique assets for future generations, are some of the benefits generated through the protection of Victoria's marine environment. These benefits also have an economic aspect, although the economic value of such benefits is (very largely) unmeasured in Victoria at this time.

INTRODUCTION

This report has been prepared for the Environment Conservation Council (ECC) by Essential Economics Pty Ltd. The report provides an assessment of the potential social and economic impacts which may arise from implementation of the ECC's *Marine Coastal and Estuarine Investigation Final Report* (2000).

This report draws on previous studies commissioned by the ECC and the former Land Conservation Council (LCC), and provides updated socio-economic profiles for a number of coastal communities identified as potentially affected by the ECC's recommendations.

The coastal communities are:

- Apollo Bay
- Cann River
- Foster, Port Franklin, Port Welshpool, Toora
- Lakes Entrance
- Mallacoota
- Port Campbell
- Portland
- Rhyll
- Seaspray
- Torquay / Anglesea

Our report is structured as follows:

- Method adopted for the review of the ECC recommendations
- Summary of the ECC recommendations
- Summary of likely socio-economic impacts arising from the ECC recommendations
- Potential impacts on commercial fishing
- Potential impacts on recreational fishing
- Potential impacts on tourism
- Aquaculture
- Management and implementation
- Potential impacts on coastal towns
- Conclusions

A summary of the telephone interviews conducted with commercial fishing operators and industry representatives are appended as Attachment A. Detailed socio-economic profiles are provided in a separate report (available in the ECC library) for the nominated towns.

1. APPROACH

Our assessment of potential economic and social impacts on coastal communities is based on the following approach:

- a review of the ECC Recommendations in the Marine Coastal and Estuarine Investigation Final Report (2000);
- a review of demographic and economic trends in the selected townships since 1991; and
- an analysis of likely socio-economic impacts of the ECC recommendations in regard to coastal communities.

The report draws on a number of sources to compile a demographic/socio-economic profile and an industry profile of the selected towns. This includes data from the Australian Bureau of Statistics (ABS) Population Census 1996, the ABS Business Register, Tourism Victoria, Fisheries Victoria, and other sources. Interviews have also been conducted with a number of fishing industry spokespeople in Mallacoota, Portland and Apollo Bay, and with peak bodies.

The socio-economic profile of the selected towns provides an understanding of:

- population shifts occurring in the towns,
- age structure,
- labour force participation, and
- key industries.

Our report provides an overview of the changes identified in the nominated townships, all of which are located in proximity to the areas proposed as marine protected areas. The report discusses the implications for commercial fishing, recreational fishing and tourism activity, and provides an assessment of the extent to which these impacts are likely to flow to the coastal towns and communities.

The extent and quality of available data limit the overall assessment, particularly as the brief for this study places emphasis on a review of existing material.

2. OVERVIEW OF ECC RECOMMENDATIONS

2.1 Introduction

The ECC report recommends marine areas to be reserved for the special protection of environmental values. The ECC proposes the following:

- 13 marine national parks
- 11 marine sanctuaries
- 18 special management areas

The marine national parks and the smaller marine sanctuaries will form the basis of the highly protected system. These areas, as recommended, represent approximately 63 136 ha or 6.2% of the total Victorian marine area of 1 017 400 ha.

Special management areas apply to areas where a lower level of protection is sufficient to protect special features. Five existing multiple-use parks will retain their current management arrangements.

The ECC also identifies 12 areas to be set aside for aquaculture. These areas are recommended where the negative effects on the environment are negligible or are within acceptable limits, and where the potential for conflict with other uses is minimal.

A summary of the ECC's proposed system of marine protected areas is detailed in Table 2.1 below.

Table 2.1 Overview of recommended marine protected areas

Proposed areas	Size of area (ha)	Number of areas	Summary of restricted activities
Marine national park	62 245	13	• No recreational fishing or harvesting • No commercial fishing or marine aquaculture • No minerals or petroleum extraction or exploration
Marine sanctuary	891	11	• No recreational fishing or harvesting • No commercial fishing or marine aquaculture • No minerals or petroleum extraction or exploration
Special management area	6 940	18	• No marine aquaculture • No minerals or petroleum extraction or exploration • Specific management prescriptions may apply to some fishing activities
Total marine protected area	70 076	42	

Source: Environment Conservation Council 2000.

2.2 Marine national parks

Areas recommended as marine national parks are provided high protection on the basis of their contribution to a system representing the range of marine environments in Victoria. No fishing, extractive or damaging activities are allowed in these areas. However, there is no restriction on access, and activities such as recreation, tourism, education and research are encouraged under appropriate conditions.

Given the restriction on fishing activity, the ECC identifies the potential impacts for users, particularly commercial and recreational fishers.

Table 2.2 below provides an overview of the areas recommended for marine national park status, and the user implications identified by the ECC in its Final Report.

Table 2.2 Marine national park recommendations

Recommendation No.	Name	Area (ha)	Nearest locality	ECC identified implications for users	
				<i>Recreation and tourism</i>	<i>Commercial fishing (rounded)</i>
A1	Discovery Bay Marine National Park	4 600	Portland	Relatively minor impact: level of use is low. Other accessible areas.	Estimated impact @ \$943 600
A2	Twelve Apostles Marine National Park	11 700	Port Campbell	Popular for passive recreation. Few locations popular for recreational fishing. Alternative fishing locations available.	Estimated value @ \$1 215 100
A3	Point Addis Marine National Park	4 750	Torquay / Anglesea	Much of park not readily accessible for recreational fishing, and alternative areas exist within reasonable distance.	Estimated value @ \$162 400
A4	Port Phillip Heads Marine National Park	3 340	Queenscliff/Portsea	Popular for passive recreational activities. Impact on recreational fishing identified as acceptable given proximity to alternative areas.	Estimated value @ \$1 151 000
A5	Yaringa Marine National Park	930	Tooradin	Little fishing identified in the park.	Limited amount of commercial fishing in the proposed park
A6	French Island Marine National Park	2 700	Tooradin	Popular for boat-based recreational fishing. Impact will be limited as alternatives available.	Estimated value @ \$85 000
A7	Churchill Island Marine National Park	675	Rhyll	Popular for boat-based recreational fishing; Rhyll is not included in the park, therefore reduced impacts on users.	Estimated value @ \$11 000
A8	Bunurong Marine National Park	2 150	Inverloch	Popular for passive recreational activities. Extension of existing park, all fishing is currently prohibited to 1km offshore.	Estimated value @ \$34 100
A9	Wilsons Promontory Marine National Park	16 600	n/a	Limited impact due to current restrictions on recreational fishing, the remoteness of the area and availability of other areas.	Estimated value @\$960 900
A10	Corner Inlet Marine National Park	4 150	Foster/Port Franklin/Toora/Port Welshpool	Popular for boat-based recreational fishing. Alternatives available.	Estimated value @ \$100 000
A11	Ninety Mile Beach Marine National Park	2 750	Seaspray	Ready access to much of coast should minimise impact on recreational fishing	Limited amount of commercial fishing in the proposed park
A12	Point Hicks Marine National Park	4 050	Cann River	Potential increase in visitation. Most popular fishing area (east side of Point) not included in proposed Park.	Estimated value @ \$637 000
A13	Cape Howe Marine National Park	3 850	Mallacoota	Effects on recreational fishing minimised by exclusion of sheltered waters around Gabo Island.	Estimated value @ \$766 200

Source: Environment Conservation Council 2000.

2.3 Marine sanctuaries

Marine sanctuaries are small, highly protected areas designated for protection on the basis of special features including habitat, special scientific significance, and the provision of recreational and education opportunities.

Areas recommended for sanctuary protection are designed to complement the recommended marine national parks, and contribute to the provision of a comprehensive, adequate and representative system of marine protected areas. The purpose of the zones is to conserve and protect the biodiversity and natural processes of the sanctuary. In these areas no fishing, extractive or damaging activity is allowed. Opportunities are identified for passive recreation, including underwater interpretative trails.

In the ECC investigation, implications for users are in the main, not addressed to the level of detail as provided for in the marine national park recommendations and this is due to the relatively small area designated for marine sanctuaries, as indicated in Table 2.3 below.

Table 2.3 Marine sanctuary recommendations

Recommendation No.	Name	Area (ha)	Nearest town/suburb
B1	Merri Marine Sanctuary	25	Warrnambool
B2	The Arches Marine Sanctuary	45	Port Campbell
B3	Marengo Reefs Marine Sanctuary	18	Apollo Bay
B4	Eagle Rock Marine Sanctuary	25	Aireys Inlet
B5	Point Danger Marine Sanctuary	20	Torquay
B6	Barwon Bluff Marine Sanctuary	18	Barwon Heads
B7	Point Cook Marine Sanctuary	290	Werribee
B8	Jawbone Marine Sanctuary	30	Williamstown
B9	Ricketts Point Marine Sanctuary	120	Beaumaris
B10	Mushroom Reef Marine Sanctuary	80	Flinders
B11	Beware Reef Marine Sanctuary	220	Orbost/Marlo

Source: Environment Conservation Council 2000.

2.4 Special management areas

Special management areas are small areas that are designated – either formally through legislation or through management arrangements – for protection of their special natural values. In these areas fishing and other uses are generally allowed. Unless otherwise stated, commercial and recreational fishing are not restricted, while encouragement is given to activities such as passive recreation, education and scientific study, which minimally affect the area and the particular values requiring protection.

Given the allowance of commercial and recreational fishing in these zones, the economic impact of these recommended areas is likely to be minimal.

2.5 Aquaculture zones

The development of a strong and healthy aquaculture industry in Victoria is supported by the ECC. Suitable areas are identified for farming of marine species, with the final recommendations focusing on achieving a balance between providing access to aquaculture and minimising the impact on environmental values.

Aquaculture zones are recommended on the basis of demonstrated successful performance or growth of target species in the past or through advice from Fisheries Victoria. Zones are chosen where conflict with other users will generally be minimal.

Potentially, the development of marine farming offers economic and social benefits in the form of new industry activity, with opportunity for employment generation.

3. POTENTIAL IMPACTS

3.1 Change in coastal towns

It is important to be aware of underlying changes which influence the profile of coastal townships, as this provides the background upon which to assess implications potentially arising from the ECC recommendations for marine, coastal and estuarine areas.

Many of Victoria's coastal towns are small both in area and in population, with key economic activities closely linked to the marine-based assets as well as the servicing of local residents and visitors to the area.

The coastline provides many opportunities for commercial fishing, recreational fishing, diving and numerous other recreational pursuits and general tourist activity. While these features are important to the underlying structure of the coastal townships, the global shift from primary industry to service economies has influenced the profile of many of these towns.

As a result, there may be structural change in particular sectors of a small town's economy (such as a reduction or a shift in farming activity in the surrounding area). However losses resulting from such structural change are often remedied by the growth in 'new' areas such as tourism and retirement living.

In regional Victoria, the on-going shift from resource based to service economies is evident. But for some coastal communities (usually those that are more distant from major population centres) the net result has been population decline which, in turn, has led to a reduction in demand for services such as banks, schools and the like.

For coastal towns and Victoria, the socio-economic impacts arising from implementation of the ECC recommendations will be experienced in two ways:

- (i) in terms of activity levels (commercial and recreational fishing, aquaculture and tourism); and
- (ii) in terms of geographic area, depending on the strength of impacts on activities listed above.

The nature of these impacts is described below, with details provided in subsequent sections.

3.2 Impacts on activity levels

Impacts arising from the ECC recommendations may potentially be experienced in:

- **commercial fishing and related processing activities**, with potential reductions in the volume and value of the catch, and potentially in employment levels if fishers and processors have to reduce their level of activities – alternatively, catch volume may be maintained by sourcing the catch from other areas not affected by the recommendations;

- **recreational fishing activities**, with potential loss of visitors at popular fishing spots that are now to be protected, and loss of their spending that would otherwise be directed to nearby towns (for accommodation, supplies, etc);
- **tourism growth potential**, where marine national parks and sanctuaries can be marketed as tourist attractions and destinations;
- **marine aquaculture**, where new or increased operations may generate economic activity;
- **management**, with potential new jobs associated with park management and infrastructure.

There are both direct and indirect impacts.

Direct impacts are the initial impacts that are (in this case) experienced by the fishers and processors who may have a reduced level of output due to implementation of the marine protection areas where fishing is not permitted. This reduced level of output (or catch) may mean a loss in employment and income for some or many of the fishers involved, and for the processors who depend on the catch to keep their processing plants in operation. Alternatively, direct impacts may be felt through employment created by marine aquaculture development and the resourcing of park management.

Indirect impacts are generated as the first round of effects (as measured by reduced fisher and processor income or employment levels) work their way through the local and wider economy. Multipliers are identified for industries by using Input-Output measures, and this is done in reference to Input-Output tables (usually at the national level), such as those prepared by the ABS (Australian National Accounts Input-Output Tables Catalogue No. 5209.0 1993–94). For the fishing industry, we allow for a multiplier of 3 (based on ABS Output Multipliers for 1993–94 and noting that detailed studies suggest some variation around this figure). A multiplier of 3 indicates that for every 1 job lost/gained in the fishing industry (ie, a direct job) there is a further loss/gain of 2 jobs (and these are the indirect jobs). In terms of positive indirect impacts, in the case of the aquaculture industry where potential employment could be generated, the multiplier is estimated at 3.5 (Fisheries Victoria – personal communication) and thus for every direct job created 2.5 indirect jobs are generated. As a matter of interest, the employment multiplier for the fishing industry (around 3) is significantly higher than for retailing (around 1.5) and most other labour-intensive service industries and including those which feature in the tourism sector.

In summary, the reason we need to be aware of these multiplier effects is that the potential loss or gain of jobs leads to a further loss or gain of jobs in other sectors (eg, in packaging, transport, export administration, etc) as the economic effects work their way through the economy. The overall outcome in economic terms (a loss/gain in jobs and incomes) can therefore be more significant for a town than the initial loss/gain of a number of jobs.

Subsequent sections of this report describe the likely impacts of the ECC recommendations on commercial fishing, recreational fishing and tourism.

3.3 Impacts on geographic areas

The geographic impact of the ECC recommendations will be influenced by the extent of impact on particular activities (as noted above). The impacts are most likely to be felt in localities where there is a high level of reliance on the fishing industry in terms of both harvesting and processing.

Clearly, any social and economic impacts are most likely to be experienced in the coastal towns where there is reliance on the fishing industry, including fishers and/or processing operations.

Importantly, the extent of these impacts on a particular town will be affected by the degree to which the town also has other employment and income generating activities. For example, over the years many coastal towns have developed new roles in tourism, or as popular places for people to retire to, or as places from which residents can commute to work in larger, nearby centres. For some towns, tourism activity is linked to recreational fishing; however, for the majority of towns examined in this analysis tourism growth is associated with passive recreational pursuits such as sightseeing, walking and water-based pursuits apart from fishing. In these circumstances, any reduction in activities associated with the fishing industry may not be as negative for the town as would otherwise be the case. These factors are taken into account in this assessment of potential social and economic impacts arising from the ECC recommendations.

3.4 Environmental benefits

The ECC recommendations recognise what is termed the “existence value” of the Victoria’s coastal and marine environment, and the recommendations provide the necessary framework within which to ensure conservation and preservation of the State’s unique asset.

Globally, the supply of wild fisheries is levelling or declining, and careful management of the resource is required if future generations are to enjoy the benefits of a healthy and diverse marine environment. Sustainable resource management is a goal for most modern economies and the ECC recommendations, enabling the preservation of a share of the State’s coastal and marine environment, are an important component in the management of Victoria’s sensitive marine environment.

Environmental benefits flow from the preservation of the State’s coastal and marine biodiversity. Increased scientific understanding, public appreciation, education opportunities and preservation for future generation’s enjoyment, are some of the benefits generated through the protection of Victoria’s marine environment. In addition protection of some fish stocks in parks provides a form of insurance against unforeseen events in fished areas.

3.5 Limitations in the analysis

It is important to note that the socio-economic impacts likely to flow from implementation of the ECC recommendations are generally not measurable in specific quantifiable terms. This is due principally to the lack of data on the numbers of jobs likely to be affected in fishing and processing. We note that the fishing and seafood industries do not have figures on aggregate employment in these harvesting and processing/packaging industries.

Notwithstanding these data limitations, this report provides guidance on the socio-economic impacts, which potentially may arise as a result of implementation of the ECC recommendations.

4. COMMERCIAL FISHING

4.1 Introduction

This section provides an assessment of the commercial fishing catch for each of the areas where the ECC has recommended a ‘marine protected area’ (ie marine national park or marine sanctuary), and provides estimates of the economic and social effects that may result on the nearby towns where there is a ‘no-take’ recommendation for the areas involved.

Information is provided on:

- the present Victorian annual catch for abalone, rock lobster and (where available) for other fish;
- estimates of catch and impact from areas affected by ECC recommendations, based on the Marine and Freshwater Resources Institute (MAFRI) and Fisheries Victoria catch and effort data (as detailed in Appendix 5 of the ECC Final Report); and
- indication of potential impacts on individual towns.

Based on examination of the MAFRI data and discussions with fishers and processors, the specific towns identified for impact assessment are Portland, Apollo Bay and Mallacoota. Comments are also provided on the likely impact situation in the other towns covered in this study.

4.2 Abalone and rock lobster – annual catch for Victoria

The principal effects of the ECC recommendations are expected to be experienced by those involved in fishing for abalone and for rock lobster. These two sectors of the commercial fishing industry accounted for a total of some \$64.3 million in 1997/8, as indicated in Table 4.1.

Table 4.1 Abalone and rock lobster catch, quantity and value

	Abalone	Rock lobster
Quantity 1997/98	1 440 tonnes	501 tonnes
Value 1997/98	\$48.8 million	\$15.7 million
Average \$/kg	\$33.93/kg (1999)	\$31.33/kg (1998/99)
*Average catch in kg 1990/1 to 1997/8	*1 400 tonnes pa	*478 tonnes pa

Source: MAFRI 1997/98

Note: *Essential Economics – derived from Department of Natural Resources and Environment and MAFRI, *Catch and Effort 1998 Information Bulletin*

As the table shows, for the past decade the abalone catch has been averaging 1 400 tonnes per annum and this approximates the annual quota of 1 440 tonnes.

The annual abalone quota, according to zone, is:

- Western Zone (SA border to Warnambool): 280 tonnes (19%)
- Central Zone (Warnambool to Lakes Entrance): 700 tonnes (49%)
- Eastern Zone (Lakes Entrance to NSW border): 460 tonnes (32%).

The rock lobster catch is estimated at around 501 tonnes for 1997/98 and is drawn from two zones:

- Western Zone (ie west of Cape Otway): 436 tonnes harvested (87%)
- Eastern Zone (ie east of Cape Otway): 65 tonnes harvested (13%).

4.3 MAFRI estimates of catch and value from areas affected by the ECC recommendations

The ECC Final Report (Appendix 5) provides estimates of the catch potentially affected by the recommendations based on MAFRI estimates and Fisheries Victoria catch and effort data.

The following figures show the values which are potentially affected. Note that any variations in percentage impacts are due to rounding values of different magnitudes (eg dollar value, tonnage, percentage).

Table 4.2 Estimate of the value of the catch affected by the ECC recommendations

	Estimate of value of catch affected by recommendations	Estimate of total value of Victorian catch	% of total value of catch affected by recommendations
Abalone	\$5.4 million	\$48.8 million	11
Rock lobster	\$1.0 million	\$15.7 million	6.4
Other fishing	\$0.6 million	na	na
TOTAL	\$7.0 million	na	na

Source: MAFRI 1997/98

Note: These figures exclude all marine sanctuaries other than Point Cook and Beware Reef Marine Sanctuaries (these are significantly smaller areas than marine national parks). Dollars expressed in average 1999 prices (abalone) and average 1998/99 prices (rock lobster).

Taking the abalone and rock lobster figures and comparing these with the known abalone quota and rock lobster catch on a zonal basis, we are able to estimate the proportionate impact of the recommendations on total quota/catch for each zone. This is shown in Table 4.3.

Table 4.3 Estimates of tonnage affected by the ECC recommendations as a proportion of the total abalone and rock lobster quota/catch

Zone	Estimate of catch affected by recommendations (tonnes)	Catch (tonnes) (quota in the case of abalone)	Affected catch as % of total quota/catch
Abalone			
Western	14.2	280.0	5.1
Central	104.0	700.0	14.8
Eastern	40.7	460.0	8.8
TOTAL	158.9	1 440.0	
Rock lobster			
Western	27.3	436	6.4
Eastern	6.1	65	9.4
TOTAL	33.4	501	

Source: MAFRI 1997/98

Note: These figures exclude all marine sanctuaries other than Beware Reef Marine Sanctuary (these are significantly smaller areas than marine national parks).

Based on the above figures, we note that the **abalone** harvest in the affected areas (across all zones) amounts to 11% of the Victorian catch. This ranges from 5.1% in the Western Zone, to 14.8% in Central Zone, and 8.8% in the Eastern Zone.

For **rock lobster**, the overall impact is estimated at 6.7% of the Victorian catch on the above figures, with the catch in the Western Zone being 6.4%, and in the Eastern Zone 9.4%.

Within each of the broad zones, we also note that the percentage impact on abalone and rock lobster fishing in specific marine protected areas will be less than the averages indicated above for the (wider) zones in which the protected areas are located. These individual average impacts, as identified in the ECC report, are indicated in the following Table 4.4.

Table 4.4 MAFRI estimates of the catch from individual marine national parks

	Location	Abalone catch	Rock lobster catch	Other fishing*
A1	Discovery Bay Marine National Park	\$480 822 5.1% of Western Zone catch	\$452 812 3.4% of Western Zone catch	\$10 000
A2	Twelve Apostles Marine National Park	\$773 400 3.3% of Central Zone catch	\$402 684 3.0% of Western Zone catch	\$39 000
A3	Point Addis Marine National Park	\$55 577 0.2% of Central Zone catch	\$54 828 2.6% of Eastern Zone catch	\$52 000
A4	Port Phillip Heads Marine National Park	\$1 119 690 4.7% of Central Zone catch	\$31 330	Negligible
A5	Yaringa Marine National Park	Nil	Nil	Negligible
A6	French Island Marine National Park	Nil	Nil	\$85 000
A7	Churchill Island Marine National Park	Nil	Nil	\$11 000
A8	Bunurong Marine National Park	Nil	\$28 072 1.3% of Eastern Zone catch	\$6 000
A9	Wilsons Promontory Marine National Park	\$791 214 3.3% of Central Zone catch	\$31 706 1.6% of Eastern Zone catch	\$138 000
A10	Corner Inlet Marine National Park	Nil	Nil	\$100 000
A11	Ninety Mile Beach Marine National Park	Nil	Negligible	Low
A12	Point Hicks Marine National Park	\$567 157 3.6% of Eastern Zone catch	\$27 884 1.3% of Eastern Zone catch	\$42 000
B11	Beware Reef Marine Sanctuary	\$145 899 0.9% of Eastern Zone catch	\$15 665 0.7% of Eastern Zone catch	Negligible
A13	Cape Howe Marine National Park	\$667 335 4.3% of Eastern Zone catch	\$1 911 0.1% of Eastern Zone catch	\$97 000

Source: Environment Conservation Council 2000 (Appendix 5). * Other fishing estimates are rounded.

4.4 Industry estimates for abalone and rock lobster catch

In discussions with representatives of the peak industry organisation, Seafood Industry Victoria, operators of fish processing plants and industry co-operatives, it is evident that there is variance between industry estimates of the catch potentially affected by the ECC recommendations for marine protected areas, and MAFRI estimates provided in the ECC Final Report.

There are a number of reasons for the disparities in MAFRI data and industry estimates. A large part of this can be explained by the use of different sources of information and the survey methods adopted, the difficulties in tracking fish catch (given the *cells* approach), and a lack of coordination or reconciliation in data from official sources and from individual fishing co-operatives.

Appendix 5 of the ECC Final Report provides a detailed discussion of the MAFRI catch and effort data and the potential sources of variance between industry and official data. Our position for this present study is to adopt the MAFRI figures as the basis for the assessment.

4.5 Potential impacts of commercial fishing on individual towns

It is difficult to precisely identify impacts of the ECC recommendations on specific coastal towns for a number of reasons.

- **Catch data.** There is variation between MAFRI data and industry sources in the estimates of catch from the recommended marine protected areas. If the MAFRI figures are under-estimates, as claimed by the industry, then potential adverse impacts on the fishing industry and the towns will be greater than otherwise estimated.

- **No industry data base.** A major limitation in measuring potential effects of the recommendations is that there is no complete or consistent data base for the fishing industry, from numbers of boats and processing plants in particular locations, to employment levels and seasonality factors, etc. This is an area where information on an industry-wide basis is a necessity if potential impacts are to be measured with any accuracy. Such a database would also benefit the fish harvesting/processing industry and local/State government in planning for and promoting the industry and encouraging local development.
- **Alternative sources of supply.** Where a fisher or processing plant is affected by a marine protected area, then the fisher may be able to fish in other areas and the processing plant may be able to source suppliers fishing in other areas or inter-state. In other words, in these circumstances there would be no net adverse effect on fishing or processing activities.
- **Adverse impacts may be overcome / ameliorated.** While there can be adverse effects on a town through, say, loss of fishers, a positive outcome may be that the individuals involved find employment in other sectors in the town and therefore there is no net effect on employment levels. However, this may be difficult for the individuals to achieve as transition to other employment is not necessarily easy, especially where unemployment levels are already high (around 11% in East Gippsland, or about twice the State average).

Having regard for these variables, the following comments are provided for towns where commercial fishing activities may be affected by the ECC recommendations.

4.6 Potential impacts associated with commercial fishing

This overview of commercial fishing activity and its relationship to coastal towns – as they may be affected by the ECC recommendations for marine protected areas – indicates three broad levels of possible impact.

Adverse impacts on commercial fishers could be significant in some cases in that:

- fishers will have to fish in other areas (with additional travel and operating costs to the fisher in accessing these alternative areas) and, in turn ...
- this will place greater pressure on these other areas and on the existing fishing operations in these other areas, while ...
- some existing fishing enterprises may have to close (at personal cost unless bought out by a funded scheme), while others ...
- will possibly become involved in illegal fishing activity by continuing to fish in areas now protected from fishing (and this option has been highlighted by industry observers as a very unfortunate but likely outcome for some).

In terms of the potential impact on jobs, there are two scenarios that are relevant, and these can be summarised as follows:

- on the one hand, there may be no net effect on the fishing industry if the 'loss' in catch from the protected areas is made up by catch sourced from other areas;
- on the other hand, there could be a net adverse effect on some fishers if this 'loss' is not made up from stock harvested from other areas, and they may have to contend with lower average catch (or a lower quota in the case of abalone), and this would also place a financial burden on some or many fishers working in the affected areas – some may have to leave the industry. There is no industry-wide indication of these numbers.

The final outcome, according to people contacted in this study, is that both scenarios will be relevant – other areas will be fished (with no loss of jobs), while some fishers could suffer financial loss as in the case of abalone fishers if they have reduced quotas.

In these circumstances, it is very difficult to forecast what is most likely to occur, and it is virtually impossible to measure potential job loss, especially where the “loss” may be financial and therefore absorbed by some fishers, while others may choose to leave the industry.

Of course, the compounding difficulty is that the fishing industry has no official estimates of numbers of persons employed in the industry, and this represents a huge gap in industry data (especially at a time when the industry is endeavouring to deal with restructuring, job loss, and other structural changes).

MAFRI figures provided in the ECC report (and noted above in Table 4.2) indicate the value of the catch in the recommended protected areas is \$5.4 million in abalone fishing (equivalent to about 11% of total abalone catch); \$1.0 million (or 6.8%) in rock lobster catch; and \$0.6 million in other fishing (percentage share not applicable, see Table 4.5). The figure for other fishing does however represent 5% of the value of fish (excluding abalone and rock lobster) landed in Victorian ports.

One way of obtaining at least an indication of potential job loss in the fishing industry is to translate these impacts on turnover into impacts on equivalent full-time employment, but there are serious reservations attached to this approach. Table 4.5 shows our estimates of employment, based on licence data provided by Fisheries Victoria and estimates from Seafood Industry Victoria on the average numbers of employed persons per licence.

Table 4.5 Estimates of employment in fishing, 2000

Type of licence	No. of licences	Estimate of employed persons (rounded)
Abalone	71	140 (allow 2 jobs per licence)
*Rock lobster	126	315 (allow 2.5 jobs per licence)
**Other fishing	**839	**1 680 (allow 2 jobs per licence)
Total	1 036	2 135

Source: Fisheries Victoria (number of renewed commercial fishing licence holders as at 12 July 2000 excluding inland licence holders); Seafood Industry Victoria (broad estimates on average jobs per licence holder).

* Excludes 28 inactive licences and 4 licences reporting less than 100kg as noted in Rock Lobster and Giant Crab Quota Panel Allocation – Report on Allocation of Individual Quotas for the Southern Rock Lobster and Giant Crab Fisheries in Victoria – October 1999.

** With other fishing there are considerable difficulties in estimating catches and jobs due to a number of factors:

- (i) there are many individuals with multiple licences
- (ii) landed catches are from a mix of State and Commonwealth managed fisheries
- (iii) many of the jobs are part time.

The table shows an estimated total of 2 135 jobs in coastal fishing at the present time, including 140 jobs in abalone diving, 315 in rock lobster fishing, and 1 680 jobs in other fishing.

By applying the percentage estimate of catch, as estimated by MAFRI, we are able to estimate in very broad terms the potential loss in equivalent full-time jobs in the fishing industry – however, we do not believe this is a likely outcome at all, for reasons noted below. The potential ‘lost’ jobs are shown in Table 4.6.

Table 4.6 Estimate of potential impact on jobs of the ECC recommendations

Type	Estimated total jobs	Estimated catch in protected areas	Estimated loss of jobs (full-time equivalent)
Abalone	140	\$5.4 m or -11%	15
Rock lobster	315	\$1.0 m or -6.8%	21
Other coastal fishing	1 480	\$0.6 m (% na)	3
Total	2 135	\$7.0 m	39

Source: See Table 4.5.

Note: Indicative impacts only. ‘Other fishing’ job loss is based on the ECC’s estimated 8.5% share of total catch.

While the figures in the above table suggest that up to 39 fishing jobs could be lost under this ‘worst case’ scenario, this is most unlikely to happen. The simple reason is that a reduction in area that is estimated to yield 11% impact on abalone catch and a 6.8% impact on rock lobster – when applied on an individual basis to licensed fishing operations – means that a fraction of an existing job would be lost, rather than a whole job. What this means in reality is that the income or hours worked is reduced for the particular job/position that is being ‘cut’ or reduced due to the loss in catch.

This exercise demonstrates that the most likely outcome of any ‘loss’ in catch would be a reduction in income due to reduced quota or catch. In some cases, the fisher will move to another area and make up any loss from a marine protected area in that way (although this could place pressure on the area now moved to, as others are likely to already be fishing there). However, it is most unlikely that a 6% to 9% loss in catch would ever feed through to a 6% to 9% loss in jobs. This is also the consultant’s experience in many employment and economic impact assessments at the enterprise level, across many sectors.

Even if all job losses in fishing actually amounted to the 39 jobs noted above, this figure represents only 0.3% of all employment in the 10 or so coastal towns covered in this study. There could be losses in processing and related activities, but it is also possible that these operations would source their input from other areas and maintain operations.

We also need to keep in context that the individuals and firms and towns involved in any potential loss of fishing and related employment can take remedial action to self-correct potentially negative outcomes for the community. While some of those involved in operating processing plants have indicated that they would source their needs from further afield, rather than close their operations, other employment opportunities are expected to continue to grow as many small towns develop new roles (as described in this report). In this way, some of the indirect impact is avoided.

Adverse impacts on towns will be experienced where processing plant and/or fishing co-operatives may have to close due to reduced levels of product. This study suggests the adverse impacts would be mainly felt in Mallacoota, Portland and Apollo Bay, with fishing co-operatives and fish processing plants located in each of the towns. The impact of the ECC recommendations on the viability of co-operatives and firms in Mallacoota, Portland and Apollo Bay is difficult to estimate. Impacts could be reflected in a reduction in existing employment levels, with multiplier effects feeding through the community as other suppliers and service providers react to lower levels of activity in the fishing and processing activities. Alternatively, reduced catch levels and therefore reduced revenues/incomes, could possibly be absorbed by the industry without actual loss of jobs (as described earlier in section 4.6).

Many towns have experienced this pattern over the years in response to structural change in local economies and local industries. However, note the comments following in paragraph (4) in respect to town-wide effects.

Generally, the adverse effect on commercial fishing is unlikely to have a lasting adverse effect on the coastal towns since in the main these towns do not have a strong reliance on commercial fishing (or recreational fishing – see section 5), and are generally reliant on a wider servicing role for local and surrounding resident populations and for tourists. While the potential loss of commercial fishing activities in a town is critically important for the individual fishers, the net effect on a town’s economy is not expected to be significant, with probably the only exception being Mallacoota where the fishing industry (in both harvesting and processing) is the main economic activity after tourism. The impacts on Mallacoota will be dependent on whether there is a reduction in abalone catch, as a result of the implementation of the ECC recommendations.

We also note that in the ‘worst case’ scenario, the potential loss of some 39 lost jobs (see above) in fishing is equivalent to just 0.3% of all employment in the towns that are located near to the proposed marine parks and sanctuaries. This ‘worst case’ scenario impact is not a significant economic or employment impact in the overall context of the coastal towns.

In summary, the net effects for the fishing industry as a whole or for the towns involved are not likely to be significant.

However, a further consideration is that although job loss in fishing and processing may be low or even zero, the reality is that for some small coastal towns the loss of even just a few jobs may impact severely on the local economy. Many small towns across the State and at the national level have already encountered other policy impacts, such as industry restructuring and the regionalisation of services to larger centres. While it is difficult to place firm numbers against possible job losses in the nominated towns, it will be important to monitor the impacts of the implementation of the ECC recommendations on coastal towns.

One area where there is little doubt about the severity of impact associated with job loss is where such impact falls on individual fishers, especially where new employment is difficult to find, and where it is difficult to even supplement possibly reduced incomes from fishing.

4.7 Conclusions

The following conclusions have been reached regarding potential employment impacts in commercial fishing sector.

- It is not clear whether there would be any loss of direct jobs in fishing, since those affected by 'no take' areas may simply fish in other areas, thus avoiding any employment loss. Similarly, a processing plant may well be able to source its catch from other locations if some of its product is currently from no-take zones.
- In any event, the 'worst case' scenario the potential loss of 39 jobs represents only 0.3% of all employment in the coastal towns covered in this study, and this is not a significant impact.

The other factor to keep in mind is that there may well be no loss in fishing and processing jobs if the loss in catch from areas to be designated as 'no take' areas is made up from other fishing areas. It is not possible to provide firm estimates of employment potential, and this task is made more difficult by the absence of any comprehensive industry data.

5. RECREATIONAL FISHING

5.1 Economic contribution of recreational fishing

The recreational fishing industry is estimated to contribute approximately \$1.27 billion annually to the Victorian economy, supporting 27 000 jobs and contributing some \$83 million to household income. This finding is from a report to Fisheries Victoria prepared by NIEIR (authored by Bill Unkles), entitled *Economic Impact of Recreational Fishing in Victoria*, July 1997.

These estimates were based on field surveys of fishers. The data collected was geographically categorised by five regions in Victoria, three of which contain marine and estuarine environments (namely South East Region, South West Region and Melbourne Region). These three coastal areas accounted for approximately 80% of the contribution to the economy, with recreational fishing in the Melbourne region accounting for 60% of all expenditure while the other two regions contributed 20% of the total. The dominance of the Melbourne region reflects the relatively high density of population in this region and the tendency for capital expenditures to be made within the home region of respondents regardless of where they are fishing.

The NIEIR study also showed that within the coastal zones an estimated 50% to 54% of recreational fishing expenditure was related to marine and estuarine fishing. Thus, the total contribution of this type of recreation to the economy would be approximately \$600 million per annum.

5.2 Likely impact of the ECC recommendations on recreational fishing

The ECC Marine, Coastal and Estuarine Investigation identifies 13 areas for recommendation as marine national parks and 11 areas for marine sanctuaries. Within these areas recreational fishing and harvesting would no longer be permitted. The ECC has broadly reviewed the recreational use of the specific areas and concludes that in most cases the impact of the recommendations on recreational fishing would be minor.

There is little evidence to counter this conclusion. However, within certain locations there will be recreational fishers who are strongly opposed to the creation of 'no-take' areas, as they will have been fishing in these areas, often for many years with varied success. These fishers will be likely to strongly oppose their exclusion from these protected areas. However, whether this has a significant impact on their participation in recreational fishing is an unknown. It is likely high intensity recreational fishers, with significant investments in capital equipment, will continue in the pastime and will find other locations outside of the protected areas. Almost 94% of Victoria's marine area will still be available for recreational fishing.

It is possible that the catch of some recreational fishers may fall as they are excluded from their favourite sites. However, this does not directly impact on the contribution of recreational fishing to the economy. The economic contribution is measured on the basis of purchases of fishing supplies and equipment, and through expenditures related to fishing trips, such as accommodation, food and beverages, other entertainment etc. If fishers merely swap locations, the State-wide economic impact is unlikely to change.

For many people recreational fishing is just one component of a tourist trip rather than the prime purpose. Some 23% of respondents to the expenditure survey (NIEIR, 1997) indicated that fishing was not the prime reason for their current trip. Within the South East and South West regions 41% and 28% of respondents, respectively, cited reasons other than fishing as the prime reason for their trip. Thus, persons fishing as part of a trip for other reasons are unlikely to be significantly affected by the development of exclusion areas.

Within the South East and South West regions the total contribution to State Gross Regional Product from recreational fishing is currently some \$250 million. Allowing for marine fishing to account for around 54% of this expenditure (see section 5.1 above), the contribution of recreational marine fishers would be around \$135 million. If all persons whose prime reason for a trip was fishing were to give up the activity, the loss in spending would be approximately \$87 million. For the Melbourne region, the contribution of dedicated marine recreational fishers could be as large as \$584 million.

While some dedicated fishers may give up fishing due to the creation of highly protected areas, this is likely to have only a small impact, as the total size of the parks and sanctuaries is small and many of the locations are relatively inaccessible.

The impacts may be more keenly felt in local communities if recreational fishing is a major tourist attraction for the region. These areas include many of the coastal locations on the far South East coast such as Bemm River, areas in the Gippsland Lakes (these are not included in the ECC recommendations) and parts of the Croajingolong National Park. The proposed Point Hicks Marine National Park is adjacent to Croajingolong but is relatively remote and excludes the popular Tamboon Inlet area as well as Clinton Rocks and the easternmost section of Point Hicks itself. It appears the areas proposed for national parks and sanctuaries are not generally major destinations for large numbers of recreational fishers although important for some individuals, and in all cases they have significant alternative fishing areas available within close proximity.

Overall, the key factor in determining impacts on recreational fishing expenditure of the proposed national parks and sanctuaries is the likely reaction of affected fishers. This cannot be predicted by reference to previous studies. However, given the high level of capital expenditure by some fishers and the relative mobility of boat based fishers and remote area surf and rock fishers, it seems unlikely that the creation of limited highly protected areas would significantly reduce expenditures.

5.3 Specific locations

The **Discovery Bay Marine National Park** is the most westerly of the proposed reserves. Although this proposed marine national park is located just west of Portland, the economy of Portland has relatively little dependence upon the tourism industry as evidenced by the low share of employment in the accommodation, cafes and restaurant sector (4.6%) and the culture and recreation sector (1.8%). The access to the waters of the marine national park is relatively limited by land, and the potentially rough nature of the sea constrains recreational boating. The ECC recommendation for this locality is therefore unlikely to have any adverse effect on the local or regional economy.

The **Twelve Apostles Marine National Park** will have little impact on recreational fishers as access is difficult and, as noted by the ECC, several of the most popular fishing areas are not in the Park. In terms of recreational fishing, the restrictions may have a small impact on Port Campbell's economy but other aspects of tourism and the emerging gas industry are more important for this town.

The **Point Addis Marine National Park** includes the internationally-known Bells Beach and incorporates some popular surf and rock fishing areas. The impact of restricting fishing in this area is likely to be significant in terms of recreational fishers. However, the impact on the local economy is expected to be limited as other areas offer easier access for the recreational fisher (ie, they will still come to fish in this region), and the local towns have reasonably diverse economies that do not depend on the spending of recreational fishers.

The loss of recreational fishing in the **marine sanctuaries** of the west coast is unlikely to have significant local economic impacts since these reserves are relatively small and alternative fishing areas are easily accessible.

The extension of the existing **Point Cook** highly protected reserve from 300m to the larger marine sanctuary is likely to have only a marginal impact in restricting some boat fishers. There are many alternative recreational fishing locations.

The limitation on fishing in the **Jawbone Marine Sanctuary** is unlikely to have any significant impact, given the restrained land access. There is also limited boat-based fishing here and many alternative areas are available.

The proposed parks for **Western Port** may impact on recreational fishing activity but this should be limited due to the relative inaccessibility of **Yaringa** and **French Island Marine National Parks** and the non-inclusion of most popular fishing channels. These fishers are mainly boat based and they would be able to find other areas for their activity with ease.

The **Churchill Island Marine National Park** may constrain activity of some boat-based fishers, but the popular areas have been excluded, as have selected channels. Again, the impacts should be minor.

Bunurong Marine National Park is effectively the seaward extension of an existing sanctuary and therefore any impact on recreational fishing should be limited.

Similarly, the impacts of the **Wilsons Promontory Marine National Park** will be limited, although there will be some impact on recreational abalone divers.

The **Ninety Nile Beach Marine National Park** is only a small area along this beach and as a result it would not be expected to reduce opportunities for recreational fishers. The proposed park is relatively inaccessible by land.

It is unlikely the ECC recommendations will affect the quantum of recreational fishing within Port Phillip and the Westernport region as the protected areas are relatively small and in some cases quite inaccessible.

The **Point Hicks Marine National Park** and **Cape Howe Marine National Park** are unlikely to create real problems for recreational fishing activity. The Point Hicks park does not include the popular Bemm River, or Tamboon Inlet estuaries Clinton Rocks area or the easternmost section of Point Hicks itself, and in any case is relatively remote. The Cape Howe Marine National Park has been designed to avoid the major recreational fishing areas (and therefore should not affect recreational fishers attracted to Mallacoota), although some boat-based fishers may feel aggrieved by the restriction on fishing in the area to be reserved for the marine national park.

The impact on the eastern zone of the ECC recommendations will be minor given the small and relatively remote locations of the proposed protected areas. Generally there appear to be many alternative and viable fishing sites.

5.4 Summary

The introduction of restrictions on recreational fishing in the selected coastal areas is unlikely to have any significant adverse effect on recreational fishing expenditures in the State. For local towns, there may be some isolated impacts where fisher visits may decline and therefore their associated spending levels would be reduced. However, these impacts should be limited as accessible alternative fishing areas exist which are accessible. In many

cases, popular recreational fishing areas have been specifically left out of zones reserved for protection. In any event, most fishers are relatively mobile with cars and/or boats and will tend to find alternative fishing locations. The economic impact is therefore likely to be small. Moreover, most towns do not rely heavily on recreational fishing spending, and they will continue to attract holiday-makers who are attracted by a range of factors other than just fishing.

Notwithstanding the above, there are strong perceptions in the Victorian fishing community relating to loss of access to waters for recreational fishing. These perceptions are generally based on the belief that access to recreational fishing should be unrestricted, and opposition to change is considered to be high. However, like many 'rights issues', perceptions change over time and what was once perceived as an infringement of personal liberty eventually becomes the accepted norm. A point in case is the Bunurong Marine Park which was declared a sanctuary zone in 1991. The initial recommendation was met with strong local opposition prior to its declaration, but now appears to be well accepted by the community.

6 TOURISM ACTIVITY IN COASTAL TOWNS

6.1 Introduction

This section provides an overview of tourism trends, with special reference to coastal towns in Victoria. While fishing (both commercial and recreational) has for many generations been the life-blood of many coastal towns, today the economic base of these places is becoming more reliant upon tourism. Other components in the economic base of these towns are also becoming more important in attracting new residents and activity, such as attracting retirees and others seeking a 'seachange' in their lifestyle, or as commuter settlements for those working in metropolitan locations.

6.2 Tourism as an economic component for towns

Tourism activity is an important component in the economic development of many coastal communities. This has previously been identified in a report to the (then) LCC by TBA Planners (1996), and is confirmed in more recent industry information.

Today, approximately one-in-three (34%) of non-metropolitan visits in Victoria are to regions with coastal aspects (Tourism Victoria 2000).

The Great Ocean Road, Lakes & Wilderness, and Phillip Island and Gippsland Discovery are the key non-metropolitan regions attracting a high share of domestic visitor activity. Much of this activity is in the form of passive recreation, with other key activities in these regions involving shopping, driving for pleasure and sightseeing. Approximately 8% of overnight visitors and 4% of day visitors to the Great Ocean Road reported fishing as an activity undertaken in the region. However, for the Lakes & Wilderness product region and the Phillip Island and Gippsland Discovery product region, fishing is reported as an activity by 23% and 13% of overnight visitors respectively (Tourism Victoria 2000).

Tourism activity in coastal centres tends to be seasonal, with high tourist flows typically occurring around special events and school holiday periods, and especially in the summer months. Accommodation varies in coastal centres, but the primary types typically include hotels, motels and caravan parks. Bed & Breakfast accommodation and boutique accommodation (such as upmarket fishing lodges or retreats located in wine regions) are emerging in some coastal areas.

A high share of coastal destinations attract the holiday visitor rather than those in the 'business' or 'visiting friends and relatives' markets. The opportunity to 'escape' is a part of the strong appeal of such destinations. Education and nature-based product development opportunities are also generally evident in small coastal communities. Water-based activities such as swimming, fishing and diving are also strong attractors for these areas. The strength of recreational fishing as an activity is shown in section 5 of this report.

Tourism activity is also a key driver for much of the retail activity that occurs in small towns. Likewise, the provision of services such as access to banking and to after-hours fuel and food, is often linked to the demands of

visitors rather than the needs of the small communities. Retail and service provision for many of the coastal communities is based on the size of the permanent population base as well as the volume and frequency of visitor flows.

For some coastal destinations, such as Mallacoota, access to recreational fishing is a key attractor. However, in most cases the special appeal of a coastal town reflects a number of factors, ranging from access to surrounding wilderness to historic attractions and ‘must-see’ icons, such as travel along the Great Ocean Road.

While recognising the popularity of fishing, Tourism Victoria acknowledges that the recreational fishing market is a difficult market to influence. Previous research undertaken on behalf of the Department of Natural Resources and Environment indicated that an estimated 800 000 Victorians participated in recreational fishing both inland and marine waters. However this figure is likely to be much lower with only 250 000 licences sold per annum since the introduction of regulated recreational fishing. The largest share of recreational fishers are day-trippers or anglers who include fishing in a trip away as a matter of course. When on extended trips, this market tends to camp out and, in expenditure terms, generally engages in low-yield activities.

In terms of destination marketing, the ‘high yield angler’ is Tourism Victoria’s target market. This market represents anglers who use tour guides, charter boats, stay in fishing lodges, and undertake extended fishing trips to interstate and international destinations.

Anglers who take planned fishing trips to regional Victoria and interstate destinations are also viewed as target markets for regional tourism organisations, particularly in regions where fishing is identified as product strength (as in eastern Victoria, for example). Regions that have highlighted the strength of fishing as part of the tourist experience and are relevant to this study include the Lakes & Wilderness region and the Bays & Peninsulas region. This ‘middle’ market prefers a higher level of accommodation, such as motels, hotels and so on, and generates higher-than-usual yield through extended visitation.

6.3 Likely impact of the ECC’s recommendations

The primary benefit likely to flow from the ECC recommendations – in a tourism context – is the opportunity for increased tourism marketing for the new marine national parks and sanctuaries.

There may also be opportunities for the development of new tourism products, such as new look-outs and vantage points for sea-views, underwater features for those diving and snorkelling, and so on.

There would also be opportunities to link the new marine national parks and sanctuaries with existing land-based national and state parks, and to promote these as integrated attractions for those visitors wishing to experience the comprehensive natural and environmental ‘appeal’ of such localities.

Generally, there would be no negative impacts arising from the ECC’s recommendations as they may affect the tourism market. Tourism numbers are unlikely to boom following the designation of marine national parks or sanctuaries, and therefore additional costs in the provision of new or expanded infrastructure to accommodate these numbers (such as new roads) would not be anticipated.

Some towns that are reliant on ‘fishing’ as an attraction for holidaymakers and tourists may fear restriction on recreational fishing in the marine national parks and sanctuaries would limit the appeal of such towns. However, it is evident that the ECC recommendations take this concern into account, and generally avoid designation of such areas that are already popular fishing recreational fishing destinations, or provide for other accessible and nearby opportunities for these recreational pursuits. These aspects are described in more detail for specific locations in section 5.

In our view, any net tourism benefits arising from the ECC recommendations in the short term are, in realistic terms, likely to be small and not measurable in terms of new jobs and incomes, etc. However, the creation of marine national parks and marine sanctuaries does offer to coastal communities the opportunity to develop new tourism experiences. Over time these assets may become an integral part of the tourism experience offered by coastal towns.

The strongest observation we can make regarding the tourism implications of these recommendations is that it is most unlikely that any net tourism benefits in the short term would balance any potential net losses that could be experienced by the fishing industry in these localities.

7. AQUACULTURE POTENTIAL

The ECC final recommendations provide for commercial access to waters for marine aquaculture, with 12 areas nominated as aquaculture zones. Most of the areas are located in Port Phillip Bay. However, regional centres such as Portland are potential beneficiaries, with industry development generating both employment and new export opportunities.

Nationally, the aquaculture industry is valued at around \$500 million (ABARE 1999), and growth is forecast at 18% per annum until 2005. Victoria's share of this growth can be facilitated through the ECC recommendations.

Tasmania and South Australia provide useful benchmarks in terms of the commercial success of the aquaculture industry. The Tasmanian experience is particularly relevant, with the eight operations in the fin fish industry generating employment of around 800 direct jobs during its 10-year history (Department of Primary Industries, Water and Environment 2000). Many of the new employment opportunities are located in rural and regional towns. Using an employment multiplier for fish processing of 3.5:1 (Department of Primary Industries, Water and Environment, Sea Fisheries Division – personal communication), Tasmania has created approximately 2 000 indirect jobs through the emergence of flow-on industries such as manufacturing of fish products and equipment, downstream processing such as smoking/preparation of fish, and the re-use of fish waste. An education-related industry has also emerged, with Tasmania being one of the few States offering short and long-term courses in aquaculture and marine farming techniques.

Key factors in the viability of the industry include targeting appropriate species for farming, and recognition that the production cycle is a minimum of three years before return is evident. Water temperature is critical in determining the type of species to be farmed. According to Fisheries Victoria, Portland is a good area to grow fin fish, with immediate species including Atlantic salmon, brown and rainbow trout, and blue fin tuna. At this stage, although Fisheries Victoria have received some interest from established operators, commercial operators require investment security prior to any firm commitments being in place.

Drawing on experiences of aquaculture development in Tasmania, the likely direct employment generation for Victoria (if the 12 areas nominated as aquaculture zones are operated by commercial interests) could be as high as 1 200 jobs, but this is only a broad estimate. The actual number of jobs depends on the type and scale of aquaculture activity and enterprise that is undertaken. Portland is likely to be a primary beneficiary, with some level of commercial interest in the site already evident. Even if only one commercial operation goes ahead in an area such as in Portland, this could potentially generate 100 direct jobs and 250 indirect jobs.

8. MANAGEMENT AND IMPLEMENTATION OF THE ECC RECOMMENDATIONS

Additional employment would be created in association with the management of the marine protected zones and associated with the implementation of the recommendations. These additional jobs would be in such areas as enforcement, park management, etc. and would tend to be located in towns close to the parks. Although estimates of this additional employment have not been prepared, employment in management of existing marine protected areas in Victoria suggest that new dedicated positions are established following park declaration such as in the case of Inverloch following the creation of the Bunurong Marine Park. However, whilst employment generation is likely in the implementation and ongoing management of the protected zones, State funding programs will be required to enable the effective management of the marine protected system.

The ECC Final Report identifies infrastructure establishment and maintenance, promotion and interpretation, monitoring, compliance and park management as the key elements in the effective management of the recommended marine protection system. The ECC acknowledge that the cost of implementing recommendations may be partially absorbed from within existing State programs, with other costs potentially offset by industry

contributions such as aquaculture licence fees. However, other costs such as those associated with monitoring and management plans will require additional funding.

9. SOCIO-DEMOGRAPHIC AND ECONOMIC TRENDS SINCE 1991 IN THE SELECTED TOWNSHIPS

9.1 Introduction

This section provides an overview of socio-demographic and economic trends taking place in the nominated towns. The comments are based on an update of ABS Population Census information, as well as other data sources, combined with other commentary where relevant. The information assists in making observations regarding potential impact that the ECC recommendations may have on the social and economic profile of particular towns.

9.2 Change in Victorian coastal towns

As previously indicated in this report (refer section 3.1), many of Victoria's coastal towns (and small towns in general) are undergoing changes that influence the type and extent of economic activity, and directly influence the prospects for local employment.

Many of these changes are being driven by structural change in industry, competition with larger towns and cities, and global factors that have widespread influence on all levels of economic activity and settlement patterns.

Some of these changes are tending to place pressure on existing employment levels, such as the loss of employment in the farm sector due to industry restructure, and the loss of local service employment to larger centres. In other cases there is an increase in local employment as tourism activities take hold, and as service employment opportunities expand in line with growth in the small-town retiree population, and so on.

Awareness of these underlying changes provides us with the ability to assess implications potentially arising from the ECC recommendations and the ways they may affect coastal communities.

The following section provides an overview of the population features of the coastal towns identified by the ECC, and includes an analysis of population change, employment, labour force participation and socio-economic features such as age and income. Where relevant, selected variables are compared to State averages in order to gauge areas of significant change.

The coastal communities identified by the ECC for investigation are:

- Apollo Bay
- Cann River
- Foster, Port Franklin, Port Welshpool, Toora
- Lakes Entrance
- Mallacoota
- Port Campbell
- Portland
- Rhyll
- Seaspray
- Torquay / Anglesea

The primary information source for the socio-economic profile of the towns is the ABS Census 1996; this is provided as an update to the 1991 Census information which underpins the earlier work undertaken by the (then) LCC. The 1996 Census data reports on employed persons by industry, which indicates the industry a resident is

employed. However, the Census does not report the number of jobs actually located in the town. In addition, ABS Business Register data – which reports businesses employing wage and salary earners by standard industry classification – is also provided as an indication to the type of business activity occurring in each of the towns.

A separate report (available in the ECC library) provides a detailed socio-economic profile of each of the towns, including:

- a brief description of each town,
- a summary of the ECC recommendations as they may affect each town,
- a community and industry profile, and
- a profile of businesses in each town.

An outline for each town is provided in the following paragraphs. Note that the population estimates for the year 2000 are based on the average annual growth rates for the period 1991–1996 in each town (ABS Census data). These figures are provided only as an indication of the likely population level at the present time.

9.3 Apollo Bay

Apollo Bay is a small settlement (1 050 residents in 2000), but holiday home ownership is high (approximately 50% of dwellings were unoccupied at the time of 1996 Census), reflecting the popularity of this locality for holiday-makers and tourists. The resident population has increased at a rate of +1.8% pa from 1991 to 1996, which is higher than the Victorian average annual growth rate for this period (+0.6%). The resident population is predominantly older (60+), though young families also feature in the age profile. Per capita median income for the town (\$8 680) is significantly lower than for metropolitan Melbourne (\$13 140) and Victoria (\$12 120), and this is influenced by the retiree market that has also developed in the town.

Tourism is a key industry for Apollo Bay, with a high share of visitors to the Great Ocean Road region undertaking a range of passive recreational activities such as going to the beach, driving for pleasure, sightseeing and eating out at restaurants.

Apollo Bay is characterised by an increasing labour force and a slightly decreasing unemployment rate. Both the business profile and the industry of employed persons residing in Apollo Bay indicate that tertiary services (such as retailing, accommodation, cafes and restaurants) are key features of the economic base of the town. Around 57% of residents are employed in consumer services, including a high proportion of employed persons in retailing, accommodation, café and restaurants. Only 7% of residents are employed in agriculture, forestry & fishing.

Apollo Bay is also an active fishing port with an estimated 15 rock lobster boats regularly working the port. A fish processing firm is located in town which employs approximately 5 full-time equivalents (FTEs) (personal communication).

Costs and benefits of the ECC recommendations

- The town profile indicates Apollo Bay is a consumer services economy with tourism and leisure services the base of the town's economy.
- The proposed changes to marine reserves in Apollo Bay may value add to the existing tourism profile of the town, providing opportunity for increased marketing as a short and long-stay destination offering a variety of nature-based experiences.
- While recreational fishing features in Apollo Bay, the natural assets of the coast also provide opportunity for passive recreational activities such as swimming, walking and sightseeing.
- Anecdotal information provided by the fish processing firm and co-operative suggest the proposed Twelve Apostles MNP and Marango Marine Sanctuaries will adversely impact on the viability of the fish processing operation in Apollo Bay. The suggestion is made by local operators that the processor would be likely to close with the implementation of ECC recommendations resulting in loss of jobs in the town.

9.4 Cann River

Cann River is a very small settlement (190 residents) which is experiencing a decline in population numbers. There is a relatively high share of unoccupied dwellings (approximately 31% of dwellings were unoccupied at the time of 1996 Census) which suggests some holiday houses as well as homes left vacant as people seek employment opportunities elsewhere. Per capita income (\$8 980) is significantly lower than for metropolitan Melbourne (\$13 140) and Victoria (\$12 120).

Noting that resident population numbers are declining (about -6% pa), a review of the age profile suggests younger persons are leaving to seek employment or education opportunities elsewhere. The town has a high proportion of young to middle age residents (25–39 and 40–59 yrs), yet a lower share of older persons (60+) and young adults (15–24).

Timber production is the key industry base for the town. Tourism is also an activity for the town, especially as this is a popular fishing base in East Gippsland. Accommodation businesses in the town draw trade from the seasonal fishing trips to the area.

Cann River is characterised by a decreasing labour force and a slightly decreasing unemployment rate. Resident employment is predominantly located in secondary industry (such as manufacturing and construction) with 27% of total employed persons in manufacturing (timber). Leisure services represent around 16% of employed persons. Agriculture, Forestry & Fishing represent 12.5% of total employed persons.

Costs and benefits of the ECC recommendations

- Cann River represents a small rural economy in change, with the on-going timber industry restructuring leading to population outflow.
- The proposed park at Point Hicks near Cann River, while not a threat to the industry structure of the town, could compound the already 'pessimistic' community sentiment. Timber industry restructuring and population decline, particularly among younger persons, has generated a perception that the town is in decline. The perceived loss of access to recreational pursuits such as fishing could further entrench a negative community sentiment.

9.5 Foster, Port Franklin, Port Welshpool and Toora

The combined communities of Foster, Port Franklin, Port Welshpool and Toora represent a coastal community of some 1 750 residents.

The resident population is slowly decreasing, with an average rate of decline of -0.8% pa for the period 1991–1996.

The age profile of these localities indicates low proportion of residents in the 25–39 age group; however, the towns have a higher share of older persons (60+) and young adults (15–24 age group).

Manufacturing represents 15.5% of total employed persons, with smaller shares applicable to retailing, health and community services. Agriculture, forestry & fishing represent 10% of total employed persons.

Information on the business profile and the industry of employed persons residing in the towns indicates that manufacturing and consumer services (especially retail trade and accommodation, cafes and restaurants) are among the key industries in these small towns.

The towns are characterised by a decreasing labour force and an increasing unemployment rate. Resident employment is predominantly secondary industry (manufacturing and construction). Manufacturing represents 15.5% of total employed persons; Retail trade and Health and Community Services feature; Agriculture, forestry and fishing represent around 9.5% of total employed persons.

Foster, Port Franklin, Port Welshpool, Toora are towns in change. Unemployment is high and industry restructuring is likely to compound the lack of employment opportunities for the towns' residential populations.

Costs and benefits of the ECC recommendations

- The main potential for the towns is to develop roles as weekend destinations and for tourist/visitor stop-overs associated with visits to SW Gippsland and Wilsons Promontory.
- The proposed changes to marine reserves in proximity to Foster, Port Franklin, Port Welshpool and Toora do not present any adverse implications for the industry structure of the towns.

9.6 Lakes Entrance

Lakes Entrance is a relatively large coastal community (6 015 residents), but also with a high provision of visitor accommodation. It is an important service centre, as well as a popular destination for visitors to the Gippsland Lakes.

The resident population is increasing (+2.6% pa) at a faster rate than for the State. The age profile suggests a mix of young families and older retirees. Per capita income (\$8 390) is lower than for metropolitan Melbourne (\$13 140) and Victoria (\$12 120).

Lakes Entrance is characterised by a slightly increasing labour force and a decreasing unemployment rate. Employment is predominantly tertiary sector (mainly in consumer services), particularly in leisure services and retail trade. Agriculture, forestry & fishing feature at approximately 10% of all employed persons.

The primary economic sector for Lakes Entrance is the tourism industry. Recreation services, retail trade, dining/eateries, and visitor accommodation are among key activities for the town. Whilst Lakes Entrance is a major fishing port, the catch from the proposed parks and sanctuaries is negligible.

Costs and benefits of the ECC recommendations

- The proposed changes to marine protected areas in South and East Gippsland do not present any adverse implications for the structure of industry in the town.

9.7 Mallacoota

Mallacoota is small coastal community of around 1 000 persons, although numbers increase with holidaymakers staying in visitor accommodation and in holiday houses (approximately 34% of dwellings were unoccupied at the time of 1996 Census, and these are mainly holiday houses). The resident population is increasing only slowly (+0.4% pa) and this is slower than the State average (+0.6% pa).

The town's age profile suggests a mix of young families and older retirees with a lower than State average proportion of young adults (15–24; 25–39), but higher share of middle age (40–59 yrs) and older persons (60yrs-plus). Per capita income is lower (\$8 760) than for metropolitan Melbourne (\$13 140) and Victoria (\$12 120).

The town's labour force is slightly increasing in size and the unemployment rate is also increasing. Employment is predominantly tertiary sector, especially in consumer services including education, leisure services and retail trade. 12% of employed persons work in the agriculture, forestry and fishing industry.

Mallacoota is actively promoted as a fishing destination, and an important service and leisure industry has evolved out of this activity. Some 20 fishing areas in and surrounding Mallacoota are promoted for recreational fishing, including the Mallacoota Inlet which is one of the most popular locations. Discussions with Tourism Victoria indicate that Mallacoota is a key fishing destination, and a boat launching facility is under consideration, which would encourage deep-sea fishing tour operations.

Reference to the business profile and the industry of employed persons residing in Mallacoota shows that tourism/holidays and supporting services, retail trade, and manufacturing (specifically seafood processing) form the key industry base for the town.

Costs and benefits of the ECC recommendations

- Adverse social and economic impacts are likely if the town loses fishing and processing jobs, as this is a large part of the local economy.
- The town is remote and has no surrounding catchment to serve other than locals and visitors, so existing industries in the town are important.
- Potential loss of jobs is difficult to measure and may be unlikely as discussed in section 4.6, but any loss of jobs should be avoided in the view of local impacts.
- Mallacoota is likely to be a location where additional jobs in park management and enforcement may be considered.

9.8 Port Campbell

Port Campbell is a very small coastal community of around 325 residents, plus a significant holiday-home market (approximately 43% of dwellings were unoccupied at the time of 1996 Census, most of which are for holiday use). The resident population is increasing (+3.7% pa) but from a low base.

The age profile indicates the town has a mix of young families and middle-age couples. The town has a high proportion of middle age persons (40–59 yrs) and lower share of older persons and young adults (15–24 yrs).

The town's labour force has grown and a reduction in the unemployment rate is evident. Employment is predominantly tertiary (consumer services) and features leisure services, retail trade and education. Agriculture, forestry & fishing represent around 9.5% of total employed persons.

Tourism and leisure services are key business activities in Port Campbell. The area's diverse coast line and the nature-based experiences it provides are key strengths for the future development of the town.

Visitor accommodation and retailing contribute to the economic base of the town.

Costs and benefits of the ECC recommendations

- Primary industry does feature in the economic profile of Port Campbell however the general trend is toward a consumer services economy.
- Port Campbell's location in one of Victoria's main tourism regions is evident in the industry base of the town, with tourism and leisure services key activities in the centre's business profile.
- Anecdotal information suggests 3–4 rock lobster boats based at Port Campbell work the Twelve Apostles area, and they would most likely have to fish elsewhere if the recommendation for a marine national park is implemented.

9.9 Portland

Portland is a large coastal community of almost 9 300 residents. However, the resident population base has been slowly declining in numbers (-1.0% pa, 1991–1996).

The age profile of the town suggests a mix of young families and middle age couples. In contrast to smaller coastal communities, Portland's demographic profile is more comparable to Melbourne metropolitan and Victorian averages.

The town's labour force is decreasing in size and the unemployment rate is also decreasing. Employment is predominantly within the secondary industry (manufacturing and construction) and tertiary services sector. Features are Manufacturing (24% of employed persons) and Retailing (14%).

Key activities in Portland are manufacturing and retail trade. Commercial fishing is also a feature of the business profile of the town, with 5 fish processing firms located in the area (personal communication). The town and district however is experiencing a shift from secondary industry to services, especially in leisure and consumer

services. The aluminium smelter is an important industry for the town and the centre's role, as Victoria's major deepwater port, will continue.

Costs and benefits of the ECC recommendations

- Portland is undergoing major changes in line with structural change in the broader Victorian and national economies.
- Aquaculture Zones offer potential opportunity for new fishing-related industry in Portland with direct and indirect employment likely.
- Commercial fishing does feature for Portland, however the relative importance of the industry is small when compared to the secondary sector (manufacturing) which appears to drive the town's economy.

9.10 Rhyll

Rhyll is a small coastal community of 430 residents experiencing reasonable growth (3.3% pa). There is a high proportion of holiday homes (approximately 52% of dwellings were unoccupied at the time of 1996 Census, and these are mainly holiday houses).

The town has a high proportion of older persons (44.2%) compared to the State average (15.9%), and the town also has a lower proportion of young dependants, young adults and middle age persons in its population.

Rhyll is a coastal community reliant upon fluctuating visitor inflows (particularly holiday home owners) to maintain the town's small economic base. It is also a residential destination for 'retirees'.

Rhyll's labour force has experienced a slight increase in size and the town is characterised by a decreasing unemployment rate. Employment is predominantly tertiary sector, especially in consumer services such as retail trade and leisure services (including cultural and recreational). Health and community services also feature.

Costs and benefits of the ECC recommendations

- The ECC recommendations are likely to have minimal effect on the town.
- Rhyll is a holiday destination and retiree locale, and these roles should continue.

9.11 Seaspray

Seaspray is a very small coastal community (around 200 permanent residents), but it also has a high level of holiday home ownership (approximately 64% of dwellings were unoccupied at the time of 1996 Census). Census data for 1991 and 1996 suggest the town was experiencing a slow decline in population numbers at that time (-1.5% pa 1991–96).

The town's age profile indicates a mix of older retirees and families. The town has a high proportion of older persons (31.2%) compared to the State average (15.9%), and a high share of young dependants (0–14 yrs) and a lower share of young adults and middle age persons.

Seaspray's labour force is decreasing in size whilst a slightly increasing unemployment rate is evident. Retail trade, leisure services, and health & community services are the main areas of employment for residents.

Costs and benefits of the ECC recommendations

- The town does not rely on the fishing industry, although recreational fishing is a significant attraction for residents and visitors.
- The ECC recommendations are likely to have no adverse effect on the town.
- There could be some positive tourism effect with the designation of a marine national park, but this is likely to be minimal in terms of economic benefit.

9.12 Torquay/Anglesea

Torquay/Anglesea are coastal communities with a combined population base of 9 000 permanent residents. It is also a very popular holiday destination and this is reflected in the high level of holiday home ownership (approximately 46% of dwellings were unoccupied at the time of 1996 Census) and provision of visitor accommodation (motels, camp sites, etc). The resident population is increasing at a significant rate (around 3.3% pa), which is substantially higher than the State average for 1991–1996 (0.6% pa).

The age profile suggests a community with a high share of young families, with a high proportion of residents in the 25–39 year age group and a high share of young dependants (0–14 years). Retirees also feature in the profile of the towns.

The town's labour force has experienced a significant increase whilst the unemployment rate has slightly decreased.

Around 72% of employed residents are engaged in services such retailing, education and visitor accommodation, while around 25% are employed in the manufacturing and construction industries. Many residents commute to employment in nearby Geelong.

Costs and benefits of the ECC recommendations

- The ECC recommendations are not expected to have any adverse economic effect on the Torquay/Anglesea region.
- Designation of areas for marine national parks and a marine sanctuary may have some positive tourism effect, but the outcome in terms of extra jobs is likely to be negligible in the short term.

9.13 Summary

For most of the coastal communities the likely impact of the ECC recommendations will be minimal. Structural changes will continue to occur in these towns in response to restructuring in economic activity in general. Moreover, these changes will continue to occur outside of the influence of the ECC recommendations. However, for some communities such as Cann River, the cumulative social impacts are based on perceptions of loss and a sense of restriction in leisure activities. In other situations (such as Mallacoota) there are concerns that a reduction in catch (due to 'no take' areas) would lead to a loss of employment for fishers and/or for processing operations. Although we have suggested in section 4.6 that the most likely outcome of reduced catch would be reduction in income, responding to such perceptions is a key issue in the communication of the benefits of the ECC policy recommendations.

The following tables provide an overview of the key socio-economic variables and the changes that have occurred in the period 1991 –1996 for each of the towns. The tables show that coastal communities, similar to most towns and regional centres, are in the process of change, much of which is driven by economic restructuring on a national and global scale, as well as by changing patterns in lifestyle and choice in place of residence.

Table 9.1 Socio-economic features of the selected towns 1991–1996

	Population				Labour force			Unemployment				
Coastal towns	1991	1996	Rate of change pa	Net change	1991	1996	Net change	1991	1996	Rate '91	Rate '96	**Regional rate '99
Apollo Bay	894	979	1.8%	85	397	449	52	50	46	12.6%	10.2%	8.8%
Cann River	336	246	-6.0%	-90	198	136	-62	12	7	6.1%	5.1%	10.5%
Foster Et Al	1 886	1 808	-0.8%	-78	699	684	-15	65	88	9.3%	12.9%	5.9%
Lakes Entrance	4 622	5 248	2.6%	626	1 837	2 019	182	344	308	18.7%	15.3%	10.7%
Mallacoota	961	982	0.4%	21	408	416	8	47	57	11.5%	13.7%	10.5%
Port Campbell	234	281	3.7%	47	108	129	21	16	14	14.8%	12.8%	8.8%
Portland	10 155	9 664	-1.0%	-451	4 707	4 435	-272	769	572	16.3%	12.9%	9.2%
Rhyll	321	378	3.3%	57	120	127	7	18	11	15.0%	8.7%	11.0%
Seaspray	233	216	-1.5%	-17	92	59	-33	9	7	10.0%	11.9%	8.4%
Torquay/Anglesea	6 884	7 979	3.0%	1 095	3 054	3 725	671	403	436	13.2%	11.7%	6.9%

Source: ABS Census Data 1996.

**1999 unemployment rates from Small Area Labour Markets Australia December 1999.

Table 9.2 Employment by sector in the selected towns – 1996

Coastal towns	Primary %	Secondary %	Tertiary %	Not stated *NEC %	Total employed persons %
Apollo Bay	8	16	74	2	100
Cann River	12	32	53	3	100
Foster etc.	10	22	65	3	100
Lakes Entrance	11	13	73	3	100
Mallacoota	13	18	68	1	100
Port Campbell	12	6	77	6	100
Portland	3	31	63	3	100
Rhyll	2	5	88	5	100
Seaspray	0	11	89	0	100
Torquay/Anglesea	1	25	72	2	100

Source: ABS Census Data 1996 all figures rounded

*Note: Note Elsewhere Stated

10. CONCLUSIONS

Socio-economic impacts arising from implementation of the ECC recommendations will be experienced in two ways:

- in terms of activity levels (for commercial and recreational fishing, tourism, marine aquaculture and park and resource management); and
- in terms of geographic area, depending on the strength of impacts on activities.

In terms of activities, impacts arising from the ECC recommendations may be experienced in:

- commercial fishing and related processing activities, with potential reductions in the volume and value of the catch, and potential loss in employment levels if fishers and processors have to reduce their level of activities, or potentially no change if the affected catch is sourced from other areas;
- recreational fishing activities, with potential loss of visitors at popular fishing spots that are now to be protected, and loss of their spending that would otherwise be directed to nearby towns (for accommodation, supplies, etc);
- tourism growth potential where marine national parks and sanctuaries can be marketed as tourist attractions and destinations;
- marine aquaculture, where new or increased operations may generate economic activity; and
- management, with potential new jobs associated with park management and infrastructure.

Impact on commercial fishing

Adverse impacts on commercial fishers are likely to be significant in some cases because:

- fishers will have to fish in other areas (with additional travel and operating costs to the fisher in accessing these alternative areas) and, in turn ...
- this will place greater intensity on these other areas and on the existing fishing operations in these other areas, while ...
- some existing fishing enterprises may have to close (at personal cost unless bought out by a funded scheme), while others ...
- will possibly become involved in illegal activities by continuing to fish in areas now protected from fishing (and this option has been highlighted by industry observers as a very unfortunate but possible outcome for some).

Potential employment impacts

There may or may not be job losses in fishing, depending on whether or not the catch can be secured from other areas outside parks and sanctuaries. In the unlikely event that none of the lost catch is sourced from other areas, the possible loss of employment for fishers could involve up to 39 jobs (by applying to total employment in fishing, the MAFRI percentage impact figures for value of catch), but we do not believe this would be the case. In any event, this (unlikely) potential for some 39 lost jobs in fishing is equivalent to just 0.3% of all employment in the towns that are located near to the proposed marine parks and sanctuaries. Instead of lost jobs, it is expected that individual incomes will be reduced (unless other areas are fished). The towns providing fishers to these areas would be likely to experience these reduced incomes.

Marine aquaculture

Employment creation and export opportunities are presented through commercial investment and development in marine aquaculture. Suitable areas are identified for farming of marine species, with the final recommendations focusing on achieving a balance between providing access to aquaculture and minimising the impact on environmental values. Drawing on experiences of aquaculture development in Tasmania, the likely employment generation for the State if the 12 areas nominated as aquaculture zones are operated by commercial interests could be as high as 1 200 jobs, but this is only a broad estimate and should only be used at this stage as an upper limit; in reality the figure might be only around 200 or so jobs, depending on what exactly is developed in the aquaculture zones. Portland is likely to be a primary beneficiary, with some level of commercial interest in the site already evident. However, the production cycle for aquaculture industry is a minimum of three years and the magnitude of export earnings are determined by the selected species for farming (and this in turn is highly dependent on the climatic and water conditions of the nominated sites).

Recreational fishing

The introduction of restrictions on recreational fishing in the selected coastal areas is unlikely to have any significant adverse effect on recreational fishing expenditures in the State. For local towns, there may be some isolated impacts where fisher visits may decline and therefore their associated spending levels would be reduced. However, these impacts should be limited as accessible alternative fishing areas exist in nearby localities. In some cases, popular recreational fishing areas have been specifically left out of areas reserved for protection. In any event, most fishers are relatively mobile with cars and/or boats and will tend to find alternative fishing locations. Any adverse economic impact is therefore likely to be negligible. Moreover, most towns do not rely heavily on recreational fishing spending, and they will continue to attract holiday-makers who are attracted by a range of factors other than fishing.

Tourism impacts

The primary benefit likely to flow from the ECC recommendations in a tourism context is the opportunity for increased tourism marketing for the new marine national parks and sanctuaries. Generally, there would be no negative impacts arising from the ECC's recommendations as they may affect the tourism market. Tourism numbers would be unlikely to increase in any significant way as a direct result of the designation of marine national parks or sanctuaries. As a result, additional costs in the provision of new or expanded infrastructure to meet visitor needs would not be anticipated. Increased marketing activity and tourism development generated through the creation of the national parks and sanctuaries may, in the long term, create additional jobs and income for the surrounding communities. Over time, the marketing of the sites may lead to increased visitor demand.

Implementation and park management

Additional employment would be created in association with the management of the marine protected zones and associated with the implementation of the recommendations. These additional jobs would be in such areas as enforcement, park management, etc. and would tend to be located in towns close to the parks. The likely numbers of such jobs are not yet available.

Impact on towns

Adverse impacts on towns would be experienced where processing plant and/or fishing co-operatives may have to close if there are reduced levels of product. Although it is unlikely such closures would occur, this study suggests any adverse impacts would be felt in Mallacoota, Portland and Apollo Bay. Impacts could be reflected in a reduction in existing employment levels, possibly with multiplier effects as other suppliers and service providers react to lower levels of activity in the fishing and processing activities. However, the adverse effect on commercial fishing is unlikely to have a lasting adverse effect on the coastal towns. This is because the towns (other than Mallacoota) do not have a strong reliance on commercial fishing or recreational fishing, and are generally reliant on a wider servicing role for local and surrounding resident populations and for tourists.

While the potential loss of commercial fishing activities in a town is important for the individual fishers, the net effect on a town's economy is not expected to be significant. Probably the only potential exception is Mallacoota, where the fishing industry (in both harvesting and processing) is the main economic activity after tourism. Mallacoota is also a town that is distant from large centres or other generators of visitor trips (unlike, say, Torquay, Anglesea, Apollo Bay). However, the large size of the processing firm at Mallacoota makes it less vulnerable to potential impacts.

Some towns that are reliant on recreational fishing as an attraction for tourists and holidaymakers may fear that no-access to recreational fishing in the marine national parks and sanctuaries would limit the appeal of such towns. However, the recommendations take this concern into account and generally avoid designation of such areas that are already popular recreational fishing destinations, or provide for other accessible and nearby opportunities for these recreational pursuits. In our view, any net tourism benefits arising from the ECC recommendations are, in the short term, likely to be negligible in terms of generating new jobs and incomes.

Fishing losses vs employment gains in other areas

The strongest observation regarding the tourism implications of these recommendations measured against potential loss of employment in fishing is that it is most unlikely that any net tourism benefits would balance anticipated net losses that will be experienced by the fishing industry in these localities.

There are however, very significant opportunities for aquaculture development, and this would lead to new employment creation, which would be sourced from surrounding towns.

Jobs would also be created in the management of the marine protected areas, and in other aspects associated with the implementation of the ECC recommendations (such as in park patrols, enforcement, etc). Estimated numbers of such jobs are not yet available.

Overall, it is likely that any loss in jobs associated with fishing and processing would be more than countered by potential growth in jobs in aquaculture, and in the management and implementation of the ECC recommendations.

Social impacts

The principal negative social impact is expected to be the potential loss of fishing jobs. This involves more than just the loss of employment for the individual – there is also the difficulty of having to find alternative employment in an environment where there is still relatively high unemployment (double the State average) and where prospects for (often) older males with limited alternative job skills are not great. Another important social impact is that which falls on fishing communities – these communities have generally survived many generations in difficult but challenging conditions. The potential loss of work is therefore a new and threatening change for those involved and for their close-knit communities.

Environmental benefits

The ECC recommendations recognise what is described as the “existence value” of Victoria’s coastal and marine environment, and the recommendations provide the necessary framework within which to ensure conservation and preservation of the State’s unique asset.

Globally, the supply of wild fisheries is levelling and careful management of the resource is required if future generations are to enjoy the benefits of a healthy and diverse marine environment. Sustainable resource management is a goal for most modern economies and the ECC recommendations, enabling the preservation of a proportion of the State’s coastal and marine environment, are an important contribution in managing Victoria’s sensitive marine environment.

Environmental benefits flow from the preservation of the State’s coastal and marine biodiversity. Increased scientific understanding, public appreciation, access to education opportunities and preservation of the State’s unique assets for future generations, are some of the benefits generated through the protection of Victoria’s marine environment. These benefits also have an economic aspect, although the economic value of such benefits is very largely unmeasured in Victoria at this time.

REFERENCES

- Australian Bureau of Agricultural and Resource Economics, (1998), www.brs.gov.au
- Australian Bureau of Statistics, (1997), Australian National Accounts Input-Output Tables 1993–94, Catalogue No 5209.0
- Department of Employment, Workplace Relations and Small Business, (December 1999) *Small Area Labour Markets*
- Department of Infrastructure, (1998) *Regional Victoria in Fact. 1996 Census Statistics for Victoria’s Local Government Areas*
- Department of Infrastructure, (1999) *Towns in Time: Data. 1981, 1986, 1991 and 1996 Census Statistics for Victoria’s Towns and Rural Areas*
- Department of Infrastructure, (2000) *Victoria in Future. The Victorian Government’s Population Projections 1996–2001*
- Environmental Conservation Council, (2000) *Marine Coastal & Estuarine Investigation Final Report*
- Fisheries Victoria, Department of Natural Resources and Environment (July 1997) *Economic Impact of Recreational Fishing in Victoria*
- Fisheries Victoria, Department of Natural Resources and Environment (May 2000) *Fish Fax*
- Li, Eric., Marine and Freshwater Resources Institute (August 1999) *Estimates of Fisheries Resources in Open Coast and Bay and Inlet Study Areas*
- McLennan Magasanik Associates, (April 1997) *Socio-economic assessment of Final Recommendations covering Marine, Coastal and Estuarine Areas in Victoria*
- Royal Automobile Club of Victoria, (1998–1999) *Accommodation Guide*
- TBA Planners, (March 1996) *Victorian Coastal Town Study. A Socio-Economic Profile.*
- Tourism Victoria, (March 2000) *Fishing. Tourism Action Plan 2000–2003.*
- Tourism Victoria, (2000) *Victorian Tourism Research Kit.*
- www.mallacoota.org/
- www.rfa.gov.au

ATTACHMENT A

Notes from telephone interviews with commercial fishing operators and industry representatives

Mallacoota

- Fishing is main industry (other than tourism/services)
- Abalone plant is largest manufacturing activity in town
- Mallacoota is also regarded as a popular recreational fishing destination
- SIV states that 3 abalone quotas under threat (60 tonnes) and equivalent to loss of 6 full-time jobs
- Locals see a potential 13% loss of catch
- Some see loss of 15 jobs in town due to ECC recommendations
- Plant would likely continue even with 13% loss, but this only eats into feasibility of operation; will come a time when closure is considered as an option
- Plant has 25 full-time equivalent (FTE) jobs – this includes about 100 casuals and permanents
- Social impacts on town (increase in unemployment and other problems) can be expected if fishing and related jobs are lost – town relies heavily on fishing
- The town has no surrounding catchment to serve, other than own townspeople and visitors, and hence the importance of maintaining and expanding the fishing industry
- Abalone fishers put investments back into town (eg shops, dwellings)

Portland

- Existing 30 cray boats (60 jobs)
- Existing 20 trawlers (possibly 60–80 jobs, seasonal)
- Existing 4–5 abalone boats from Port fairy and Warrnambool
- Three processing plants (1 cray/2 for abalone), with about 6 full-time plus 15 or so in season
- One abalone processing plant exports all output (100 tonnes). Employs 12 including 3–4 full-time plus casuals
- \$350 000 pa in wages goes to local economy from 1 plant
- Existing under-supply with quotas, so further reduction with marine national park proposal will aggravate this situation
- ECC recommendations take out several abalone quotas (37 tonnes according to ECC data for Discovery Bay). This would be equivalent to about 4 FTE jobs in this area
- No room to fish elsewhere

Port Fairy

- Fishing industry is a main activity, plus tourism mainly in the summer months
- Abalone processing plant has 6 full-time jobs, plus 30 casual (20 FTE)
- A 10% cut to the abalone quota in ECC recommendations would mean a loss of 18 tonnes pa equivalent to 2 full-time jobs
- Fishing costs likely to increase as would have to fish further out in deeper waters
- Abalone processing costs per tonne would increase if there is less throughput
- Rock lobster fishers will be affected by recommendations for Twelve Apostles Marine National Park

- Any increased recreational use of area, as a marine national park is not likely to be important
- Poaching is likely to increase as the area would no longer be under ‘surveillance’ by fishers on a day-to-day basis

Apollo Bay

- Rock Lobster is under threat, especially around the Twelve Apostles Marine National Park
- 12–15 cray boats at Apollo Bay, and they are mostly working in the western zone
- 3 abalone boats permanently here, plus other boats that fish in the central zone (from Warrnambool to Wilsons Promontory)
- ECC shows 12.9 tonnes here in rock lobster would be lost, but Apollo Bay and Port Campbell fishers claim it will be greater than this (possibly twice as much, and could even be more than 40 tonnes)
- Apollo Bay Fishing Co-op handles about 80% of catch from this zone. Could have to close (SIV claim) with loss of 3 full-time jobs and 2–3 part-time jobs, plus use of area by abalone fishers for some processing with 2–3 full-time and up to 6 part-time jobs. New marine national parks would likely affect 6–7 licensed boats or 12–14 jobs including owner and deckhand, plus the flow-on effects. Multiplier is around 2.9 for rock lobster (SIV)

Port Campbell

- 7 cray boats and 2 abalone boats in Port Campbell
- Usually 2 fishers per boat = 18 jobs
- 3–4 boats work this area full-time, so about half of the local fleet (about 9 jobs) operates in the Twelve Apostles area
- With loss of lobster catch, the fleet will fish in other areas and this increases fishing intensity of these other areas, which probably is not sustainable. Cray grounds are only in certain areas
- Industry is already in a 25% reduction mode, and this will be exacerbated with marine national park proposal
- Same situation faces Portland fishers
- Only way to make the proposals work is to buy out the licences, “but how does a 43-year old find a new job when he has no prospects?”

Appendix 5

Assessment of commercial fisheries catch and value

The ECC commissioned the Marine and Freshwater Resources Institute (MAFRI) of Fisheries Victoria to assess the commercial fisheries catch weight and dollar value associated with a number of study areas under investigation by the ECC (MAFRI 1999). This assessment was based on catch and effort data over the years 1992/93 to 1996/97 and interviews with commercial fishers, and resulted in estimates of weight and value for abalone, rock lobster and other fisheries for each of the nominated study areas. Where recommended marine national parks or marine sanctuaries in the Final Report are significantly different from the study areas used by MAFRI, or were not assessed directly by MAFRI, estimates have been made with input from MAFRI catch data, the industry, and Fisheries Victoria officers.

Holders of commercial fishing licences are required to submit monthly catch returns which have a range of data about each fishing operation, including species caught, weight of catch, and time and location where the fish were caught. This information is generally referred to as catch and effort data. These data must form the basis of any estimate of the fisheries resources within catch and effort cells (the spatial units for which data is reported and recorded).

Catch and effort data, in most instances, cannot be used alone to assess the potential impact of the ECC's proposals on commercial fisheries, as the spatial resolution of the cells are generally much larger than most proposed marine national parks. Catch and effort cells vary in their resolution between fisheries. Finfish have been reported to cells defined by one degree of latitude and one degree of longitude to 39°S, and abalone according to reef codes which vary in extent and size. Rock lobster catches are apportioned to cells usually 10' of longitude in width.

Following the release of the Draft Report, Seafood Industry Victoria (SIV) and some specific sectors of the commercial fishing industry challenged the MAFRI estimates of catch and value from some of

the proposed marine national parks. In particular, SIV considered that the commercial fisheries catch was under-estimated from the following marine national parks or marine sanctuaries proposed in the Draft Report:

- Twelve Apostles (rock lobster)
- Point Addis (rock lobster)
- Point Cook (abalone)
- Wilsons Promontory (rock lobster, abalone, finfish)
- Corner Inlet (finfish)
- Point Hicks (rock lobster and abalone)
- Cape Howe (rock lobster).

SIV did not comment on estimates for other areas, or fisheries other than those indicated.

Discussions with industry indicate that some of the concern arises from the fact that estimates were based on the most recent year for which full figures were available (1996/97) rather than the current year or averages over several years.

The dollar price per kilogram used to calculate the value of the catch was also queried. In this report, value of the catch has been calculated using 1999 prices for abalone, and 1998/99 average prices for rock lobster. In addition, the industry also felt that the direct value of the catch was not the best measure of the economic value of the fishery as flow-on values were not included. Potential flow-on implications of the recommendations for coastal communities and the State have been addressed in Appendix 4.

The following sections of this appendix include brief descriptions of each of the abalone, rock lobster and finfish fisheries of Victoria, and discuss some of the inherent limitations associated with estimates or claims about the fishery value of proposed marine national parks.



Abalone

To improve understanding of the potential impacts of proposed marine protected areas on the Victorian abalone fishery, the structure of the Victorian fishery is briefly outlined, and then the catch described from a reef complex over a ten year period.

The Victorian abalone fishery is a limited entry, output managed, fishery based mainly on the species *Haliotis rubra*. It is sub-divided into three zones - the Western, Central and Eastern Zones - and a Total Allowable Catch (TAC) is set annually for each zone. Since the introduction of quota management in 1988 the TACs have remained constant at 280, 700 and 460 tonnes respectively. The TAC is allocated evenly amongst each licence holder within the zone.

Abalone prefer reef substrates with high wave energies and surge, generally dominated by kelps, which offer crevices, gutters and overhangs for protection. These reefs are often concentrated around headlands. The reefs are grouped for management purposes, and each group of reefs is given a reef code. All abalone taken by licensed divers are allocated to a reef code within the zone.

The annual catch from a reef can be used to represent the contribution of a particular reef code to the TAC of the fishery. This contribution will vary depending on natural fluctuations, the physical extent of the reef, its productivity, density of abalone, proximity to a port or boat ramp, price of abalone, weather conditions during a season, and so on. Some reefs may have quite a high productivity, over and above what the size of the reef would suggest, that enable divers to repeatedly harvest over a season, whilst other reefs may only be harvested once a year. To illustrate the variable contribution of a reef to the total catch, the catch from a typical reef complex (the Point Cook Homestead Reef) is described from the introduction of quota management to the fishery in 1988 until the present.

Using catch and effort data supplied (as a legal requirement) by the industry to Fisheries Victoria, the catch from this reef complex has varied between 17.9 tonnes in 1992/93 to 43.6 tonnes in 1998/99, with an average catch of 29.9 tonnes. Expressed in percentage terms the reef's contribution to the Central Zone TAC has varied from 2.6% to 6.2%, with an average of 4.3%. Similar variability is typical for other reef codes in all zones.

This example illustrates how the contribution of an individual reef complex to the TAC of the fishery can vary from year to year. It is also clear that the implications of the proposed marine national parks for the Victorian abalone fishery can be discussed in terms of a range of potential impacts, based on the average weight of abalone produced from reefs within the recommended areas.

In most instances, catch data cannot be used to directly estimate the potential implications of the proposed parks on the abalone fishery as the reef codes are only occasionally completely within the boundaries of the proposed areas. Reef codes that are completely within a proposed park occur at the recommended Discovery Bay Marine National Park, Cape Howe Marine National Park and the Beware Reef Marine Sanctuary. For the Cape Howe Marine National Park, the combined catch of the reefs known as The Howe and the Iron Prince have varied between 1987 and 1997, from a high of about 34 tonnes to a low of 15.6 tonnes. Thus the reefs' contribution to the Eastern Zone TAC has varied from as much as 7.4% to as little as 3.5%. The average contribution in this ten year period is 23.2 tonnes per annum, but if the most recent five years are averaged this contribution falls to 19.5 tonnes per annum. The MAFRI estimate for the proposed Cape Howe Marine National Park is 19.7 tonnes.

The dollar value of the potential impacts on the abalone fishery can vary depending on the price used. In this report the 1999 price of approximately \$34/kg is used.

Table 5.1 Victorian commercial abalone fishery

	Western Zone	Central Zone	Eastern Zone
TAC (tonnes)	280	700	460
Number of licences	14	34	23
Diver days	707	1 643	982
Catch rate (kg/hr)	77	85	86



Rock lobster

As with the abalone fishery, to improve understanding of the potential impacts of proposed marine protected areas on the Victorian rock lobster fishery, the structure of the Victorian fishery is briefly outlined, and then the reported catch from a catch cell is described for a six year period.

The fishery is based on the species *Jasus edwardsii* caught in pots on and adjacent to reefs. The Victorian fishery is sub-divided into eastern and western zones at 143°4' E, just east of Cape Otway. The rock lobster fishery is an input managed fishery, with limited entry, limited pot entitlements, legal minimum sizes, and restricted seasons. Features of the fishery are briefly summarised in Table 5.2 below. It should be noted that there are a number of inactive licences in the fishery or licences with reported catches of less than 100 kg. In 1997/98, there were 28 inactive licences (one in the Western Zone and 27 in the Eastern Zone), and four licences with less than 100 kg reported catch (one in the Western Zone and three in the Eastern Zone).

The MAFRI estimates for rock lobster have been the subject of a number of counter claims by industry. These assertions are more complex to address than similar claims for the abalone fishery. There are three reasons for this:

- the variation in catches between participants in the fishery,
- the lower spatial resolution of the catch and effort data, and
- 'evidence to suggest under reporting of catch' (page 36, Rock Lobster and Giant Crab Quota Allocation Panel 1999).

Under-reporting of catch, in particular, is a problem as the methodology used by MAFRI to estimate the catch within the proposed marine national parks will only reflect the reported (ie legal) catch. In submissions to the Draft Report, there were five areas for which industry claimed that the rock lobster catch is under-estimated. However, the industry's counter claims of catch in the recommended areas exceeded

the entire catch reported to the much larger catch cell in four out of the five claims, and in two instances by more than double.

Rock lobster catch and effort data are apportioned to a catch cell, which is usually much larger than the proposed parks. Cells are usually 10' of longitude across. The catch reported to cells varies for reasons similar to those described above for abalone reefs.

To illustrate how catch from a particular area varies over time, catch code 21 encompassing the recommended Point Addis Marine National Park, is described. This catch code covers the area from 144°10' (west of Point Roadknight) to 144°20' (Horseshoe Bend Rd at Torquay), and south as far as 38°S. The reported catches to a depth of 70 metres from 1992/93 were double that of the 1996/97 catch. Variations of such magnitude are more typical in the Eastern Zone than in the Western Zone. Therefore Eastern Zone estimates will be subject to greater variability than those of the Western Zone.

In the case of abalone there are instances where catch and effort data are an adequate proxy to estimate the potential catch from an area proposed as a marine national park. The rock lobster catch cells, being much larger than the proposed parks, cannot be used to directly estimate the catches, but can offer an upper limit to the potential catch. There are areas other than Point Addis, where the MAFRI estimates seem similarly accurate, but there are some areas where inherent sampling limitations may have led to some underestimates, in particular in relation to the recommended Twelve Apostles and Point Hicks Marine National Parks.

The value of the any catch foregone due to the proposed parks should be considered in the light of intra-annual price movements of rock lobster. As the fishing season (commencing in November) proceeds, the price paid for rock lobster increases; however the landed weight falls substantially after the end of summer. The majority of rock lobster landed is prior to Easter, at prices of \$30/kg or less. In this report values are based on the 1998/99 average price of approximately \$33/kg.

Table 5.2 Victorian commercial rock lobster fishery

	Western Zone	Eastern Zone
Number of licences (including inactive licences)	90	69
Total pots	5 388	2 615
Average number of pots per licence	60	38



Catch 1997/98 (tonnes)	436	65
-------------------------------	------------	-----------

Finfish

Fisheries can be defined by species (eg the abalone fishery), area (eg the South East fishery), or gear type (eg the purse seine fishery). The Victorian finfish fishery, as defined for the purposes of this report, is 'the fishery that exists within Victoria's coastal waters and is not abalone or rock lobster'. This includes a wide range of finfish including some shark, caught by a variety of techniques including hooking, mesh nets and long lines. Below is a broad summary of the licensing categories and value of the catch for a number of fisheries that occur within Victorian waters.

The well documented bay and inlet fisheries comprise the majority of the Victorian finfish catch. The value of the finfish caught in open coastal waters has been less well documented. Fisheries Victoria report the weight and value of finfish in annual Catch and Effort Bulletins, as that landed in Victoria. This includes some catch caught outside Victorian waters including South East Fishery (SEF) species such as gemfish and warehou. Similarly,

shark is mostly caught in Commonwealth waters with by-catch allowed from Victorian bays and inlets. To better estimate the potential impact of ECC recommendations, in Table 5.3 below the species that are predominantly SEF species have been removed from the broader catch and effort data.

Finfish estimates are the most difficult to make, primarily due to the mobility of most commercial species, and the number of species with different values and different habitat requirements. For example, in an area proposed as a park, reef habitat may be used to target pinkie snapper, but a poor year for snapper may be a good year for garfish in another part of the recommended park. In the following tables, to fully describe the fisheries catch from each park, where possible the sector or type of fishing within MAFRI's general category of 'other' fisheries eg wrasse, trawl or general is identified. Values are based on 1997/98 catch data unless otherwise noted.

Table 5.3 Other commercial fisheries in Victoria

Licence Type	Number of licences (1 June 2000)	Value of catch 1997/98 \$ million
General Ocean Access (open coastal waters)	520	2.3 ¹
Port Phillip Bay and Western Port	53	2.82
Corner Inlet	20	1.26
Gippsland Lakes and Lake Tyers	19	2.13
Mallacoota	4	0.17
Ocean Wrasse	59	0.6

¹ This figure is derived from 1996/97 data.



Estimates of commercial fisheries catch and value in recommended marine protected areas

These figures are derived from MAFRI (1999) except where estimates have been adjusted to account for changes in the recommended area or as annotated. Note: in the tables below, the letters W, C or E denote the Western, Central or Eastern fishery zones respectively (where applicable).

A1 Discovery Bay Marine National Park

Fishery	Weight kg	Value \$	% of zone	% of State total
Abalone W	14 171	480 822	5.1	1.0
Rock Lobster W	14 453	452 812	3.4	2.9
Other	4 018	9 946		

A2 Twelve Apostles Marine National Park

Fishery	Weight kg	Value \$	% of zone	% of State total
Abalone C	22 794	773 400	3.3	1.6
Rock Lobster W	12 853	402 684	3.0	2.6
Other	10 130	39 279		

A3 Point Addis Marine National Park

Fishery	Weight kg	Value \$	% of zone	% of State total
Abalone C	1 638	55 577	0.2	0.1
Rock Lobster E	1 750	54 828	2.6	0.4
Squid	14 700	22 528		
Other	5 719	29 360		

B7 Point Cook Marine Sanctuary

Fishery	Weight kg	Value \$	% of zone	% of State total
Abalone C	23 300	790 569	3.3	1.6
Rock Lobster E	0			
Other	4 903	13 944		

Note: estimate of abalone catch is the average catch from 1988/89 to 1996/97.

B9 Ricketts Point Marine Sanctuary

Fishery	Weight kg	Value \$	% of zone	% of State total
Abalone C	0			
Rock Lobster E	0			
Mesh nets & other	5 246	10 904		



A4 Port Phillip Heads Marine National Park

Fishery	Weight kg	Value \$	% of zone	% of State total
Abalone C	33 000	1 119 690	4.7	2.3
Rock Lobster E	1 000	31 330	1.5	0.2
Mesh nets & other	negligible			

Note: abalone catch is estimated from a much larger MAFRI study area and much larger catch cells, and should be regarded as an upper limit, especially as catch from this area has reportedly diminished since 1996/97.

A6 French Island Marine National Park

Fishery	Weight kg	Value \$	% of zone	% of State total
Abalone C	0			
Rock Lobster E	0			
Mesh nets & other	17 496	84 880		

A7 Churchill Island Marine National Park

Fishery	Weight kg	Value \$	% of zone	% of State total
Abalone C	0			
Rock Lobster E	0			
Mesh nets & other	3 165	11 289		

A8 Bunurong Marine National Park

Fishery	Weight kg	Value \$	% of zone	% of State total
Abalone C	0			
Rock Lobster E	896	28 072	1.3	0.2
Other	841	5 957		

A9 Wilsons Promontory Marine National Park

Fishery	Weight kg	Value \$	% of zone	% of State total
Abalone C	23 319	791 214	3.3	1.6
Rock Lobster E	1 012	31 706	1.6	0.2
Trawl, seines & other	39 359	137 956		

A10 Corner Inlet Marine National Park

Fishery	Weight kg	Value \$	% of zone	% of State total
Abalone E	0			
Rock Lobster E	0			
Mesh nets & other		100 000		

Note: catch is estimated from 1998/99 catch data.



B11 Beware Reef Marine Sanctuary

Fishery	Weight kg	Value \$	% of zone	% of State total
Abalone E	4 300	145 899	0.9	0.3
Rock Lobster E	500	15 665	0.7	0.1
Other	negligible			

Note: estimate of abalone catch is the average catch from 1988/89 to 1996/97.

A12 Point Hicks Marine National Park

Fishery	Weight kg	Value \$	% of zone	% of State total
Abalone E	16 716	567 157	3.6	1.2
Rock Lobster E	890	27 884	1.3	0.2
Mesh nets & other	13 580	41 791		

A13 Cape Howe Marine National Park

Fishery	Weight kg	Value \$	% of zone	% of State total
Abalone E	19 668	667 335	4.3	1.4
Rock Lobster E	61	1 911	0.1	0
Other	28 454	96 579		

Abalone – Western Zone

The Western Zone for this fishery runs from the South Australian border to the mouth of the Hopkins River near Warrnambool. Discovery Bay Marine National Park is the only recommended park within the Western Zone of the abalone fishery. The impact on the Western Zone abalone fishery is the loss of grounds that yield approximately 5.1% of the Western Zone catch, with this likely to vary between 4.0% and 6.5%.

Abalone – Central Zone

The Central Zone for this fishery runs from the mouth of the Hopkins River at Warrnambool to Lakes Entrance. The combined effect of the recommended Twelve Apostles, Point Addis, Port Phillip Heads and Wilsons Promontory Marine National Parks and the Point Cook Marine Sanctuary is the loss of ground that yield approximately 14.8 % of the Central Zone abalone catch.

Abalone – Eastern Zone

The Eastern Zone for this fishery runs from Lakes Entrance to the New South Wales border. The effect of the recommended Point Hicks and Cape Howe Marine National Parks and the Beware Reef Marine Sanctuary on the eastern zone of the abalone fishery is the loss of grounds that have historically provided up to 8.8% of the Eastern Zone catch, varying between 7.9% and 9.4%.

Rock lobster – Western Zone

The Western Zone for this fishery runs from the South Australian border to just east of Cape Otway. The recommended Discovery Bay Marine National Park and the Twelve Apostles Marine National Park represent the only two recommended parks within the Western Zone of the rock lobster fishery. The potential impact of the ECC's recommendations are estimated by MAFRI to be loss of grounds that have yielded 6.4% of the Western Zone rock lobster catch. The ECC, in reconsidering these estimates taking into account some of the issues outlined in the above discussion, believes that the impact is potentially higher, perhaps up to 10% of the Western Zone catch.



Rock lobster – Eastern Zone

The Eastern Zone for this fishery runs from just east of Cape Otway to the New South Wales border. The effect of the recommended marine national parks (including Port Phillip Heads), and considering the additional catch of Beware Reef, is the loss of fishing grounds that yield approximately 9% of the zone's catch.

Finfish

The value of the finfish catch from all recommended marine national parks and significant marine sanctuaries was estimated to be \$604 000. This amounts to less than 5% of the catch landed commercially in Victoria in 1996/97. Note: finfish includes all species except abalone and rock lobster.

Statewide summary for Victorian commercial fisheries

The effects of the recommended marine national parks and major marine sanctuaries across the whole Victorian abalone fishery is the loss of grounds that yield approximately 11% of the Victorian commercial abalone harvest, valued at about \$5.4 million per annum (1999 prices). In the case of the Victorian rock lobster fishery, areas that have provided approximately 6.8% of the total catch of rock lobster, valued at about \$1 million per annum (1998/99 average prices) will not be available for harvest. The effect of the proposed marine national parks on Victorian finfish fisheries is the loss of access to grounds that have supplied an estimated 5% of the Victorian landed catch valued at \$0.6 million per annum (1997/98 prices).



Appendix 6

Victorian marine ecological data

- 6.1 Summary of marine ecosystem mapping in Victoria (1992 – 2000)
- 6.2 Marine habitat classes and ecological communities
- 6.3 Marine invertebrate species of conservation concern and significant locations



6.1 Summary of marine ecosystem mapping in Victoria (1992 – 2000) – adapted from Ferns & Hough (2000)

	Mapping related to the development of bioregions for Victoria 1:1 million	Strategic inshore mapping 1:100,000	Extended mapping of selected offshore areas 1:100,000	Mapping of specific areas for management purposes For the open coast 1:10,000 - 1:25,000	Mapping of specific areas for management purposes For bays and inlets 1:10,000 - 1:25,000
Summary	Broad examination and classification of physical and biological components of Victoria's coastal waters and the Bass Strait. Work supported the development of IMCRA.	Strategic statewide area mapping of Victoria's broad substratum classes within nearshore waters (generally < 30m depth).	Extended mapping of nearshore waters to the 3 nautical mile State Territorial Boundary to assist with the identification of candidate MPAs.	Mapping at specific areas of Victoria's open coast for management and monitoring purposes.	Mapping at specific areas of Victoria's bays and inlets for management and monitoring purposes.
Data collection overview	1. Initially key marine environmental datasets were identified as suitable for the development of a biophysical classification (eg bathymetry, tides, physico-chemical, waves, geology, distribution of biota etc.). 2. Physical classification of open coastal waters using multivariate analysis using the variables bathymetry, coastal orientation, tidal levels, currents, wave energy and sea surface temperature. 3. Physical classification of Bass Strait using multivariate analysis of physico-chemical properties of seawater. 4. Spatial boundaries for bioregions submitted towards the development of IMCRA.	Initially LandSat TM imagery of open coastline nearshore waters supplemented with aerial photo interpretation to produce spatial boundaries of major substratum attributes ranging from 10-50 m depth. (NB: aerial photo interpretation used exclusively for intertidal mapping.) Spatial boundaries and substratum attributes checked through a series of bounce dives, video drops and grab samples. Dominant biota described from observations. (NB: quantitative infauna community and sediment data derived from broad scale sampling of sediments across the open coast.)	Refinement of spatial boundaries and substratum attributes derived from original LandSat TM using hydroacoustic devices (eg RoxAnn and Echo Listener). Spatial boundaries extended to the 3 nautical miles, additional substratum attributes derived from application of hydroacoustic technology. Substratum attributes checked through a series of video drops. Dominant biota described from observations.	Further refinement of spatial boundaries for open coast areas using combined side-scan sonar and Echo Listener devices to achieve fine-scale spatial resolution. Quantitative data on biotic communities inhabiting rocky reefs collected by trained marine biologists. Divers swam a series of stratified 200m belt transects.	Aerial photo interpretation to produce spatial boundaries, mainly depicting macrophyte beds and major substratum attributes. Semi quantitative data on macrophytes. Visual transects using glass bottom observation pod on base of survey vessel. Also video transects using towable camera.
Scale(s)	Nominal scale of 1:1million	Nominal scale of 1:100 000	Nominal scale of 1:100 000	Nominal scale of 1:25 000	Nominal scale of 1:25 000





Data sources	Numerous data sources, see key references for details.	LandSat TM images from ACRES (Band 1, pre-processed to level 9), rectified against AUSLIG 1:100 000 topographic maps. Final processed maps incorporate 1:25 000 coastline.	Collected directly from field sampling.	Collected directly from field sampling.	Rectified colour positive aerial photos, other data collected from field sampling.
Level of ground truthing	Regions derived through modelling and expert opinion. Bioregionalisation provides an initial framework towards delineating the marine environment into broad 'homogeneous' regions.	Bounce dives and video variable, depending on heterogeneity of local area (in total 467 samples to date). Broad-scale systematic sampling of soft sediments involved 46 transects, 20 km apart. Replicate samples taken at 10m, 20m and 40m stations (total of 136 samples).	Selected offshore areas mapped using hydroacoustic devices involving boat transects 200 – 500 m apart using RoxAnn and Echo Listener acoustic devices.	Bunurong area mapped using hydroacoustic devices involving boat transects approx 200 m apart. Note: side scan sonar provides a swath area approximately 120m therefore a mosaic of whole area is generated.	Numerous transects and observation sites (generally <100) in each study area.
Accuracy, precision and resolution of data capture	Varies for original data. Most data point form then modelled into continuous polygon areas using spatial interpolation methods.	DGPS employed throughout surveying. Polygon boundaries accuracy 30m. Attribute accuracy derived from remote sensing interpretation - generally 80% accurate.	DGPS employed throughout surveying. Polygon boundary accuracy 30m. Polygons generated using IDW interpolation of transect data combined with LandSat TM polygons. Attribute accuracy derived from remote sensing interpretation - generally 80% accurate.	DGPS employed throughout surveying. Polygon boundaries accuracy 20m. Attribute accuracy derived from remote sensing interpretation - generally 80% accurate.	DGPS employed throughout surveying. Polygon boundaries accurate within 5-10m. Attribute accuracy derived from remote sensing interpretation - generally 80% accurate.
GIS or other presentation	Available on NRE Marine and Coastal Corporate Geospatial Data Library and Australian Coastal Atlas (see References 157, 235 and 336).	Available on NRE Marine and Coastal Corporate Geospatial Data Library and Australian Coastal Atlas (see References 157, 235 and 336).	Available on NRE Marine and Coastal Corporate Geospatial Data Library and Australian Coastal Atlas (see References 157, 235 and 336).	Soon to be available on NRE Marine and Coastal Corporate Geospatial Data Library and Australian Coastal Atlas (see References 157, 235 and 336).	Available on NRE Marine and Coastal Corporate Geospatial Data Library and Australian Coastal Atlas (see References 157, 235 and 336).
GIS metadata standards used	All data captured according to full ANZLIC Metadata standards.	All data captured according to full ANZLIC Metadata standards.	All data captured according to full ANZLIC Metadata standards.	All data captured according to full ANZLIC Metadata standards.	All data captured according to full ANZLIC Metadata standards.
Coverage	Statewide (and national).	Statewide nearshore waters.	Selected areas.	Bunurong Marine Park.	All major bays, inlets and estuaries across Victoria (Port Phillip Bay to be completed late 2000).
Key references	105, 175 and 377	154, 155, 156 and 158 (See 157, 235 and 336 for work associated with GIS)	154, 332, 333 and 334	158	50, 331 and 337 (Western Port and Port Phillip Bay unpublished)

6.2 Marine habitat classes and ecological communities

In Victoria, marine ‘ecosystem’ mapping is conducted on both a strategic and management basis. The scale of mapping for both spatial and attribute detail is therefore dependent on the purpose for which it is required. All the attributes can be represented at different spatial scales, but their use is dependent on the resolution, suitability and availability of the attribute information. Victoria considers an ‘ecosystem’ as a holistic entity. The ‘ecosystem’ is not readily definable at one spatial scale; rather, it is the attributes that form part the ‘ecosystem’ that exist on various spatial scales. The major units that describe Victoria’s ecosystems are described below:

Bioregions

Bioregions are large biogeographic regions that share similar broad-scale physiographic processes. Victoria’s biophysical regions are described by the Victorian Institute of Marine Science *et al.* (1994), which were used nationally for Australia’s IMCRA regions.

Marine Habitat Classes (MHCs)

MHCs are based on dominant habitat attributes that are readily observed by underwater divers, video and remote sensing techniques. We have attempted to construct a logical approach to mapping MHCs by developing standard attribute descriptors that can be selected to be represented at various spatial scales (1:10,000 – 1:100,000). In general the attributes describe the dominant physical and biological structure of marine ‘habitats’. MHC attributes are available for intertidal and subtidal areas (refer Ferns & Hough 1999 for details).

Marine Ecological Communities (MECs)

MECs represent the finest level of ecological community data available and are derived from systematic quantitative sampling of species along 200m belt transects. Currently MECs for macrophytes, invertebrates and fish have been delineated for rocky reefs of the Central Victoria and Flinders bioregions (refer Ferns & Hough 2000 for details).

Interim MHC attributes for the intertidal and immediate coastal areas

Description	Intertidal MHC attributes		
Shoreline category	Dune Beach Platform Beach/platform	Reef Cliff (steep or inclined) Lagoon Flat	Artificial seawall
Intertidal area/zone	Coastal/Backshore Supralittoral	Littoral Infralittoral fringe	
Substratum type	Bedrock Bedrock (broken) Bedrock/Rock Cobble	Boulder/Cobble Sand Sand/Gravel Sand/Bedrock	Mud Mud/Sand Artificial structure (ie concrete/wood/metal)
Lithology	Basalt Granite Sandstone	Limestone Calcarenite	
Wave energy/exposure	Low	Moderate	Moderate – High
Dominant structural biota	Coastal scrub Coastal heath Mangrove Salt marsh Seagrass	Fleshy algae–mixed greens Fleshy algae–mixed browns <i>Durvillaea</i> <i>Hormosira</i> Turf algae	Coralline algae <i>Pyura</i> Mussels Barnacles



Interim MHC attributes for subtidal reef and sand substrata across Victoria

Description	Subtidal MHC attributes			
Substratum type	Reef		Sediment	
Substratum relief*	Low profile (reef) Heavy (reef)		Flat (sand / mud) Ripples (sand) Gently undulating ridges (sand) Steeply undulating ridges (sand)	
Substratum texture#	Solid Broken (boulders/slabs/bommies) Cobbles Rubble/Pebbles/Gravel	Gutters	Coarse sand Medium sand Fine sand	Muddy sand Mud/silt Shelly rubble/grit
Substratum consistency	Continuous	Patchy		
Lithology	Basalt Granite Sandstone		Limestone Calcarene	
Dominant reef biota**	Kelp – <i>Phyllospora</i> dominated Kelp – <i>Macrocystis</i> dominated Kelp – <i>Durvillaea</i> dominated Kelp – <i>Ecklonia</i> dominated Kelp – Mixed <i>Phyllospora</i> / <i>Ecklonia</i> Mixed algae - Brown algae dominated Mixed algae – other		<i>Cystophora</i> <i>Amphibolis</i> <i>Cystophora</i> / <i>Amphibolis</i> Red algae dominated Sessile invertebrates (eg sponges) Urchin barrens	
Reef understorey biota**	Encrusting coralline algae Mixed red algae Sessile invertebrates		<i>Caulerpa</i> dominated Mixed algae <i>Plocamium</i> dominated	
Dominant sediment biota**	<i>Halophila</i> <i>Posidonia</i> <i>Amphibolis</i> <i>Zostera</i>	<i>Heterozostera</i> <i>Ruppia</i> Mixed seagrass/algae <i>Caulerpa</i> dominated	Mixed <i>Zostera</i> / <i>Posidonia</i> / <i>Halophila</i> Mixed <i>Posidonia</i> / <i>Halophila</i> Mixed <i>Zostera</i> / <i>Posidonia</i> Mixed <i>Zostera</i> / <i>Halophila</i>	
Seagrass density	Sparse	Medium	Dense	

*** Substratum relief descriptions**

Low profile reef = relief < 1 m.

Heavy reef = relief > 1 m.

Flat = surface predominantly smooth without noticeable rises or depressions.

Ripples = obvious rises up to 0.3 m in height.

Gently undulating ridges = rises > 0.3 m in height, gradually sloping between successive troughs and rises.

Steeply undulating ridges = rises > 0.3 m in height, steeply sloping between successive troughs and rises.

Substratum texture descriptions

Solid = solid rock, not obviously broken into fragments.

Broken (boulders/slabs/bommies) = rock fragments > 30 cm diameter or expanses of broken reef termed 'slabs' or 'bommies'.

Cobble = rock fragments 10 cm - 30 cm diameter.

Rubble/Gravel/Pebbles = small or irregular rock particles 4 mm – 10 cm in diameter.

Gutters = gutter-like depressions or chutes between rock facies, often filled with sediment.

Coarse sand = 0.5 mm – 1 mm diameter.

Medium sand = 0.25 mm – 0.5 mm diameter.

Fine sand = 0.125 mm – 0.25 mm diameter.

Muddy sand = mixture of sand and mud.

Mud/silt = < 0.031 mm diameter.

Shelly rubble/grit = sediment composed of shelly debris.



Detailed descriptions of selected MHC attributes for reef and sediment biota

MHC attribute	Detailed description
<i>Durvillaea</i>	<i>Durvillaea potatorum</i> forms a dense fringe just beyond the intertidal zone on exposed coasts across Victoria. <i>Durvillaea</i> can occur in lower depths (to 15 m) at very exposed locations.
<i>Phyllospora/Ecklonia</i>	The large brown algae <i>Phyllospora comosa</i> and <i>Ecklonia radiata</i> form canopies in many exposed open coast localities across Victoria (2-15 m depth). Both algae usually co-occur, however, <i>Phyllospora</i> can form single stands at shallow depths (5 m), and <i>Ecklonia</i> can dominate in slightly deeper water (10 m), particularly in far east Gippsland. Other larger algae present include <i>Cystophora platylobium</i> and <i>Seirococcus axillaris</i> . The understory consists of red algae and sessile invertebrates.
<i>Macrocystis</i>	<i>Macrocystis angustifolia</i> forms canopies in isolated patches across Victoria from the far west to Wilsons Promontory (and possible to Cape Conran). <i>Macrocystis</i> was not covered in Part 2 of this inventory report as it occurred infrequently. Consequently there is no data to determine whether the assemblages in <i>Macrocystis</i> beds differ from those elsewhere. Nevertheless there is evidence from Tasmania that fish assemblages differ in <i>Macrocystis</i> beds (eg Edmunds 1990).
Mixed algae	A mixed algal assemblage exists in shallow waters (1-5 m) on sheltered to moderately exposed coasts. This assemblage extends subtidally on some coasts (eg Bunurong) to 15 m. No one algal species dominates. Species include brown algae (eg <i>Cystophora</i> spp, <i>Sargassum</i> spp, <i>Acrocarpia paniculata</i> , <i>Zonaria</i> spp, <i>Ecklonia radiata</i>), green algae (<i>Caulerpa</i> spp, <i>Codium</i> spp), and red algae (eg <i>Sonderopelta coriacea</i> , <i>Plocamium</i> spp, <i>Phacelocarpus peperocarpus</i> , various coralline algae).
Urchin “barrens”	The urchin <i>Centrostephanus rodgersii</i> forms large “barrens” in far east Gippsland. These barrens can cover several hundred square metres. Vegetation in these areas is restricted to crustose coralline algae. The common sea-urchin <i>Helicodaris erythrogramma</i> rarely forms large barrens.
Red algae	Red algae can dominate reefs when they are ephemeral (eg periodically covered by shifting sand) or in poor light (ie deep reefs or in turbid waters).
<i>Amphibolis</i> seagrass	<i>Amphibolis antarctica</i> can form large beds, in sandy areas or on flat low profile reefs, in shallow water (1-7 m), on sheltered to moderately exposed coasts. It is common in small bays on the open coast or on the sheltered side of inshore reefs. <i>Amphibolis</i> beds can contain some large brown algae (eg <i>Cystophora</i>) if there are exposed patches of rock or stones. <i>Amphibolis</i> extends from western Victoria to the eastern side of Wilsons Promontory.
<i>Caulerpa</i>	<i>Caulerpa</i> species can form large patches in shallow water (1-5 m) in sandy areas adjacent to rocky reefs or in sheltered bays (eg Westernport). Common patch-forming species include <i>C. brownii</i> and <i>C. cactoides</i> . <i>Caulerpa</i> beds often merge with adjacent seagrass beds.
<i>Heterozostera</i> seagrass	<i>Heterozostera tasmanica</i> covers patches of sand in sheltered bays, and occasionally on the open coast, in shallow water (1-10 m).
<i>Posidonia</i> seagrass	<i>Posidonia australis</i> forms large beds in Corner Inlet and in small isolated patches elsewhere (Barwon Heads and Great Glennie Island).
Sessile invertebrates	Sessile invertebrates dominate reefs in poor light (eg in turbid or deep water). These invertebrates include sponges, bryozoans and cnidarians (gorgonians, antipatharians, hydroids) etc. Future studies may show that this habitat is heterogeneric and requires subdivision.



Macrophyte MECs of Victoria (Cental Victoria and Flinders bioregions)

MEC Category	Description
M1	Mixed browns dominated by <i>Acrocarpia paniculata</i> , <i>Cystophora retorta</i> , <i>Seirococcus axillaris</i> and the seagrass <i>Amphibolis antarctica</i> . <i>Phyllospora</i> absent, <i>Ecklonia radiata</i> uncommon. <i>Macrocystis angustifolia</i> present in small patches. Erect coralline algae abundant. Locality: south and east Bunurong.
M2	Mixed browns dominated by <i>Cystophora moniliformis</i> , <i>Cystophora retroflexa</i> , <i>Cystophora retorta</i> , <i>Acrocarpia paniculata</i> and <i>Macrocystis angustifolia</i> . Erect coralline algae abundant. Fleshy red algae not abundant. Locality: east Pyramid Rock, Phillip Island.
M3	<i>Phyllospora comosa</i> dominated assemblage. <i>Acrocarpia paniculata</i> , <i>Macrocystis angustifolia</i> , <i>Cystophora</i> spp and other browns also abundant. Understorey and open turfs of erect coralline algae and fleshy red algae, including <i>Haliptilon</i> , <i>Amphiroa</i> and <i>Phaeocarpus</i> . <i>Ecklonia</i> uncommon. Locality: Phillip Island.
M4	<i>Phyllospora-Ecklonia-Cystophora retorta</i> dominated assemblage. <i>Acrocarpia paniculata</i> , <i>Carpoglossum confluens</i> and <i>Cystophora platylobium</i> abundant. Understorey of fleshy red algae including <i>Pterocladia lucida</i> , <i>Melanthalia obtusata</i> , <i>Plocamium</i> spp, <i>Phaeocarpus peperocarpus</i> . Locality: Lonsdale Back Beach.
M5	<i>Ecklonia</i> dominated assemblage. Fleshy red algal species abundant (similar species to MEC Category M4). <i>Phyllospora</i> absent.
M6	<i>Ecklonia-Phyllospora</i> dominated assemblage. <i>Seirococcus axillaris</i> , <i>Carpoglossum confluens</i> , <i>Sargassum</i> species abundant and fleshy red algal species abundant. Locality: northwest (Shellback Island) and northeast Wilsons Promontory (from north Waterloo Bay).
M7	<i>Phyllospora</i> dominated assemblage. <i>Ecklonia</i> abundant. Understorey of fleshy and coralline red algae common but in low abundance. High cover of encrusting coralline algae. Other browns present but in very low abundance. <i>Durvillaea</i> may be present in the shallow sub-littoral zone. Locality: Lonsdale Bay; Cape Woolamai; midwest, south to mid-eastern Wilsons Promontory.
M8	<i>Phyllospora</i> and <i>Durvillaea</i> assemblage, <i>Durvillaea</i> occurring to considerable depth (>3 m). Understorey algae generally absent. High cover of encrusting coralline algae. Locality: Cape Schanck; Cape Otway.
M9	Low to medium cover of large brown algal species, either mixed or monospecific (generally less than 50% cover). Sparse to patchy stands of <i>Phyllospora</i> , <i>Macrocystis</i> , <i>Ecklonia</i> and <i>Acrocarpia</i> . High cover of encrusting and erect coralline algae, including <i>Haliptilon</i> , <i>Metagoniolithon</i> and <i>Cheilosporum</i> . <i>Halopteris</i> , <i>Caulerpa flexilis</i> , <i>Caulerpa obscura</i> and <i>Sonderopelta</i> common. Locality: Flinders to Cape Schanck.

Invertebrate MECs of Victoria (Cental Victoria and Flinders bioregions)

MEC Category	Description
IN1	<i>Heliocidaris erythrogramma</i> , <i>Haliotis rubra</i> and <i>Cenolia trichoptera</i> very abundant. High diversity of sea star species with characteristic species including <i>Nectria ocellata</i> , <i>Nectria macrobrachia</i> , <i>Patiriella brevispina</i> , and <i>Petricia vernicina</i> . Location: Wilsons Promontory.
IN2	<i>Haliotis rubra</i> and <i>Turbo undulatus</i> the most abundant species. <i>Dicathais orbita</i> , <i>Plagusia chabrus</i> and <i>Patiriella brevispina</i> also common. <i>Heliocidaris erythrogramma</i> not abundant. Locations: Lonsdale Bay, Lonsdale Back Beach, Phillip Island and Bunurong.
IN3	<i>Haliotis rubra</i> , <i>Haliotis laevigata</i> , <i>Heliocidaris erythrogramma</i> and <i>Patiriella brevispina</i> the most abundant species. Locations: Port Phillip Heads and Bunurong.
IN4	All species low in abundance. <i>Haliotis rubra</i> the most abundant. Other characteristic species: <i>Nectria ocellata</i> , <i>Nectria macrobrachia</i> , <i>Fromia polypora</i> and <i>Tosia australis</i> . Location: from Gunnamatta to Cape Schanck.
IN5	<i>Cenolia trichoptera</i> abundant, all other species relatively low in abundance, including <i>Haliotis rubra</i> . Location: south of Waratah Bay.



Fish MECs of Victoria (Central Victoria and Flinders bioregions)

MEC	
Category	Description
F1	Dominant species are <i>Notolabrus tetricus</i> , <i>Odax cyanomelas</i> , <i>Scorpius aequipinnis</i> , <i>Notolabrus fucicola</i> and <i>Cheilodactylus nigripes</i> . Other characteristic species include <i>Parma victoriae</i> , <i>Pictilabrus laticlavius</i> , <i>Menschenia hippocrepis</i> and <i>Aplodactylus arcidens</i> . Locations: Lonsdale Back Beach, Phillip Island and Bunurong.
F2	Dominant species are <i>Notolabrus tetricus</i> , <i>Odax cyanomelas</i> , <i>Parma victoriae</i> and <i>Cheilodactylus nigripes</i> . <i>Scorpius aequipinnis</i> and <i>Notolabrus fucicola</i> are generally low in abundance. Other characteristic species include <i>Pictilabrus laticlavius</i> , <i>Upeneichthys vlamingii</i> , <i>Menschenia hippocrepis</i> and <i>Menschenia flavolineata</i> . Location: Port Phillip Heads.
F3	Dominant species are <i>Caesioperca rasor</i> , <i>Notolabrus tetricus</i> , <i>Notolabrus fucicola</i> , <i>Dinolestes lewini</i> and <i>Odax cyanomelas</i> . Other characteristic species are: <i>Acanthaluteres vittiger</i> , <i>Enoplosus armatus</i> , <i>Cheilodactylus nigripes</i> , <i>Scorpius aequipinnis</i> and <i>Trachinops caudimaculatus</i> . Location: western Wilsons Promontory.
F4	Dominant species are <i>Caesioperca rasor</i> , <i>Notolabrus tetricus</i> and <i>Dinolestes lewini</i> . Other characteristic species are: <i>Cheilodactylus nigripes</i> , <i>Scorpius aequipinnis</i> , <i>Scorpius lineolata</i> , <i>Atypichthys strigatus</i> and <i>Latridopsis forsteri</i> . Location: eastern Wilsons Promontory.



6.3 Marine invertebrate species of conservation concern and significant locations

Recommended marine invertebrate species to be listed as threatened under *Victoria's Flora and Fauna Guarantee Act 1988* (O'Hara & Barmby 2000). Species denoted * recorded in existing MPA, species denoted # recorded in ECC recommended marine protected area.

Species	Locality	IUCN threat category and criteria	Scale of threat
<i>Hallicarcinus</i> sp # (undescribed) Crab	Delray Beach to Woodside Beach	Vulnerable, D2	Global
<i>Athanopsis australis</i> # Ghost shrimp	Bridgewater Bay and Corio Bay and Beaumaris	Vulnerable, D2, B2c	Global
<i>Eucalliax tooradin</i> *# Ghost shrimp	Swan Bay (Port Phillip Bay and Cribb Point (Western Port)	Vulnerable, D2, B2c	Global
<i>Michelea microphylla</i> Ghost shrimp	Crib Point	Vulnerable, D2, B2c	Global
<i>Amphiura triscacantha</i> * Brittle-star	South of Sunday Island, North Arm of Western Port	Vulnerable, B2c	Within Victoria
<i>Ophiocoma australis</i> * Brittle-star	South of Sunday Island	Vulnerable, B2c	Within Victoria
<i>Apsolidium densum</i> # Sea-cucumber	Mushroom Reef (off Flinders)	Vulnerable, D2	Global
<i>Apsolidium handrecki</i> Sea-cucumber	Merricks (Western Port)	Vulnerable, D2	Within Victoria
<i>Pentocnus bursatus</i> * Sea-cucumber	Cape Patterson	Vulnerable, D2	Within Victoria
<i>Thyone nigra</i> Sea-cucumber	Corio Bay (Port Phillip Bay)	Vulnerable, B2c	Within Victoria
<i>Trochodota shepberdi</i> * Sea-cucumber	South of Sunday Island	Vulnerable, B2c	Within Victoria
<i>Bassethulia glypta</i> # Chiton	Port Phillip Heads, Mushroom Reef (off Flinders)	Vulnerable, D2	Global

Note: B2c = Small distribution; fragmented habitat decline in area or habitat. D2 = Very small distribution at threatened locations.



Significant shallow- water sites (0-20 m) for marine invertebrate species within Victoria (O'Hara & Barmby 2000)

Location	Species
Cape Bridgewater Bay (Horseshoe Reef)	<i>Athanoopsis australis</i>
Skenes Creek (10 km NE of Apollo Bay)	<i>Apsolidium densum</i>
Port Phillip Bay: - Swan Bay - Northern Corio Bay from Pt Abeona to Pt Wilson - Beaumaris - Port Phillip Heads	<i>Eucalliax tooradin</i> <i>Thyone nigra</i> <i>Athanoopsis australis</i> <i>Bassethulia glypta</i>
Flinders (Mushroom Reef)	<i>Apsolidium densum</i> , <i>Bassethulia glypta</i>
Western Port: - Merricks (shore platform) - Off Crib Point - San Remo (reef flat)	<i>Apsolidium handrecki</i> <i>Eucalliax tooradin</i> , <i>Michelea microphylla</i> <i>Platydoris galbanus</i> , <i>Rhodope</i> sp, (11 other undescribed opisthobranch molluscs are also known only from this site)
Cape Paterson (boat ramp)	<i>Pentocnus bursatus</i>
Nooramunga: - NE of Snake Island - S of Sunday Island	<i>Ophiocolina australis</i> , <i>Trochodota shepherdii</i> <i>Amphiura triscacantha</i>
Off Delray/Woodside Beaches	<i>Halicarinus</i> sp, <i>Platydoris galbana</i>



Appendix 7

Technical criteria for marine aquaculture sites

Marine-based sites

	Shellfish	Finfish
Water depth	For subtidal species minimum depth of 10 m to 25 m generally preferred.	Minimum depth of 12 m with more than 20 m preferred.
Waves	Generally maximum wave heights less than 2 m. Wave period (which defines wave steepness) should be more than 5 seconds.	Generally maximum wave height of 2–3 m. Costs increase significantly with waves greater than 3 m.
Salinity	Salinity levels need to be considered for individual species.	
Water temperatures	Of less significance than for finfish, however, increased growth rates may be achieved where temperatures are at the higher end of the natural range for the species.	Water temperatures directly influence physiological processes including growth. Higher end of natural temperature range is advantageous for growth, dependent on the species. Cold water species (e.g. Atlantic Salmon) will require production strategies that minimise the impact of high summer water temperatures in Victoria.
Contamination	Sites should not be in downstream proximity to effluent outfalls and heavy metal contamination and faecal coliform counts should be within set limits.	
Nutrient status of water	Prefer low to moderate nutrient status. Excessive levels can lead to reduction in water quality, increased fouling and blooms of undesirable species.	Not directly significant, however, nutrients may influence the extent of marine biofouling on sea pen nets.
Algal blooms	Areas with no known history of algal blooms preferred. Known algal bloom areas may be acceptable where there are other benefits (e.g. high nutrient water) and where blooms are either rare or predictable so that stock can be moved. In the latter case alternative sites would also be required.	Generally prefer moderate to low seasonal algal blooms. Excessive blooms of specific species can cause major problems resulting in mortality of fish.
Currents and flushing	Within range of 5–50 cm per second av. current. Greater current speeds will require additional mooring design consideration.	Within range of 5–50 cm per second av. current. Problems in managing equipment at speeds greater than 50 cm per second.
	Flushing (or water exchange) may be less significant for shellfish compared with intensive finfish farming. Well flushed sites enable adequate oxygen exchange, dispersal of organic sediment outputs and reduce competition for nutrients (eg. filter-feeding shellfish). Shellfish are liable to remove nutrients from the water while finfish are liable to add matter to the water over a localised area. For these reasons aquaculture sites should operate well within defined boundaries with adequate separation from high conservation value sites, e.g. marine protected areas.	
Wind	Areas with some protection from prevailing winds are preferred. Boat access and serviceability is limited where winds (greater than 20–30 knots) over an extended fetch generate unsuitable wave climate.	
Sea floor	Generally prefer sandy sea floors while avoiding areas such as reefs and seagrass beds with high environmental and other values. Areas where benthos recovery time from any effects which are likely to be slow should also be avoided.	
Area available	Designated areas should be large enough to meet the following criteria: of sufficient size for a viable industry with reasonable economies of scale; room for a number of separate licence areas; sufficient space between sites to reduce the risk of spread of disease and to enable general access between farmed areas; the total area needs to be of sufficient size to allow regular fallowing of actually utilised sites. The figures below are indicative of intensity of use within lease areas.	
	At any one time ~50% of area in use. Within this area intensity of use would be low with normally 10–20 m between surface long lines.	At any one time around 5% of actual lease area would be in use to allow for rotation of pens. Pens are usually about 25 m in diameter.
Access	Areas should be in reasonable proximity to land-based infrastructure. Access is more important for finfish where generally daily access will be required. Remote stations on aquaculture sites (houseboats etc.) have been established overseas, however this will increase production costs.	
Land-based infrastructure	For some species (e.g. mussels) grading and cleaning generally done at sea. Require port or jetty with loading and unloading facilities, vehicle access and vessel mooring.	Generally more land-based infrastructure required than for shellfish. Harvest, grading and processing facilities generally required close to port with cool store and feed storage.
Visual impact	Low profile dark flotation is desirable to reduce visual impact. Where biological characteristics allow, sub surface flotation could be used to reduce visual impact.	Areas should preferably be where visual impact will be minimised.



Land-based sites

Salinity of water source	Salinity levels need to be considered for individual species.
Water temperature	This will often be controlled on site. Preference for stable source with gradual seasonal changes.
Contamination	Water intake site should not be in a downstream proximity to effluent outfalls and heavy metal contamination and faecal coliform counts should be within set limits.
Nutrient status of water	For certain shellfish species a higher level is preferred.
Turbidity	Low turbidity water is preferred.
Algal blooms	Areas with no (or very low) history of algal blooms are preferred.
Water intake site	Site should be where environmental effects of the intake and pipeline are acceptable and where pumping requirements are minimised. Deeper intake gives cleaner water and more stable water properties.
Waste discharge	Ideally land-based aquaculture should aim for zero discharge, but this will not always be practicable. Any discharge should be subject to EPA works approval and should be adequately separated from high conservation value sites (eg. marine protected areas) and possibly high recreation use areas.
Area available	Visible impact should be able to be minimised. Where private land is utilised, the proposal will need to meet the required planning provisions. Where public land is utilised, it must be demonstrated that the proposal is the most appropriate use for the land from a whole-of-community perspective.

