Australia's South-east Marine Region: A User's Guide to Identifying Candidate Areas for a Regional Representative System of Marine Protected Areas

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http://www.ea.gov.au/coasts/mpa/

Natural Heritage Trust

Helping Communities Helping Australia

A Commonwealth Government Initiative

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Contents

About this user's guide

This guide, developed with input from stakeholders and scientific advice, aims to assist stakeholders to contribute information to the identification and selection of options for a representative system of marine protected areas (MPAs) in Australia's South-east Marine Region.

This guide is in two parts:

Part A includes an introduction and background on general considerations for designing the regional system of MPAs as a whole. Part A outlines the context and the evolution of the process to date and will be essential reading for people less familiar with the process or who have not been directly involved.

Part B includes guidance to stakeholders in the form of specifications, a checklist and a hypothetical example to help identify options for a representative system of MPAs using 11 Broad Areas of Interest.

Stakeholders who are familiar with the MPA process in Australia's South-east Marine Region, and who have been involved in the evolution of the process over the last few years, may wish to go directly to Part B of this guide and begin to consider their options for a system of MPAs in the region.

Additional resources are available on the Environment Australia web site (http://www.ea.gov.au/coasts/mpa/index.html) including maps showing:

- Broad Areas of Interest for the South-east Marine Region
- Exclusive Economic Zone boundary (200 nautical miles)
- Coastal waters boundary (three nautical miles)
- Geomorphic features
- the Interim Marine and Coastal Regionalisation for Australia (IMCRA)
- Level 2 and 3 bioregionalisations
- Existing marine protected areas in Commonwealth and state waters
- Maps of each of the Broad Areas of Interest in pdf format

Your input to the process

You are invited to use the specifications (Section 3), the description of the 11 Broad Areas of Interest (Figure 3.1 and Appendix E), the tools in Section 4 and your knowledge and interests in the region to help identify areas that may contribute to a representative system of marine protected areas (MPAs) in the South-East Marine Region. Your information will be used as one of the many inputs to decisions on the regional reserve design. Support to design your option is available by contacting either Environment Australia, [phone 02 6274 1767 or email leanne.wilks@ea.gov.au or peter.taylor@ea.gov.au] or your peak representative body (see Appendix C). It is expected that leaders of peak industry associations and other non-governmental groups will coordinate and collate input from and on behalf of their members to ensure a 'whole of sector' development of options.

A series of cross-sectoral workshops commencing in mid-September 2003 will aim to draw together this information to develop shared options for a regional system of representative MPAs. Nominated representatives from key stakeholder groups will be invited to participate in these workshops.

These workshops signal the start of an ongoing consultative process designed to enable all interested persons to become aware of and to understand the issues associated with reserve design, to share their knowledge and expertise and to collaborate toward generally acceptable outcomes for marine conservation in the region. Please check with your peak representative body and/or the Environment Australia web site (http://www.ea.gov.au/coasts/mpa/) for information on meetings and updates on the process.

PART A

Section 1 Introduction

1.1 Policy context

A marine protected area (MPA) is an area of sea (which may include land, the seabed and subsoil under the sea) established by law for the protection and maintenance of biological diversity and of natural and cultural resources.

In Australia, the Commonwealth, state and Northern Territory governments are working together to develop a national system of MPAs that contains representative samples of Australia's marine ecosystems – the National Representative System of Marine Protected Areas (NRSMPA) (Australian and New Zealand Environment and Conservation Council (ANZECC) 1999). The primary goal of the NRSMPA is to build a system of MPAs that will be:

- **comprehensive** - include MPAs that sample the full range of Australia's ecosystems;
- **adequate** – include MPAs of appropriate size and configuration to ensure the conservation of marine biodiversity and integrity of ecological processes; and
- **representative** – include MPAs that reflect the marine life and habitats of the areas they are chosen to represent.

The NRSMPA exists within a range of national, state and territory management tools aiming to achieve marine biodiversity conservation. The development of the NRSMPA fulfils Australia's responsibilities and obligations under a number of international conventions and agreements. *Australia's Oceans Policy* (1998) identified the need to accelerate development of the NRSMPA both for conservation and to give regional security for industry access to ocean resources.

The focus is on developing a representative system of MPAs, as well as individual MPAs to protect areas of known outstanding conservation significance.

Since the declaration of the Great Barrier Reef Marine Park in 1975, an additional 13 MPAs have been established in Commonwealth waters. These MPAs protect identified biodiversity values under a variety of World Conservation Union (IUCN) management categories listed under the *Environment Protection and Biodiversity Conservation Act 1999* ranging from strict nature reserve (IUCN category Ia) to managed resource protected area (IUCN category VI). The state and Northern Territory governments continue to carry out core functions related to the development and management of MPAs.

1.2 Future representative marine protected area proposals in the South-east Marine Region

Despite the achievements to date, significant gaps remain in the distribution of MPAs, especially in deepwater and cooler temperate systems. The priority is to establish MPAs in large-scale bioregions that are not already represented within the NRSMPA.

Consistent with *Australia's Oceans Policy*, future representative MPA proposals under the Commonwealth component of the NRSMPA will be developed as part of the regional marine planning process. Conservation of marine biodiversity is recognised nationally and internationally as being best achieved through strategic regional marine planning that provides for the establishment and effective management of a representative system of MPAs and the complementary sustainable management of adjoining waters (ANZECC 1999).

The South-east Marine Region is the first region identified for planning under *Australia's Oceans Policy*. Accordingly, this is the first time the regional marine planning process has been used to strategically design a comprehensive, adequate and representative system of MPAs in Commonwealth waters[1] under the direction of the National Oceans Ministerial Board. This is also the first time a system-wide approach has been taken to establish representative MPAs within a large-scale deep offshore marine region.

The South-east Marine Region's system of representative MPAs will build on the two existing Commonwealth MPAs in the region (the Tasmanian Seamounts Marine Reserve and the Macquarie Island Marine Park) as well as complementing MPAs established in adjoining state waters (Appendix D). The aim of the system is to ensure that adequate samples of the full range of the defined bioregions are represented in a network of MPAs across the region. In addition, the integration of the regional marine plan and MPA processes provides an exceptional opportunity to consider other conservation measures when designing the MPA system, and to ensure that MPAs are not identified in isolation from the management of sustainable resource use.

1.3 Process for designing options for a regional representative system of marine protected areas

Environment Australia (with statutory and policy responsibility for MPAs) and the National Oceans Office (with responsibility for regional marine plans) are working together to ensure a representative MPA system will be integrated into the regional marine planning framework through the decisions of the National Oceans Ministerial Board. To achieve this, a two-stage program linked to the delivery of the South-east Regional Marine Plan has been developed that is both scientifically credible and open to stakeholder input:

- **Stage 1**: (April to December 2002) identified 11 Broad Areas of Interest in the South-east Marine Region as the focus for identifying and selecting samples of

[1] For further information regarding the process for selecting representative MPAs and regional marine planning see the National Oceans Office web site http://www.oceans.gov.au and the Commonwealth Department of the Environment and Heritage - Marine Protected Areas web site http://www.ea.gov.au/coasts/mpa/index.html .

the region's marine biodiversity for inclusion in a regional representative system of MPAs.

- **Stage 2**: (began January 2003) aims to identify and select options for a regional representative system of MPAs using the Broad Areas of Interest.

Stakeholder consultation

Existing MPA stakeholder processes have been combined with regional marine planning forums to streamline the process for stakeholders and ensure effective integration of MPAs with the South-east Regional Marine Plan. The key forums consulted were:

- Commonwealth Marine Protected Areas Committee: a forum for relevant Commonwealth government agencies to provide input into the Commonwealth MPA process and integrate complementary marine environment management objectives, such as spatial management of fisheries and MPAs;
- Commonwealth Marine Protected Areas Stakeholder Reference Group: a forum for integrating the expertise and views of non-government stakeholders into Commonwealth policy for MPA development;
- Natural Resource Management Council's Taskforce on Marine Protected Areas: a forum of Commonwealth and state agencies to progress the development of the NRSMPA;
- South-east Regional Marine Plan Working Group: a forum of representatives from key stakeholder groups in the South-east Marine Region to assist in the development of the South-east Regional Marine Plan; and
- Focus Group: a small sub-group of the Stakeholder Reference Group and South-east Regional Marine Plan Working Group to provide expert advice on the detailed outputs and processes for consideration by the broader stakeholder forums.

In addition, Environment Australia and the National Oceans Office have addressed specific sectoral concerns with stakeholders through a series of one-on-one meetings at their request.

Key outcomes – Stage 1

Through these forums, Environment Australia and the National Oceans Office developed operational criteria to identify and select a comprehensive, adequate and representative system of MPAs (Appendix A). These criteria are derived from the ANZECC (1998) guidelines for establishing the NRSMPA. This is the first time these criteria have been interpreted for application within a large-scale, deep, offshore marine region.

Using the operational criteria, 11 Broad Areas of Interest were identified (Figure 3.1). The 11 areas were based on the bioregionalisations of IMCRA (on the continental shelf) (IMCRA Technical Group 1998) and the interim offshore regionalisation (Butler et al. 2001) developed for the National Oceans Office as part of the South-east Regional Marine Plan process, as well as other existing biological and physical data and information. Development of the Broad Areas of Interest from those regionalisations was done through a combination of scientific modelling, expert opinion and the exchange of stakeholders' ideas and information.

The Broad Areas of Interest are not candidate MPAs. They are intended to provide stakeholders with some certainty over which marine areas may be sampled for possible inclusion within an MPA.

Key steps – Stage 2

Key steps in Stage 2 of the process are:

1. Specifications have been developed to help identify samples of marine areas within the Broad Areas of Interest that are comprehensive, adequate and representative (Section 3).
2. Through this user guide, stakeholders are invited to apply the specifications in the context of their knowledge of the region (especially socio-economic and cultural interests) to develop options for a regional system of candidate representative MPAs. A hypothetical example is provided in Section 4.3 to show how to use the specifications.
3. Representatives of key stakeholder groups will be invited to bring this information to a series of workshops commencing in mid-September 2003. In these workshops stakeholder information will be combined with the best available information on 'representative' features and ecological considerations assembled by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) to develop options for a regional system of representative MPAs that satisfy the requirements of the specifications with reference to socio-economic or cultural issues.
4. Using the results of step 3, Environment Australia and the National Oceans Office will work with other government agencies to ensure whole-of-government consideration of these options. As part of the evaluation process these options will be subject to stakeholder examination and input. The overall aim is to develop options that achieve a comprehensive, adequate and representative system of MPAs that respects the interests of all stakeholders.
5. It is intended that these options will be presented to the National Oceans Ministerial Board in late 2003 for consideration as part of the final South-east Regional Marine Plan.

Statutory declaration process

Following consideration by the National Oceans Ministerial Board it will then be necessary for each candidate area recommended as an MPA to be considered individually through the statutory processes for marine reserve declaration. [2]

A notice inviting public comment on each MPA proposal must be published, specifying proposed boundaries, purposes and IUCN category. The minimum period for comment is 60 days. Consultation on all native title issues is in accordance with the *Native Title Act 1993*. A regulatory impact statement may also be prepared. On this basis the Director of National Parks prepares a report to the Minister for the Environment and Heritage. The report must include any comments received and the

[2] The statutory process for declaring Commonwealth reserves is set out in chapter 5, part 15, division 4 of the *Environment Protection and Biodiversity Conservation Act 1999*. A summary of this process can be found on the Environment Australia web site www.ea.gov.au/coasts/mpa/ - see Commonwealth Marine Protected Areas Program.

Director’s views on the comments. If the Minister is satisfied that a reserve should be declared the Governor-General is advised accordingly. Only when these steps are taken may the Governor-General make a proclamation declaring the area to be a Commonwealth reserve by publishing the declaration in the Commonwealth Government Gazette.

Section 2 Background to the specifications

2.1 Aim and development of the specifications

The aim of the specifications is to help identify comprehensive, adequate and representative samples of key bioregions within and across 11 Broad Areas of Interest for the South-east Marine Region (see Section 2.3). The specifications aim to guide stakeholders to identify these areas using the best available information on 'representative' features and ecological considerations (see Appendix E).

The specifications are non-technical and range from broad precautionary specifications for areas where there is very little knowledge, to specifications based on current understanding of the system for areas where more information is available. The specifications are designed for ease of interpretation to allow stakeholders to add in their socio-economic and cultural interests.

The specifications were developed initially by CSIRO in consultation with scientists from other agencies. They build on the biodiversity and other environmental criteria (identification criteria) agreed with stakeholders during 2002 (Appendix A). The specifications have been subject to stakeholder input and independent scientific peer review.

2.2 Integration with other spatial arrangements for biodiversity conservation

The specifications deal primarily with MPAs as one tool for achieving biodiversity conservation with the aim of ensuring that a representative system of MPAs is developed in the South-east Marine Region.

Other actions to progress biodiversity conservation outcomes such as species-specific conservation and the management of marine resource use, for example through fisheries spatial arrangements, should be linked to MPAs through the specifications to the extent that the actions have complementary objectives for protecting representative habitats and marine biodiversity. The representative system of MPAs in the South-east Marine Region will contribute to conservation outcomes in the broader context of the South-east Regional Marine Plan as well as the range of state and national mechanisms to achieve biodiversity conservation. Ease of management is an important consideration in reserve design in terms of ensuring community support, compatibility with existing management regimes and effective compliance and enforcement.

2.3 Some important considerations underlying the design and use of the specifications

The specifications have been developed within the context of limited data for large-scale, deep-water, offshore marine environments and Commonwealth policy on MPAs. Some important considerations affecting the design and use of the specifications are described below.

Surrogates for biodiversity

Typically the assessment of an area proposed for an MPA requires information on biodiversity (including ecosystem mapping), ecological processes, conservation status, biogeographic characteristics, social interests (including data relating to Indigenous and non-Indigenous values), economic interests (including existing and potential uses) and threatening processes.

In the South-east Marine Region our knowledge of conservation values, resources, activities and uses is rapidly changing and improving. For example, recent surveys sponsored by the National Oceans Office have extended the coverage of seafloor maps of the region and our understanding of the structural features of deep-sea habitats, unveiling details of spectacular features such as canyons, seamounts and fractures. Similarly, descriptions of uses and threatening processes have been undertaken at the regional level as part of the assessment process for the South-east Regional Marine Plan. However, the level of fine-scale information for MPA decision-making is very limited. As acquiring this information is costly and will take many decades, a precautionary approach to reserve system design is taken. This uses the best scientific understanding of surrogates for broad-scale ecosystems and habitats based on bioregional assessments as well as the advice and expertise offered by stakeholders.

The two core regional datasets that underpin the specifications and the descriptions of the Broad Areas of Interest are:

- the Interim Bioregionalisation of the South-east Marine Region (NOO 2002; Butler et al. 2002) for the deepwater areas outside the continental shelf; and
- the Interim Marine and Coastal Regionalisation for Australia (IMCRA 3.1, ANZECC 1998) for areas on the continental shelf to the 200 metre isobath.

The hierarchical structure of the deepwater bioregionalisation (briefly explained in Table 2.1) is defined at three scales: the large-scale provinces (Level 1 - biomic), (Level 2a and 2b - shelf, slope and abyssal plain) and geomorphic units (Level 3 - features such as a field of seamounts, or a seamount, canyons etc). Level 3 are the finest scale units and are used to provide information about the type of biological assemblages that might occur in a given area (NOO 2002).

Table 2.1 Hierarchical scheme for habitat mapping and classification (Adapted from Butler et al. 2001).

Level	Name	Examples
1	Province	Large-scale biogeographic units. For example, IMCRA Technical Group (1998) recognised three demersal provinces and two biotones on the continental shelf in the South-east Marine Region and one for Macquarie Island. Provinces are typically of the order of ~1000km in extent.
2	2a Biome	Continental shelf, slope, abyssal plain and offshore continental blocks (e.g. South Tasman Rise) are dictated by gross geomorphology. These are nested within provincial units and are typically several hundreds of kilometres or more in extent.
	2b Sub-biomes	Shelf-break and upper slope; lower slope. These subdivisions are dictated by the distributions of animal communities, some of which have quite narrow depth ranges.
	2c Mesoscale units	Along-slope subdivisions within, e.g. mid-slope units, again typically dictated by faunal distributions. IMCRA identified 12 mesoscale units on the continental shelf in the South-east Marine Region, from 50 to 350km in size.
3	Geomorphological units	Areas characterised by similar geomorphology. These may include (on the continental shelf) fields of sand-waves, rocky outcrops, incised valleys, flat muddy seabeds, etc. and (on the slope and at abyssal depths) submarine canyons, seamounts, oceanic ridges and troughs, etc. Such units may typically be about 100km in extent.

Note in Table 2.1 that size is not a criterion for level in the hierarchy. Thus, some Level 2b units may actually cover less area than some Level 3 units. Nevertheless, size typically decreases from Level 1 to Level 3. Table 2.1 gives some indicators of spatial extent. Although the hierarchical scheme described in Butler et al. (2001) had at least seven levels, the South-east Bioregionalisation project reported only on Levels 1 – 3; that is, provinces, biomes, some subdivisions within biomes, and fairly large-scale geomorphological units.

In the deepwater regionalisation, biological data was available for a wide area and provided useful information about the large-scale spatial pattern of diversity. This included data from collections of benthic and demersal fish and invertebrates, mainly from the outer shelf and upper continental slope. This biological data helped identify three broad biogeographic provinces in the South-east Marine Region but was not adequate to identify fine structure within those provinces. Finer patterns are inferred from surrogate data sets such as nutrients, temperatures, oxygen and salinity, ocean currents, bathymetry, seabed characterisation and sediment data and modelling. These are reasonable surrogates for large-scale patterns of diversity. For example, it is known that different suites of organisms occur at different depths, at different water temperatures, or in different sediment types. It is therefore expected that one spatial unit, for example sediment type, is likely to contain a different suite of organisms and ecological processes from a different spatial unit. By representing the different spatial units, identified by surrogates such as sediment type, in a system of MPAs we can reasonably assume we are representing the diversity of life within the region.

However, as surrogates tell us little about the details of those organisms or their ecological processes decisions about MPAs, especially in deepwater ecosystems, will be made in the face of uncertainty and a considerable lack of knowledge.

Achieving comprehensiveness, adequacy and representativeness

The specifications are designed to help identify samples of marine areas within the Broad Areas of Interest that meet the NRSMPA principles of comprehensiveness, representativeness and adequacy.

While all three principles are equally desirable for an effective system of MPAs, the use of surrogates for biodiversity due to the lack of fine-scale information on viability of populations, species and communities makes practical consideration of comprehensiveness and adequacy relatively more difficult than representativeness. For this reason, **representativeness** is the primary driver for identifying potential samples of the Broad Areas of Interest to ensure the diversity within each bioregion is sampled with a system of candidate MPAs.

In addressing **comprehensiveness**, the Broad Areas of Interest were designed to ensure that the full range of Level 3 bioregions that exist within the South-east Marine Region could potentially be sampled within candidate MPAs. **Adequacy** is determined by the size and number of MPAs (see below). It is essentially a risk management concept and can be enhanced directly through reserve management, replication of ecosystems within MPAs and complementary management of adjacent marine areas. Where data on ecosystems, communities and/or species distributions exists it should be incorporated to improve the identification of marine areas that also contribute to adequacy and comprehensiveness.

Number, size and design of marine protected areas

In designing an MPA or network of MPAs consideration of size, shape and spacing is important. These design issues will be guided by the specifications as well as system-wide considerations (Section 3.3). As MPAs can operate at a variety of scales for a range of marine biodiversity objectives, percentage targets and/or other quantitative rules are not used to prescribe the size of the MPA. Instead, the process focuses on meeting a broad range of specifications designed to ensure that the candidate MPAs reasonably reflect the range of features and ecosystems and the biotic diversity within the South-east Marine Region.

Socio-economic and cultural considerations, as well as issues of management practicality and feasibility, will also influence the boundaries and number of individual MPAs and the design of the system as a whole. For example, opportunities will be sought to integrate MPAs with spatial management in other sectors (e.g. fisheries management habitat protection and infrastructure corridors) where the objectives of these other forms of spatial management and MPAs overlap.

In this way, the number, size and design of the candidate MPAs will be determined in consultation with stakeholders considering conservation objectives and socio-economic and cultural interests. The final system of MPAs will be the one that best achieves the principles of comprehensiveness, adequacy and representativeness while respecting the interests of all stakeholders.

World Conservation Union (IUCN) categories

The Environment *Protection and Biodiversity Conservation Act 1999* requires the assignment of one or more IUCN category to Commonwealth reserves including MPAs. Just as there are no targets for setting aside a certain percentage of the region for MPAs, nor are there any targets for allocation of MPAs to any particular IUCN category. However, for adequate protection of biodiversity it is appropriate that there be a range of management regimes, from highly protected areas to sustainable use MPAs, within each major ecosystem type (ANZECC 1998; Commonwealth of Australia 2003). In applying this to the South-east Marine Region each candidate MPA will aim to contain a highly protected area (IUCN categories I and II) to ensure that samples of representative ecosystems are managed in as undisturbed a state as possible. This precautionary approach to the level of reservation secures one of the key outcomes of the NRSMPA by guaranteeing high protection of a sample of the region's marine biological diversity.

The type, size and location of IUCN categories to be assigned to candidate MPAs will be determined on a case-by-case basis in consultation with stakeholders using all the information available for the area including ecological and socio-economic values. Categories can only be usefully discussed when the characteristics and objectives of a potential reserve and the specific conservation values under protection are known. As explained in Section 1.3, the public is invited to comment on all MPA proposals, including the IUCN category.

PART B

Section 3 Specifications for identifying candidate areas for a regional representative system of marine protected areas

3.1 Applying the specifications

The assessment of an area as a candidate MPA requires information on biodiversity, ecological processes, conservation status, biogeographic characteristics, social, cultural and economic interests and threatening processes. In the assessment process, specifications based on ecological criteria (Appendix A) are *first* used to help identify candidate MPAs (that is, to help identify preferred general areas within which MPAs may be selected). Stakeholders may incorporate social, economic and cultural information in applying the specifications to help maximise the conservation and socio-economic benefits and minimise any potential for adverse impacts.

The specifications are flexible because of the limits of the information base, the variety of state and Commonwealth legislative and management frameworks, requirements for cost-effective management and enforcement and overall reserve system design (see Section 3.3). For these reasons areas closely adjacent to a Broad Area of Interest may be considered for sampling. Not all areas identified need result in an MPA and consideration must also be given to the most effective tool for achieving conservation objectives (see Section 2.2 and Appendix B). While in principle all specifications should be met, one or more specifications may be considered to have greater 'weight' in the identification process. Section 4, including a checklist, will guide you in using the specifications.

For areas on the continental shelf, the specifications will apply to each IMCRA region so that a sample of each broad biogeographic area defined at the meso-scale level (hundreds to thousands of kilometres) is identified for inclusion within a candidate MPA. For areas outside the continental shelf the specifications are, at a minimum, designed to include a sample of each Level 2 biome within a candidate MPA. The reliance on physical surrogates to infer patterns of biodiversity (as discussed in Section 2.3) means that the readily identifiable features (Level 3 units) such as submarine canyons, seamounts, cinder cones, oceanic ridges and troughs are important attributes for inclusion within candidate MPAs.

3.2 General considerations

In the descriptions of the Broad Areas of Interest (Appendix E), conservation values have been described subject to the available information.[3]

In arriving at the Broad Areas of Interest, and now in seeking to identify sites for candidate MPAs, surrogates are used for biodiversity (depth, water properties,

[3] Due to time constraints this information compiled by CSIRO from a variety of sources is not comprehensive and there may be resources that have not been accessed to date. New data will continue to be acquired and included as part of the process of identifying candidate MPAs.

geological and geomorphological data) and in only a few areas do we have some biological data to guide us. As explained in Section 2.3 these surrogates are sufficient to tell us that the different units are likely to differ in their benthic and demersal fauna. They do *not* tell us in detail what those fauna are or their ecology (length of life, critical habitat, adult home ranges, larval dispersal distances, trophic relationships between species, etc.). It is therefore not possible to write specifications based on that sort of understanding, nor will this be possible in the foreseeable future.

Other conservation values that are not specifically associated with the site in question (and might not normally be addressed using an MPA) may nevertheless add conservation value to the site. For example, if an area has attributes (fixed in space and appropriate to an MPA) that make it a good candidate for an MPA focused on biodiversity conservation and part of a representative system, then its value may be further strengthened if it is also, for example, a migration route for some highly mobile species or an area of great scenic beauty. This idea of complementarity is in addition to, and distinct from, the idea that MPAs should be designed to be complementary to other management measures.

The specifications include unique features in an MPA system. This is a general principle of MPA design and, by definition, of the design of a representative system. An example would be the Bass Canyon which, with its winter cascade but summer upwelling processes, is an oceanographic feature peculiar to this region and likely to have important productivity and unique biodiversity and ecological dynamics.

Finally, it is a general principle of MPA design to avoid, where possible, 'putting all your eggs in one basket'. Replication of (apparently) similar MPAs contributes to the adequacy of the reserve system overall. Replication is essentially insurance against the loss of natural values due to events outside management control (such as a major marine pollution event), which may significantly reduce or negate the reserve for its specified purposes (ANZECC 1998). Replication also increases the chance that we will capture habitat diversity that is presently unknown (because we have only coarse, surrogate-based information for most units).

These specifications are considered to provide guidance on the necessary minimum requirements to achieve a comprehensive, adequate and representative sample of marine areas for inclusion within a candidate MPA. All specifications are given for good reasons, and a balance between them is necessary. Overall the objectives of each candidate area need to be considered in terms of the contribution of individual reserves to marine biodiversity protection and to the system of MPAs as a whole.

3.3 The regional system of marine protected areas

As described above, the system of MPAs will be primarily based on the principle of protecting representative samples of the region's marine ecosystems. While the specifications provide guidance on how to identify a sample of each of the key bioregions as the basis for ensuring representativeness within candidate MPAs, the candidate areas also need to be considered and prioritised in terms of their contribution to the regional system.

This identification process will involve constant feedback as each identified area is assessed in terms of its merits as a candidate MPA (using the specifications) and in

terms of its contribution to the NRSMPA (using system-wide considerations). This is especially important for marine systems, due to the extent that species may be migratory and highly mobile or depend on very different and geographically separated ecosystems for different stages of their life cycle. The high degree of interconnectedness between marine ecosystems means there is also a high degree of interdependence, which must be taken into account in designing an integrated reserve system.

System-wide considerations

System-wide objectives for the South-east Marine Region were first developed with stakeholders as part of the operational criteria for identifying and selecting a system of MPAs in the region (Appendix A). Further stakeholder consultation and recommendations by the peer review panel have led to refinement of this vision for the regional network of MPAs as a whole. On this basis a viable system of MPAs in the South-east Marine Region will aim to:

1. address gaps and priorities for the conservation of marine ecosystems across the region to enhance the representativeness of the region's reserve system by considering other conservation tools and existing MPAs (see Appendices B and D);
2. seek opportunities to integrate fisheries and other sectoral spatial arrangements with MPAs in the region where complementary objectives are identified, e.g. protection of representative benthic habitat;
3. include a small number of large MPAs rather than a large number of small MPAs to ensure practical and feasible management;
4. include MPAs of a size and shape that are ecologically robust in terms of protecting what is known about the conservation values of the marine area;
5. obtain the best possible arrangement of MPAs in terms of spacing and orientation according to what is known about migration patterns, currents and connectivity among ecosystems;
6. consider vulnerability of areas to disturbance and seek replication of key features;
7. contain a network of MPAs with IUCN categories ranging from strict nature reserve to managed resource protected area where these are compatible with the objectives of the MPA;
8. contain MPAs that will each aim to include a highly protected area (IUCN categories I or II) as a scientific reference site and to ensure that samples of representative systems are managed in as close to an undisturbed state as possible;
9. maximise benefits to all stakeholders to build support and community ownership of the MPA system; and
10. include regular review of the effectiveness of the system.

Specifications for identification of options for candidate representative marine protected areas

The specifications are set out in Table 3.1 and grouped under the following headings for convenience of use, and in general order of priority:

- Primary specifications concerning representativeness, including special and unique features

- Particular ecological specifications
- General specifications on size and shape

Reasons for some of the specifications are explained under Section 3.2 above. Some more specific explanations are given in the ‘rationale and notes’ column in Table 3.1. Use of the specifications is one input to decisions regarding reserve system design. In applying the specifications stakeholders are asked to take account of their interests as a starting point to broader consideration of socio-economic and cultural issues.

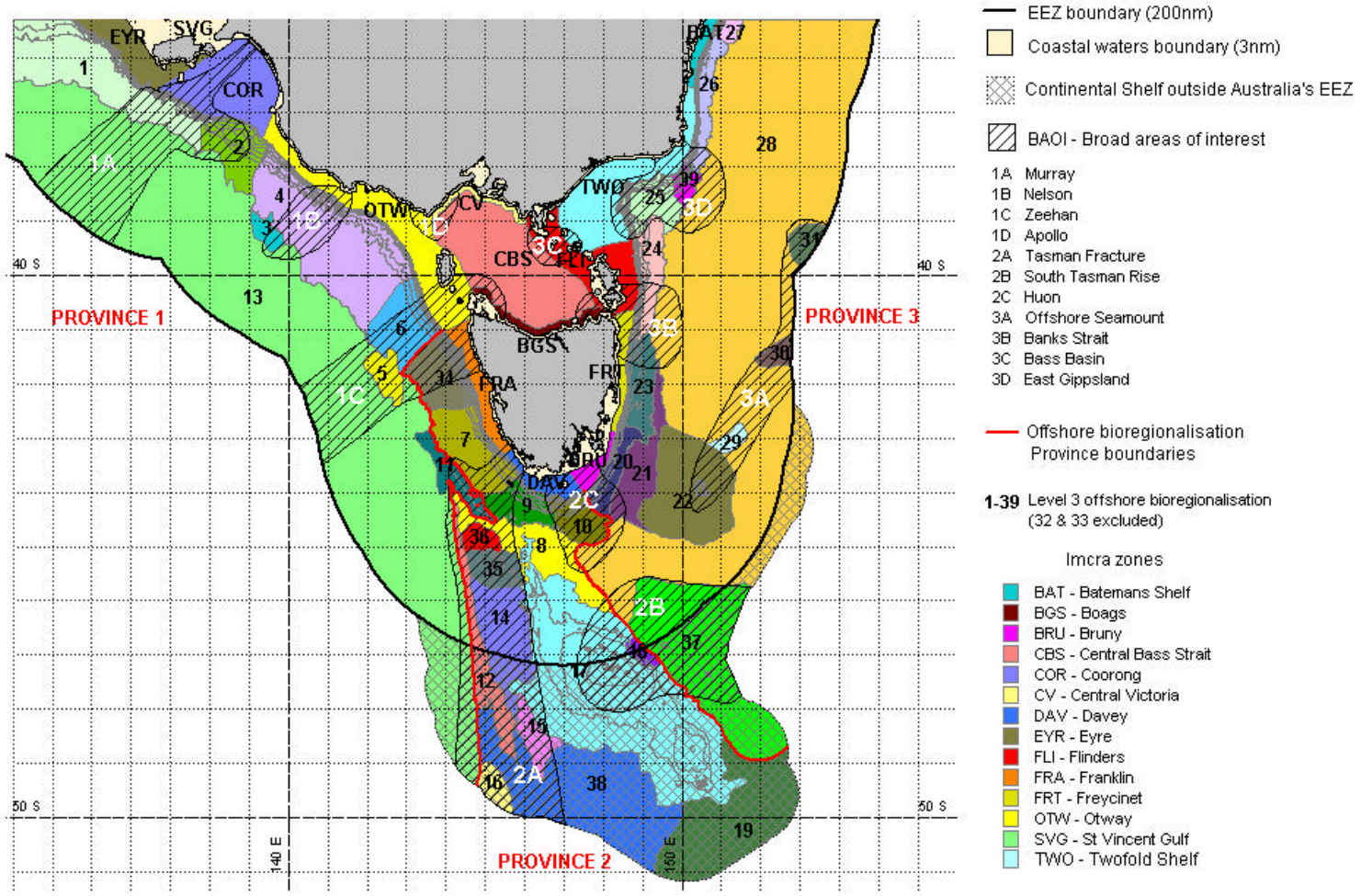

Figure 3.1: South-east Marine Region of Australia showing the Broad Areas of Interest, the Interim Marine and Coastal Regionalisation for Australia regions and the Level 3 bioregionalisations.

Table 3.1 Specifications for identification of options for candidate marine protected areas within the Broad Areas of Interest.

Specifications		BAOI	Rationale and notes
S1	**Represent a sample of all features listed under the Bioregions and Geomorphic Characteristics and in the 'Conservation - Features' column in Appendix E to the extent that an MPA is the best conservation tool. In general, seek to include a whole feature rather than a fraction of it (which may lack ecological integrity and be difficult to manage).**	All	*Features here means:* *Any feature or region that is 1) listed under the Bioregions and Geomorphic Characteristics; 2) shown in the geomorphic maps; and 3) in the 'Conservation - Features' column in Appendix E. Note that on the shelf (< 200m) due to the absence of an available geomorphic regionalisation select a sample of an IMCRA region.*
S2	**Wherever possible, include a range of habitats and linked systems across the shelf and extending down the slope – where possible to the abyssal plain and to separated continental blocks. This specification seeks to include habitat diversity and cases where it is likely there are important dynamic linkages between parts of the system (e.g. via canyons).**	Those BAOI that extend across several biomes	*Most of the regionalisation units are selected on the basis of geomorphology and other physical surrogates, and understanding of the biodiversity is very limited. Therefore, in general, biological dynamics are not understood, and interactions between habitats unknown. We know that terrestrial organisms, marine organisms understood in shallower waters, and the few marine organisms studied in deep waters often move between habitats during their lifetime; many deeper-water organisms may do the same. Thus, habitats should not be seen in isolation. As a precautionary approach in the absence of detailed dynamic knowledge, we opt for identifying a variety of adjacent habitats where possible. Further, canyons are important conduits of nutrients, sediments, and organisms between continental shelf areas and the deep seafloor. For that reason, where possible, include whole shelf, canyon and abyssal plain systems.*
S3	**Favour areas that are in a highly natural state. For example, if there are areas where human activities are known to have disturbed ecological processes, but where certain known locations are still intact, include the intact benthic habitats in MPAs.**	All	

Specifications		BAOI	Rationale and notes
S4	**Take account of possible negative and or positive influences ('edge effects') from adjacent human uses, including interactions with other existing conservation measures.**	All	*This is a general principle of the establishment of protected areas for conservation. Edge effects can be beneficial or harmful. For example, adjacent fisheries spatial arrangements to protect spawning areas or benthic habitats may have a beneficial effect on the values of an adjacent MPA whereas nearby extractive activities may result in parts of the seafloor being repeatedly disturbed with sediments deposited in the adjoining MPA. The degree of insulation from external destructive forces as well as the complementary benefits of other conservation mechanisms will be determining factors in the effectiveness and adequacy of the MPA.*
S5	**Select at least 2 canyons adjacent to each other, and include intervening seafloor.**	All but 1D, 2B and 3A	*Canyons are physically and ecologically dynamic, productive systems. They are structurally diverse and characterised by high biological diversity and high biomass. Within a canyon, there is movement within depth zones of motile organisms and likely larval exchange of sessile ones; movement across depth (up and down the canyon) is poorly understood but likely in some cases to be substantial. Processes influencing ecosystem dynamics certainly occur up and down canyons (e.g. at times there is massive movement of water either up or down, carrying nutrients and sediment, sometimes having spectacular erosive effects, and influencing the ecology of the organisms). Thus protecting a fraction of a canyon would be of little value. Exchange between canyons and adjoining 'high ground' is poorly understood but likely to be of ecological significance in some known cases (e.g. for certain commercial fish species). Exchange between two or more canyons is poorly understood. Given all that, a cautious approach is to enclose at least two canyons including the high ground between them. We also advocate including canyon-rich to canyon-poor transition regions, which are likely to represent a unique overlap and/or exchange between two rather different habitats.*
S6	**Include canyon-rich to canyon-poor transition regions.**	1A, 1C and 2A	*See rationale for S5.*

Specifications		BAOI	Rationale and notes
S7	**Include entire seamounts, not only part. Where an area includes seamounts on continental block and on abyssal plain, treat these as different; represent each, with some adjacent continental block/abyssal plain.**	3A	*Seamounts are likely to be species-rich and have different fauna on the lee and luff sides. Also management would be difficult and the effectiveness of protection limited if only part of a seamount were in an MPA.*
S8	**As a minimum, include entire cinder cones. Preferably, include at least 2 cinder cones.**	2C and 3B	*See rationale for S7.*
S9	**With consideration of other existing conservation tools, select areas known for high biodiversity or ecologically special areas, which might be identified by:** • **having high biodiversity inferred indirectly (e.g. seabird and marine mammal feeding areas);** • **being known significant habitat for a listed species;** • **being known to contain a refuge for a highly (or over-) exploited species;** • **being known to contain a nursery, breeding, or spawning site.** **(The available information on these areas is in 'Conservation additional factors' Broad Area of Interest Descriptions in Appendix E.)**	All	*Productive areas are likely to have high biodiversity and to contribute strongly to the ecological functioning of neighbouring areas. Such areas may be known to have been productive in the past (even if not so now because of over-use by human activities), they may be known to be productive now (from scientific measurements, or from the productivity of fishing in the area), or they may be inferred from the activities of indicator organisms. In particular, seabirds and marine mammals are conspicuous, and commonly use the same, productive areas. Their feeding sites can be used as indicators of highly productive locations.*
S10	**Design simple (rather than complex) shapes and reduce fragmentation of areas within each Broad Area of Interest. This can be achieved by using straight boundary lines and minimising the perimeter to area ratio.**	All	*Depth contours may also be used to help define logical ecological units for potential management.*

Section 4 How to use the specifications and descriptions to help identify candidate marine protected areas

The specifications (Section 3) have been designed for use by stakeholders without the need to use sophisticated reserve design tools. This section explains how to use the specifications, the descriptions (Appendix E) and the checklist (Section 4.2) to help identify options for systems of representative MPAs while incorporating socio-economic or cultural information. This is followed by a worked example on a hypothetical Broad Area of Interest (Pycnantha). A large-scale map of Pycnantha is at Figure 4.1.

Section 4.1 lists the tools needed and steps to follow.

4.1 Tools and steps to follow in using the specifications

You will need:

- the Broad Area of Interest descriptions (Appendix E);
- geomorphic maps (available from Environment Australia or direct from web site http://www.ea.gov.au/coasts/mpa/;
- system-wide considerations (Section 3.3);
- the specifications (Table 3.1);
- your own knowledge of and interest in the region; and
- checklist (Section 4.2).

Identifying a candidate marine protected area

Using the tools above:

1. Choose a Broad Area of Interest.
2. Examine the descriptions and the associated map (Appendix E).
3. Consider the system-wide considerations and try to bear these in mind while working through the specifications.
4. Use the checklist to guide you as you work through the specifications (S1 to S10). Start with the primary specification (S1) to identify (on the map) samples of the key bioregions with reference to the listed conservation features. S2 to S4 and S10 are general specifications applicable to all the Broad Areas of Interest whereas S5 to S9 generally need only be considered for specific Broad Areas of Interest.
5. Consider size and shape of candidate areas using S10. Again there will not be a unique solution.
   You will often find there is more than one way to identify the features and group them inside candidate MPAs. Aim to maximise marine biodiversity values of these areas by using the additional information on the flora and fauna contained in the descriptions (Appendix E).

Add in your interests

6. Because many options can be identified to achieve the specifications please add in your interests (socio-economic and or cultural issues) to develop your preferred options.
   For example, consider the interaction between your activities and the areas so far identified. You may find a candidate MPA overlaps with your activities so you may wish to identify an alternative equivalent area or feature that meets the requirements of the specifications. Bear in mind also, while the primary goal of the NRSMPA is the conservation of marine biodiversity, many other values and uses can be accommodated in MPAs where these are compatible with the objectives of the protected area.
   The boundaries of the Broad Area of Interest are 'fuzzy'. You can place your candidate MPA outside this region to suit the requirements of the specifications and your interests (if a similar feature is located there).
7. Once you have broadly identified your options for candidate MPAs, think about the system-wide considerations listed in Section 3.3 such as other existing conservation measures that may protect the features you have identified as well as the overall shape, orientation and spacing of your candidate MPAs. Think also about the type of management that may be necessary to protect the features you have identified and aim to identify highly protected areas or zones in your candidate MPAs.

Refine your options

8. In refining your options please use the checklist to indicate if you are unable to satisfy the requirements of any particular specification and explain why.

4.2 Checklist

Please use the checklist below to work through each Broad Area of Interest, step-by-step, checking off each box as you go.

Have you?	Murray (1A)	Nelson (1B)	Zeehan (1C)	Apollo (1D)	Tasman Fracture (2A)	South Tasman Rise (2B)	Huon (2C)	Offshore Seamount (3A)	Banks Strait (3B)	Bass Basin (3C)	East Gippsland (3D)
Sampled all the features and regions as described in the BAOI descriptions (S1)?											
Included entire features (S1)?											
Linked shelf, slope, abyssal plain and separated continental blocks (S2)?											
Chosen undisturbed areas (S3)?											
Considered any 'edge effects' that you are aware of (S4)?											
Included at least 2 adjacent canyons (S5)?											
Included the seafloor between adjacent canyons (S5)?											
Included transitions from canyon-rich to canyon-poor areas (S6)?											
Included seamounts and adjacent continental block (S7)?											
Included seamounts and adjacent abyssal plain (S7)?											

Have you?	Murray (1A)	Nelson (1B)	Zeehan (1C)	Apollo (1D)	Tasman Fracture (2A)	South Tasman Rise (2B)	Huon (2C)	Offshore Seamount (3A)	Banks Strait (3B)	Bass Basin (3C)	East Gippsland (3D)
Included at least 2 cinder cones (S8)?											
Considered areas of high biodiversity that you are aware of (S9)?											
Used simple boundaries (S10)?											
Reduce fragmentation (S10)?											
Considered system-wide considerations (Section 3.3.1)											
Considered any socio-economic or cultural issues you are aware of?											
Given reasons (below) if a particular specification could not be met?											

Notes:

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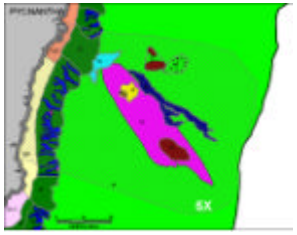
4.3 Worked example for the hypothetical Broad Area of Interest Pycnantha



This example uses a hypothetical Broad Area of Interest called Pycnantha, situated off the coast of Acacia (Figure 4.1). Hypothetical descriptions, conservation features, human uses and other considerations are shown in Figure 4.2 and Table 4.1.
In the worked example the specifications are contained in a blue box.

Specifications are in boxes like this.

Following each specification box a general explanation of the specification is given. The specification is then applied to the hypothetical Pycnantha Broad Area of Interest.

The white and yellow bound regions on the maps represent the geomorphic features/areas, whereas the red bound regions show hypothetical candidate MPAs. The solid yellow regions outside these areas were not identified as priority areas for candidate MPAs.

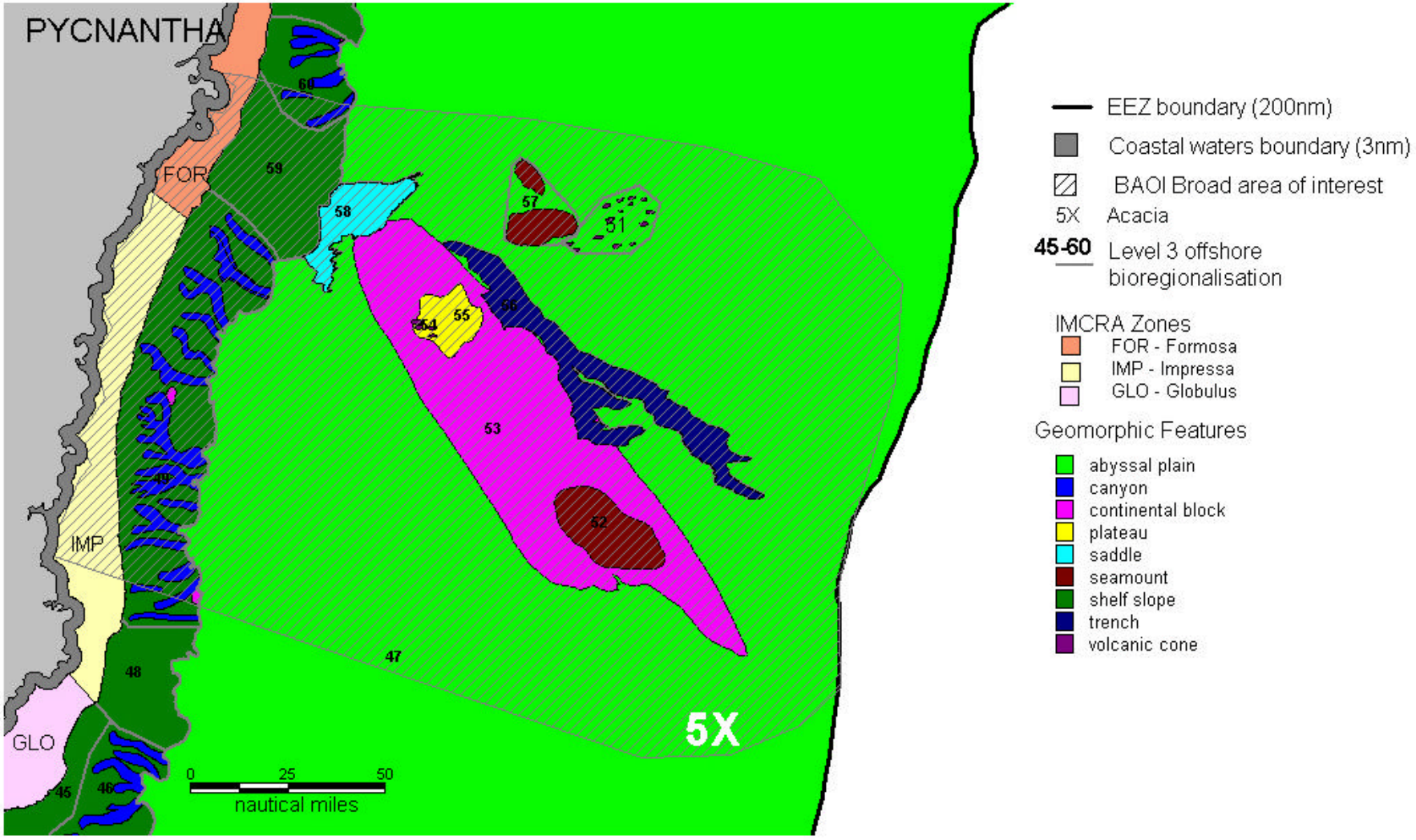


Figure 4.1 Hypothetical region, Pycnantha, showing the Broad Area of Interest, the Interim Marine and Coastal Regionalisation for Australia regions, Level 3 regions and the geomorphic features.

Pycnantha

Bioregions and Geomorphic Characteristics

- Pycnantha occurs wholly within P1.
- Contains 12 Level 3 geomorphologic units: 47, 51, 49, 59, 60, 58, 54, 55, 53, 52, 56, 57.

  - 49 and 60 - continental slope, extensively incised with submarine canyons. Contains rotated continental block. On the continental slope (<200 m) mean currents form complex clockwise and counter clockwise rotating gyres.
  - 59 – continental slope, with no submarine canyons.
  - 47 – abyssal plain.
  - 56 – ridge/trench, Pycnantha Fracture Zone.
  - 53 – continental block with extensive plateau areas.
  - 57 - abyssal plains containing seamounts.
  - 58 – saddle.
  - 51 – abyssal plain with scattered cinder cones.
  - 54 – plateau with cinder cones.
  - 52 – seamount on continental block (shallow).
  - 55 – extensive plateau regions.

- 2 IMCRA meso-scale regions: Impressa and Formosa.

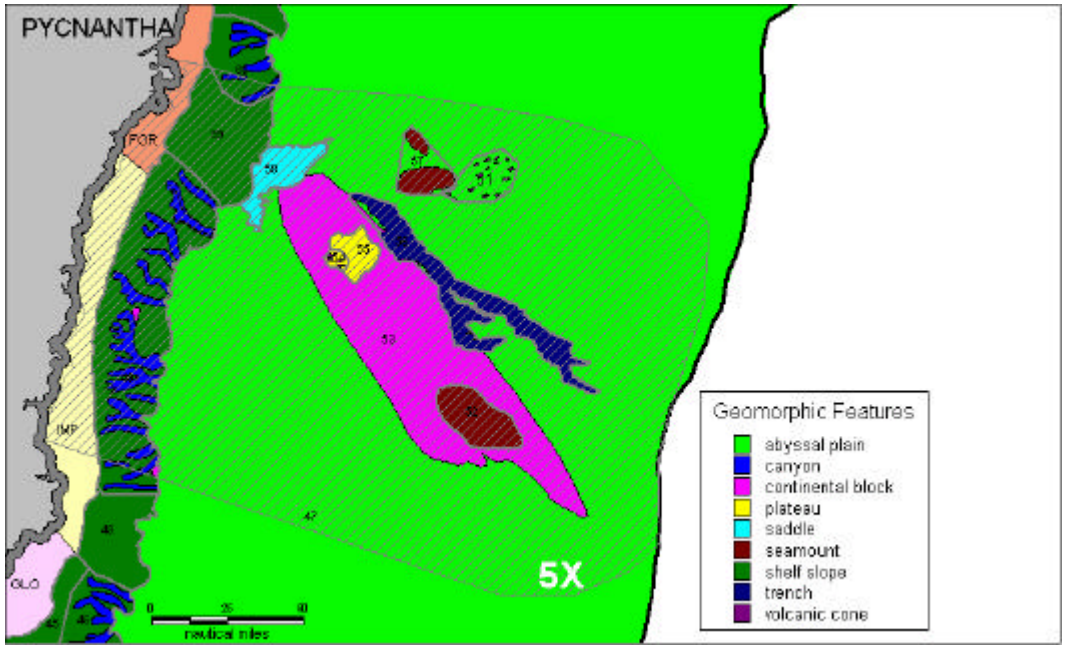


Figure 4.2 Bioregions and Geomorphic Characteristics for Hypothetical Broad Area of Interest Pycnantha.

Conservation	Human Uses	Other Considerations
Features • Nearshore fish and plant species-richness both high (IMCRA). • The existence of a canyon-rich area abutting canyon-poor area. • Includes a range of habitats from rotated continental blocks, extensively incised canyons, abyssal plains, Pycnantha fracture zone which includes a very deep trench and 3000 m high escarpment, plateaux, to prominent ridges and swales. This geology is likely to result in a rich, diverse and possibly unique fauna for this region. **Additional Factors (Flora and Fauna)** • Migration routes for pelagic species. • Number of coastal and pelagic cetacean species (e.g. baleen spp., sperm, pilot, beaked and killer whale, southern right whale, spectacled porpoise, dusky dolphin) that use deep oceanic regions to feed, breed and migrate. • Female Australian fur seals from Panda Island feed on continental shelf (benthic feeders). • Residence area for school shark.	• Potential petroleum industry. • Commercial fishing: dropline, trawl. • Charter fishing/recreational fishing • Yacht races. • Shipping route (100 – 500 vessels). • Port.	• Shipwrecks. • Borders state waters- talk to state government.

Table 4.1 Conservation features and additional factors, human uses and other considerations for hypothetical Broad Area of Interest Pycnantha.

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Identifying a candidate marine protected area

In this worked example we are considering the hypothetical Broad Area of Interest Pycnantha. To work through this example you will need a map of Pycnantha (Figure 4.1) and the descriptions for this Broad Area of Interest (Table 4.1 and Figure 4.2).

As you work through the process of identifying a candidate MPA it is important to keep the system-wide considerations (Section 3.3) in mind. However, this example relates to one Broad Area of Interest only, and does not illustrate the application of the system-wide considerations. Work through the specifications using the checklist in Section 4.2 to assist you.

S1 Represent a sample of all features listed in the Bioregions and Geomorphic Characteristics and the 'Conservation - Features' column in Table 4.1 to the extent that an MPA is the best conservation tool. In general, seek to include a whole feature rather than a fraction of it (which may lack ecological integrity and be difficult to manage).

Specification 1 **(S1**) instructs you to select the features described in Table 4.1 (bioregions and geomorphic characteristics, conservation features, human uses and other features for the Broad Area of Interest). It also asks you to include a whole feature rather than a fraction of it. For example when selecting a seamount include the whole seamount in your candidate MPA.

In Pycnantha there are 12 Level 3 geomorphic regions (47, 51, 49, 59, 60, 58, 54, 55, 53, 52, 56, 57) and two IMCRA meso-scale regions (Formosa and Impressa). These regions are labelled on the hypothetical geomorphic features map included in the descriptions.

- In the 'Conservation – features' column of the descriptions (Table 4.1) there is a list of features that should be included in your candidate MPA.

You should mark these features and a sample of the IMCRA regions described in the Broad Area of Interest descriptions (Table 4.1) on your map as illustrated in Figure 4.3.

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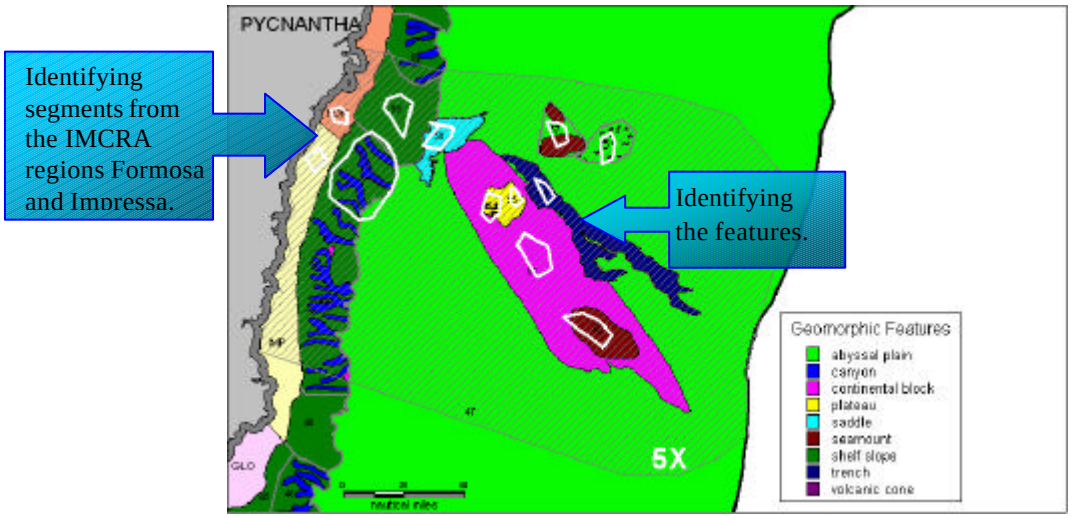

Figure 4.3 Identifying the features to include in the candidate marine protected area. Each white circle represents the selection of different features. Here we have selected a section of each of the features. A selection of the Interim Marine and Coastal Regionalisation for Australia regions (Impressa and Formosa) is also identified.

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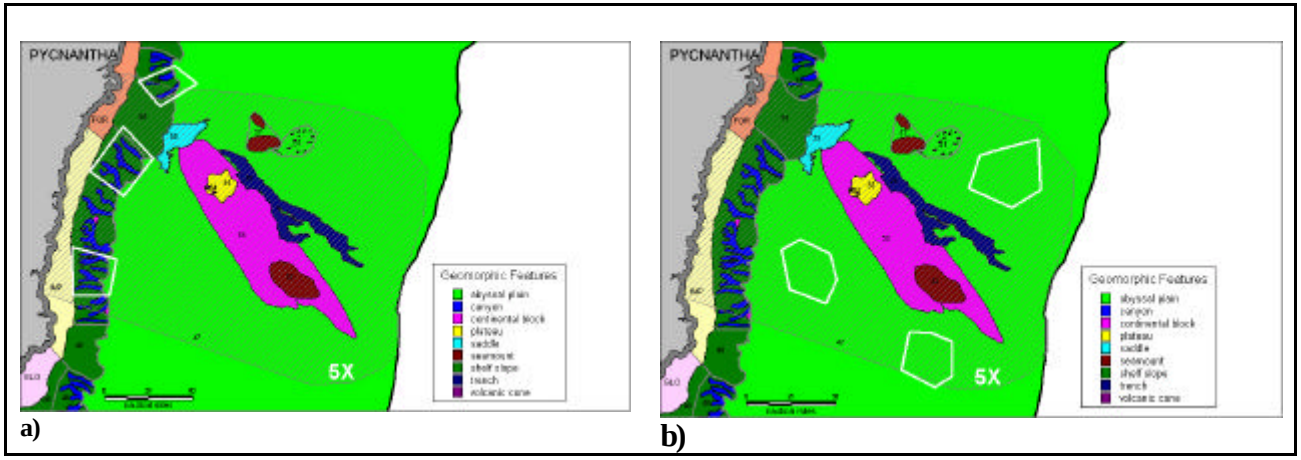

a) b)

Figure 4.4 Features can be identified in more than one way: a) a group of canyons can be identified in many ways as can b) a sample of abyssal plain.

There will often be more than one way to choose a feature. For example, you can identify a section of abyssal plain and canyons in many ways (see Figures 4.4a and 4.4b). However one of the choices may comply better with the later specifications. Once you are sure you have included all the features/regions as instructed by **S1** you can consider the next specification (**S2**).

S2 Wherever possible, include a range of habitats and linked systems across the shelf and extending down the slope – where possible to the abyssal plain and to separated continental blocks. This specification seeks to include habitat diversity and cases where it is likely there are important dynamic linkages between parts of the system (e.g. via canyons).

Specification 2 (**S2)** instructs you to include a range of habitats across the shelf. In complying with **S1** we have identified a piece of the Impressa and Formosa regions. However this specification asks for a refinement. Figure 4.5 shows how we have now identified a sample of the region that includes the range of habitats across the shelf. Examination of Figure 4.5 shows that we have now identified a range of features that, when grouped in one MPA, will make up a linked system (shelf, slope, canyon and abyssal plane, separated continental block).

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Keep this specification in mind for when we are considering the size, shape and spacing criteria later in the process. Careful drawing of your candidate areas will often satisfy this specification.

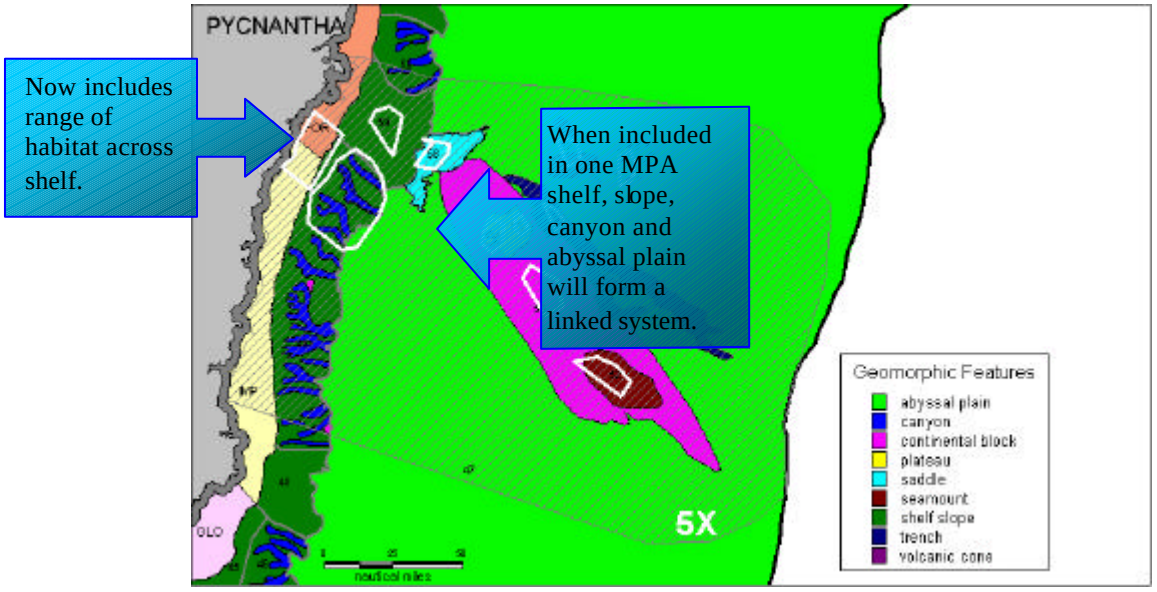

Figure 4.5 In complying with S2 we have identified an area that transverses the shelf to include a range of habitats.

S3 Favour areas that are in a highly natural state. For example, if there are areas where human activities are known to have disturbed ecological processes but

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where certain known locations are still intact, include the intact benthic habitats in MPAs.

Specification 3 (**S3**) asks that you aim to include undisturbed or highly natural benthic habitats in your MPA. If you know that one of the areas you have selected has been damaged by human activities try to identify an undisturbed sample.

S4 Take account of possible negative and/or positive influences ('edge effects') from adjacent human uses, including interactions with other existing conservation measures.

Specification 4 (**S4**) asks you to consider any possible positive or negative edge effects from adjacent human activities. If you think that an adjacent human activity will negatively affect the feature you are trying to conserve then choose another area if possible or ensure the size of the candidate MPA is large enough to minimise impact from the activity. An edge effect may be positive as in the case of neighbouring MPAs and any other species-specific plans (listed in Appendix B). In these cases you may prefer to have a smaller MPA or consider other areas in greater need of protection. Appendix D includes a map of existing reserves.

S5 Select at least 2 canyons adjacent to each other, and include intervening seafloor.

Specification 5 (**S5**) is a refinement of **S1**. A canyon-rich area (L3 region 49) has already been selected for the Pycnantha Broad Area of Interest. Figure 4.6 shows that we have met this specification by including a minimum of two canyons.

S6 Include canyon-rich to canyon-poor transition regions.

Again Specification 6 (**S6**) is a refinement of **S1.** We have already included a canyon-rich region (L3 region 48) and a canyon-poor region (L3 region 59). This specification asks us to include the transition zone between these two regions. This is achieved by simply joining the two regions as illustrated in Figure 4.6.

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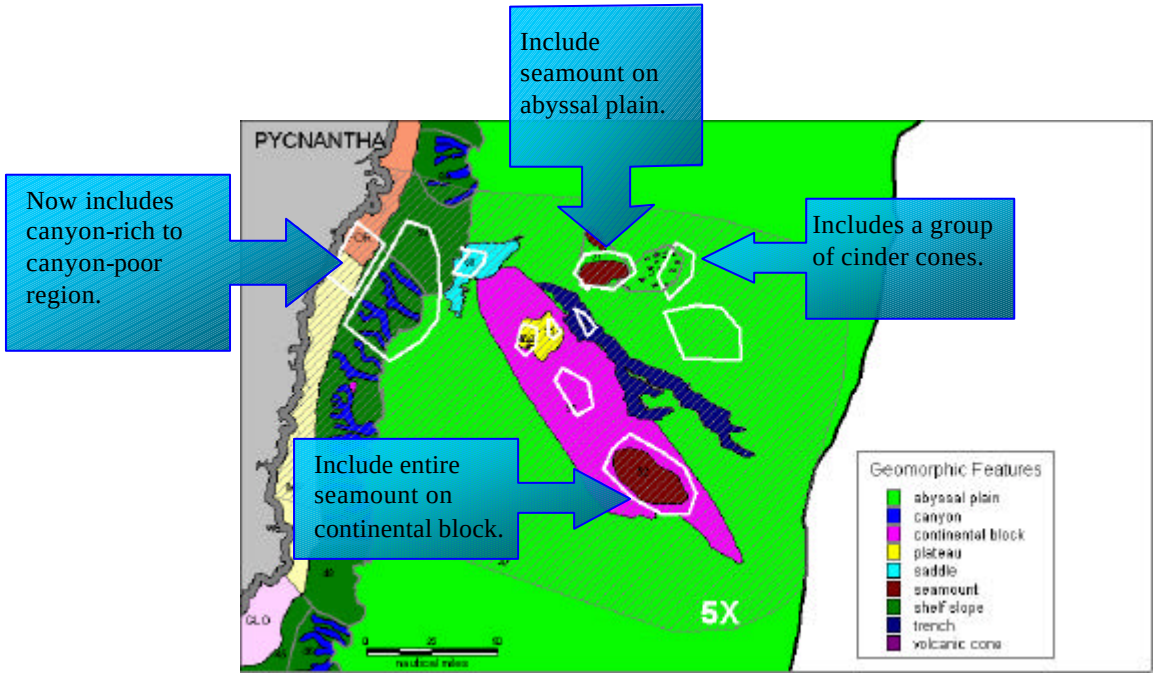

Figure 4.6 By including a sample of the canyon-rich and the canyon-poor regions in the same grouping you comply with S7. We have redrawn the area around the seamount on the continental block to comply with S8 and included this and the seamount on the abyssal plain.

S7 Include entire seamounts, not only part. Where an area includes seamounts on continental block and on abyssal plain, treat these as different; represent each, with some adjacent continental block/abyssal plain.

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Specification 7 **(S7)** asks that you include entire seamounts. Figure 4.5 shows that we only included a part of the seamount on the continental block. We have corrected this in Figure 4.6. In complying with S1 we have already included both a seamount on abyssal plain and on the continental block.

S8 As a minimum, include entire cinder cones. Preferably, include at least 2 cinder cones.

Specification 8 (**S8**) asks that you include at least an entire cinder cone but preferably include a group of cinder cones. By identifying a sample of each feature as instructed in S1 we have already complied with this specification.

S9 With consideration of other existing conservation tools, select areas known for high biodiversity or ecologically special areas, which might be identified by:

- **having high biodiversity inferred indirectly (e.g. seabird and marine mammal feeding areas);**
- **being known significant habitat for a listed species;**
- **being known to contain a refuge for a highly (or over-) exploited species;**
- **being known to contain a nursery, breeding, or spawning site.**

(The available information on these areas is in 'Conservation additional factors' Broad Area of Interest Descriptions in Appendix E.)

As explained, these specifications are primarily designed to help identify candidate MPAs based on the available benthic regionalisations. However we do know something about some of the visible species such as birds and mammals. Specification 9 (**S9**) asks you to identify areas of high biodiversity that can be inferred directly from concentrations of seabirds and mammal feeding areas. For example, the 'Conservation additional factors' (mainly flora and fauna) for the Pycnantha region give some information about the foraging grounds for Australian fur seals (Table 4.1).

If it is known that an area contains an identified significant habitat for a listed threatened or migratory species or a refuge for a highly (or over-) exploited species that area should be given higher priority for inclusion in the candidate MPA. For example in the Pycnantha Broad Area of

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Interest there is a residence area for school shark (Table 4.1). It is important to consider any known nursery areas, breeding sites or spawning areas and again give these regions higher priority when selecting candidate MPAs from your options.

Some of the data required (and/or references to sources) to fulfil these specifications can be found in Appendix E. This is a good place to include any knowledge you may have of the species and their protection requirements in the area. It would be desirable for you to document the sources of any data used so that information can be shared with other stakeholders.

S10 Design simple (rather than complex) shapes and reduce fragmentation of areas within each Broad Area of Interest. This can be achieved by using straight boundary lines and minimising the perimeter to area ratio.

Specification 10 (**S10**) ask that you design a simple rather than a complex shape to group together the features you have sampled. This is an important consideration for practical and feasible MPA management. Figure 4.7a illustrates the type of shape you should avoid. This specification also asks that you reduce fragmentation (see Figure 4.7b) when designing your candidate MPA. Fragmentation complicates management of your MPA and may minimise conservation benefits by leaving out important transition zones or other connections important for ecological integrity. The MPA in Figure 4.8 illustrates how S10 can be complied with.

Note: The boundaries of the Broad Area of Interest are fuzzy and it is permissible to identify areas outside the boundary (as in Figure 10) if a similar feature is there. This may be done to simplify a candidate MPA or to minimise the impact on, or to complement, your interests.

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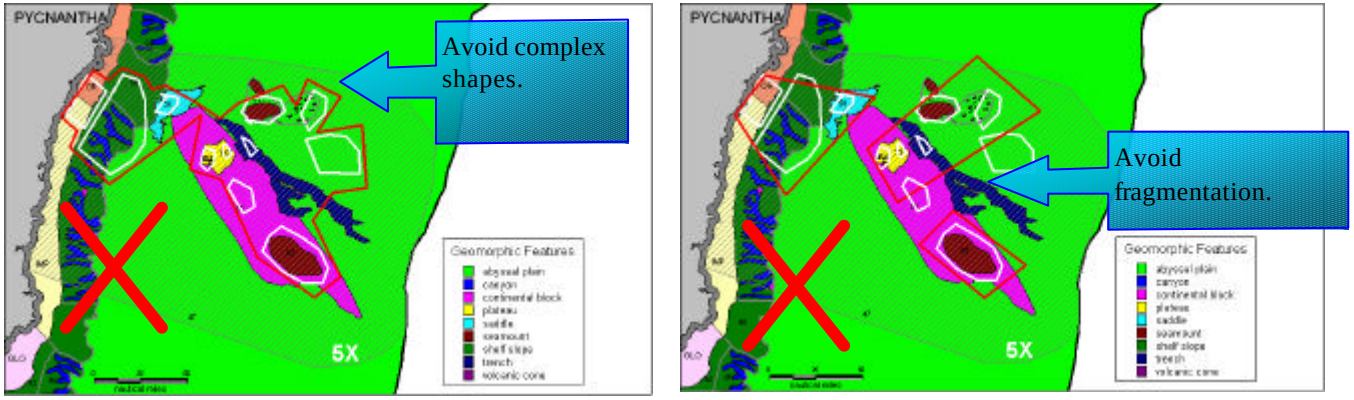

a) **b)**

Figure 4.7 It is important to mini mise the length of the boundary by a) avoiding complex shapes and b) avoiding fragmentation.

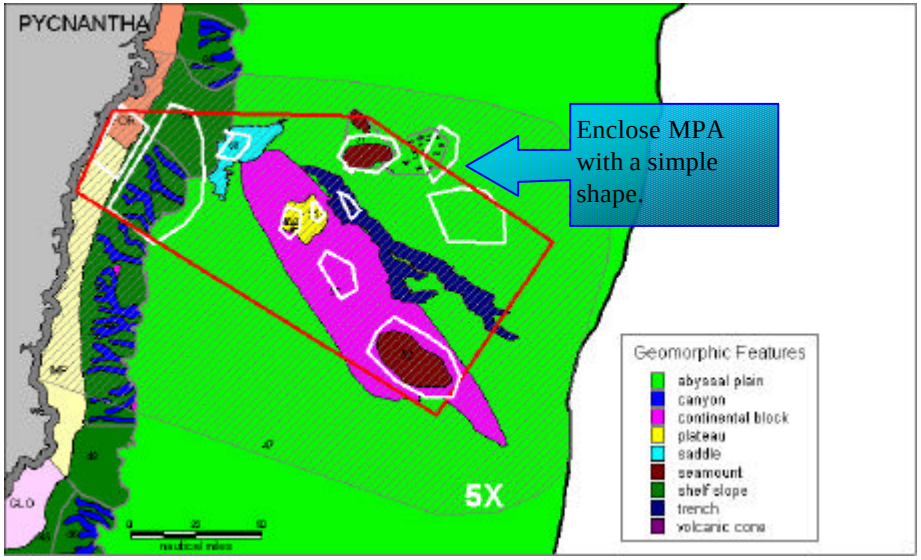

Figure 4.8 Design your identified areas as a simple shape.

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Adding in your interests

You may know of an activity that overlaps with an area identified as a possible site for an MPA. For example we have highlighted hypothetical candidate areas in yellow in Figure 4.9. To avoid this overlap you may prefer to find a sample of abyssal plain and seamount elsewhere (see Figure 4.9). This choice introduces fragmentation but may be a necessary trade-off. Conversely there may be a unique feature that has to be included. This could mean, for example, choosing another group of canyons rather than the group adjacent to the canyon-poor region. Not complying with **S6** will be the trade-off in making that choice and this should be recorded on your checklist. However you can still include a sample of the canyon-poor region (L3 region 59) (Figure 4.10a). You could choose to include a second canyon system as in Figure 4.10b. This choice may result in your candidate MPA being fragmented or larger. However, now your area meets more of the specifications.

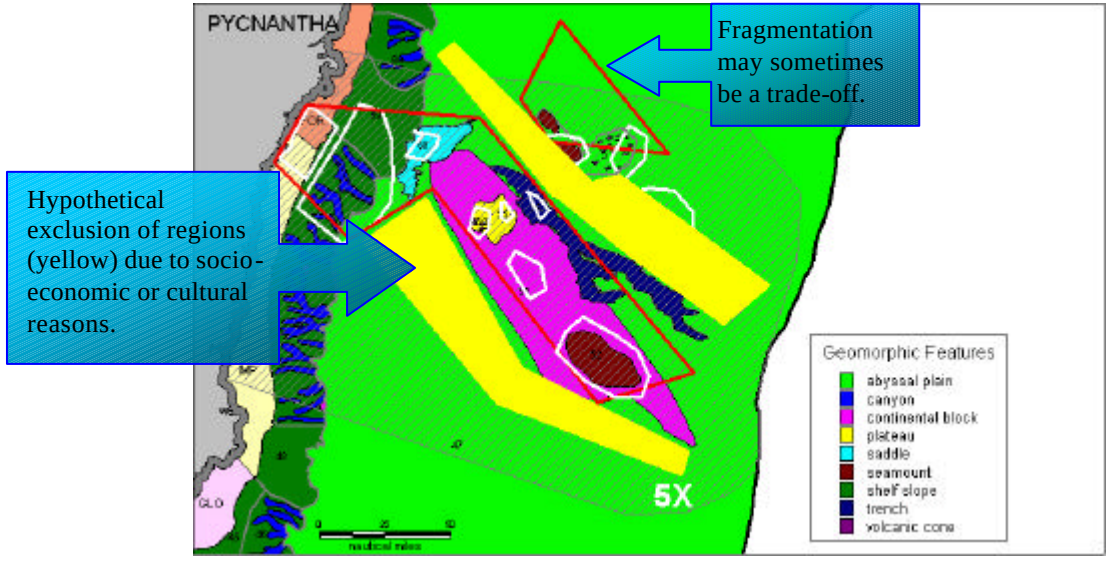

Figure 4.9 There may be reason to exclude areas from a candidate MPA (yellow). The trade-off may be a more fragmented set of candidate MPAs.

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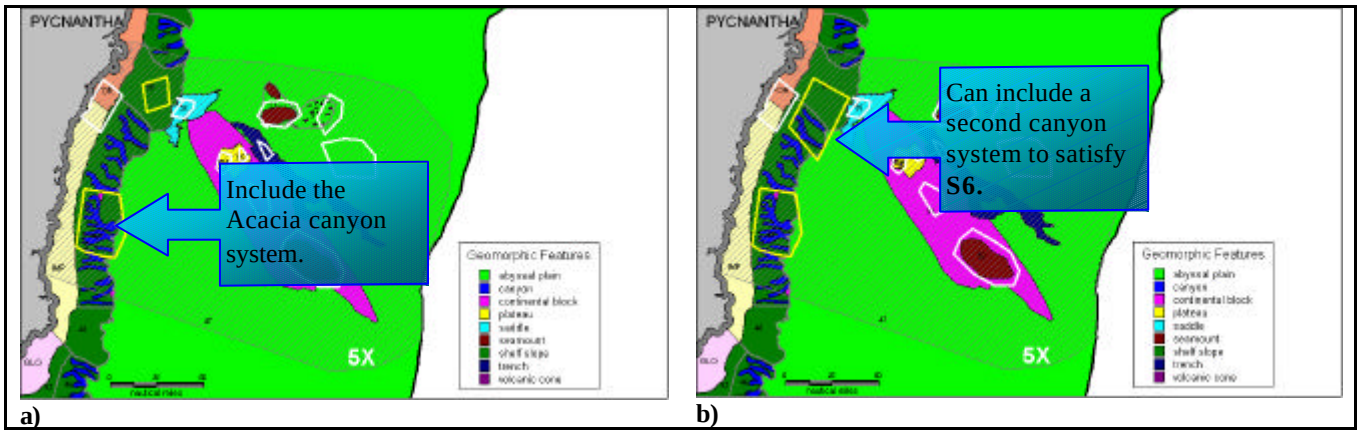

a) b)

Figure 4.10 By identifying the large Acacia canyon a) you do not include the canyon-rich to canyon-poor region and satisfy S7 and your candidate MPA may become fragmented; b) however you can choose to include another canyon system and thus satisfy S6. Your candidate MPA may still be fragmented but you satisfy more of the criteria so b) would be the preferred option.

Once you have broadly identified option(s) for each of the Broad Areas of Interest you should review the system-wide considerations (Section 3.3) and ensure your option(s) for a system of MPAs take account of these considerations.

Refining your options

Refine your options by rechecking all the steps. Use the checklist to ensure you have completed the process and to record if you are unable to satisfy any particular specification and why.

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Glossary

ANZECC	Australian and New Zealand Environment and Conservation Council
BAOI	Broad Area of Interest
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EA	Environment Australia
IMCRA	Interim Marine and Coastal Regionalisation for Australia
MPA	Marine protected area
NOO	National Oceans Office
NRSMPA	National Representative System of Marine Protected Areas
SEMR	South-east Marine Region
SERMP	South-east Regional Marine Plan

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References

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Appendix A Final draft Environment Australia/National Oceans Office paper – criteria

Operational criteria[4*] for identifying and selecting a comprehensive, adequate and representative system of marine protected areas in the South-east Marine Region

Purpose

This paper sets out the criteria or decision rules to help identify and select options for Broad Areas of Interest and candidate representative marine protected areas in the South-east Region. These criteria are generally derived from the ANZECC (1998) *Guidelines for establishing the National Representative System of Marine Protected Areas (MPAs)* and have been adapted in consultation with stakeholders to suit the level of information available for the deepwater offshore ecosystems of the Region. Consistent with these guidelines, these environmental, social, cultural and economic criteria will be applied as layers in an iterative decision making process with criteria to be used at any stage of the processes of identification and selection as appropriate.

The information to address the criteria will be drawn from a scientific assessment of the available bioregional data for the Region as well as ongoing input from agencies and stakeholders. An overview of the methodology to be used is described in Attachment A. The process is described in a companion Environment Australia/National Oceans Office document *Process for identifying and selecting a comprehensive, adequate and representative system of marine protected areas as part of the south-east regional marine planning process*.

Background

In accordance with the ANZECC guidelines, the development of a comprehensive, adequate and representative system of MPAs has two key interactive phases:

- Identification – use of biological and other scientific information to identify candidate areas to achieve biodiversity objectives;
- Selection – use of social, economic and cultural information and other stakeholder information to select sites from the candidate areas:

Both the identification and selection phases will be based on the best available understanding of ecosystem/biological processes in deepwater systems as well as existing and potential uses in the region. This information will be drawn from:

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* These criteria are drawn from a number of sources including the ANZECC Task Force on Marine Protected Areas (1999) Guidelines for Establishing the NRSMPA - Appendix 2; Great Barrier Reef Marine Park Authority Representative Areas Program Operational Principles; New South Wales Marine Parks Authority (2001) Developing a Representative System of Marine Protected Areas in NSW – An Overview; WACALM (2000) Development of a Generic Operational Framework for Marine Reserve Implementation in Western Australia.

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- the existing information including the National Oceans Office scoping and assessment data (biological, physical, economic, community, Indigenous and management characteristics of the SE region);
- consultation with stakeholders to help identify candidate areas that best complement human values, priority areas for conservation, uses, activities and opportunities.

System-wide objectives
A viable system of MPAs in the South-east Marine Region will aim to incorporate:

1. a small number of large MPAs rather than a large number of small MPAs to ensure integrated and effective management;

2. what is known about migration patterns, currents and connectivity among ecosystems;

3. existing Commonwealth and State MPAs in the NRSMPA;

4. a range of IUCN categories from strict nature reserves to managed resource protected areas where these are compatible with the objectives of the MPA;

5. maximum stakeholder/community ownership of the MPA system;

6. a regular review of the effectiveness of system.

Criteria

The MPA system will identify and select candidate areas based on the best available ecosystem knowledge, threatening processes, uses and impacts including stakeholder information on socio/economic and cultural interests.

Depending on the objectives for the area, one or more criteria may be considered to have greater 'weight' in the identification and selection process. The application of the criteria will be consistent with the goals and principles of the National Representative System of Marine Protected Areas. The primary goal of the NRSMPA is to establish and manage a comprehensive, adequate, representative system of MPAs, to contribute to the long-term viability of marine and estuarine systems, maintain ecological processes and systems and protect Australia' biodiversity at all levels. Secondary goals such as to provide for recreational, cultural and economic needs are also promoted where these are compatible with the primary goal.

Consistent with the ANZECC guidelines (1999) the criteria listed will be used to identify and select options for Broad Areas of Interest and candidate sites. For the NRSMPA, biodiversity and other environmental criteria are the primary criteria for the identification of Broad Areas of Interest. Social, cultural and/or economic criteria are applied primarily in the selection of MPA sites from candidate areas. In practice, some of the selection criteria may be applied at an earlier stage of the identification phase eg socio-economic considerations. Environmental criteria and social, cultural and economic criteria should be considered as layers in the decision making process,

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with criteria from each list able to be used at any stage in the process of identification and selection as appropriate. Flexibility in the application of the criteria will be required due to the variety of levels of data available.

	Identification criteria	Issues for consideration
Identification criteria – to be applied via scientific interpretation of available bioregional assessment data	**1. sample a full range of bioregions in the Region - candidate areas may extend over several bioregions, for example across latitudinal or cross-shelf ranges;**	Broad Areas of Interest (including the range of biogeomorphological features) that could potentially be sampled for protection within an MPA will be identified using the best available ecosystem knowledge. In general this process will identify 2-3 options within each province that target features present in the Region. To the extent possible these features will be used as surrogates for biodiversity.
	2. are large enough to ensure adequate viability and integrity of marine biodiversity at all ecosystem levels including transition zones;	The size of the candidate areas need to be of a dimension that provides effective protection to the values the area aims to protect. Candidate areas should avoid fragmentation and consideration should be given to any positive and or negative edge effects resulting from use of adjacent area, including the status, condition and vulnerability of the ecosystem type to disturbance where this is known.
	3. include atypical/unique areas or areas known for high biodiversity and or high quality/good condition (eg. significant biogeographic features, ecosystems, species, breeding/spawning areas);	The principle of representativeness also requires candidate MPAs to include known areas of unique and or distinct areas as well as typical areas. However, a representative approach will not specifically identify these important or unique sites. Temporal effects of high productivity events should also be recognised and considered in identifying candidate MPAs.
	4. include the whole of a biophysical feature/place to conserve the integrity of the biological unit;	Each feature is an integral biogeographical unit that should be managed as such.

	Identification criteria	Issues for consideration
Selection criteria to be applied via stakeholder input and other available cultural, social,	**5. minimise conflict with users;**	The selection of candidate MPAs will consider current use patterns and trends and take into account wider community expectations and support. This will include stakeholder input to a risk assessment of activities in the context of the biodiversity objectives for the candidate MPAs as well as a socio-economic assessment of the relative benefits and costs of candidate MPAs options.
	6. have boundaries including any zones that assist cost effective compliance and enforcement;	The selection of candidate MPAs will take into account management arrangements that apply in adjacent waters when designing a cost effective compliance and enforcement regime. Consideration will also be given to the practicality and feasibility of management.

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ATTACHMENT A

A brief overview of the methodology to be used to identify Broad Areas of Interest for a comprehensive, adequate and representative system of Marine Protected Areas in Australia's South-east Marine Region

This is not a technical document, and is not to be cited. It is merely an interim communication product specifically for the information of stakeholders at the 17 September 2002 workshop conducted by Environment Australia and the National Oceans Office, including presentations from CSIRO Marine Division.

The primary objective of the Commonwealth system of Marine Protected Areas (MPAs) is protection of biodiversity, following the principles of comprehensiveness, adequacy, and representativeness .

Although there are a range of methods and tools available for identifying and selecting representative marine protected areas, there is no single method or tool that can simply be adopted as the 'best approach' in the South-east Marine Region. Each method has advantages, limitations, and constraints in relation to the data availability, and the detailed criteria to be used for selection. Some may be helpful in the South-east Marine Region.

It is clear that the selection, design and management of MPAs involve *both* the interpretation of scientific data *and* the engagement of stakeholders in a context of values and objectives. Scientists have been devising tools to assist in evaluating the options and making such decisions without losing sight either of the data, or of the values, objectives, costs and risks. This is still a developing research area.

Even with the use of the most formal and detailed group, the scientific-analytic methods, the selection and design of MPAs is not a scientific problem; but it should be scientifically supported. Three broad approaches are:

1. Opportunistic-Serendipitous approach
This involves creating marine reserves in a piecemeal fashion, conserving when the opportunity presents itself with little thought towards a greater reserve system. To date, this procedure has been followed for the great majority of existing MPAs (and terrestrial parks) worldwide; it is the obvious approach when there is an identified site of particularly high significance or urgent threat. In this document this approach will not be discussed further, as the Commonwealth Government has committed, through the Regional Marine Planning process, to develop a CAR system of Marine protected areas as part of a strategic National Representative System of Marine protected Areas (NRSMPA).

2. Delphic-Judgmental approach
Under this approach, MPAs are selected or evaluated by relatively few people (stakeholders, managers and scientists mostly) making rapid decisions using a hierarchical list of criteria and objectives that try to balance out the overall range of values and interests. This approach is by far the most developed and is increasingly used for marine reserve selection. The Delphic approach normally includes an expert

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panel with the involvement of managers and direct stakeholders. It involves simply applying common sense, but taking advantage of expert advice, to achieve progress in the definition of objectives and quantitative criteria. This approach allows a rapid 'first-cut' for the selection of candidate MPAs. The major problem is that the process has intrinsically high levels of uncertainty.

There are two common methods for applying the Delphic approach.

- ***COMPARE***

Recently, the Delphic semi-quantitative approach based on *Criteria and Objectives for Marine Protected Area Evaluation (COMPARE)* has been proposed and used for the evaluation of the MPA system of South Africa. This approach consists in the up front identification of major general objectives for MPAs: in the South African case, these were roughly grouped into: (a) biodiversity protection, (b) fisheries management, and (c) human utilization. The procedure *begins* with a set of potential sites; each potential site is scored according to these agreed objectives. Overall this is a relatively easy process to apply once the candidate sites have been identified and there is a need to make choices between candidates or existing sites for MPAs.

- ***Dimensionless Analyses and Delphic Priority Ranking***

Another Delphic approach has been proposed for the identification of coral reef MPAS in the US. This is the so-called Dimensionless Analyses and Delphic Priority Ranking methodologies for selecting MPAs. This approach involves two steps, based on an expert panel for scoring and the use of analytical models. The first step is a formal priority ranking exercise, in which the starting point is the identification of Natural Resource Values of a given site or sites in relation to biogeographic representation. In the second step, a numerical model is used to compare the resource values of each site to the resource values of the biogeographic province represented by that site, and then to make comparisons among the sites themselves in order to determine priority ranking of sites.

3. Scientific-Analytic Approach

This approach is supported, so far, by only a few established procedures largely based on mathematical and computational techniques. These approaches use existing data on biodiversity, habitats (or environmental classification as proxy for biodiversity) and use independent and objective numerical and computational techniques (from the familes of 'optimisation' and 'heuristic' methods) to reach, normally, a few alternatives for MPA selection. They assess what combination of MPA sites would best represent the biodiversity, subject to a range of constraints, which can be imposed with stakeholder involvement. The methods are usually applied to relatively detailed data, from previously published work or specifically designed surveys of biodiversity, or using environmental classification in conjunction with some biological attributes. These approaches are still in early versions and under constant development. Their use for cases where there are only sparse data is still largely untried and controversial.

Four main packages of software and computational procedures have emerged recently from the original work of Australian researchers: C-PLAN, SITES, MARXAN, and TRADER.

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- *C-PLAN*

This package has been developed by New South Wales National Parks and Wildlife Service, designed to support the conservation planning for terrestrial ecosystems.

- SITES

The SITES software has been developed by The Nature Conservancy to support their ecoregional conservation plans and terrestrial nature reserve systems. SITES is currently being used for supporting the nature reserve siting that explicitly incorporates spatial design criteria into the site selection process. It helps to prioritise among potential conservation sites as a conservation portfolio is assembled, often using a hierarchical set of decision rules applied by combining goals, targets, and sites.

- *MARXAN*

In Australia, early versions of this software (developed by Hugh Possingham, Ian Ball and others) were used to formulate plans for the Regional Forest Agreements process in New South Wales, and in designing 'Green Zones' for the Great Barrier Reef Marine Park. The current MPA process in South Australian state waters may use MARXAN to identify sites. Overseas, MARXAN or earlier versions has been used in the Florida Keys, the Channel Islands, the Northern Gulf of Mexico in the US, British Columbia, Canada, and to identify regional conservation portfolios for The Nature Conservancy in the US. It is now in use in the Puget Sound/Georgia Straits, Canada, and open coasts of Washington and Oregon in the US.

- *TRADER*

Another suite of scientific-analytic methods is provided by the software TRADER (Glenn De'ath, AIMS). This is a composite approach, which attempts to incorporate in a quantitative manner the ecological, and management principles that have been developed for both bioregionalisation and reserve design processes. It is an approach that maximises the choices of designers - from managers and ecologists to local communities, and acknowledges the need for adaptive methods and software for each application.

Which approach and methods are most appropriate?

The methodologies outlined above are suited for different cases; to some extent to different kinds of objectives, and particularly to different quantities and qualities of available data. Broadly, Delphic approaches have been employed when data are sparse or uneven, but where there are experts with a 'feeling' and intimate knowledge for the system based on their long experience.

Scientific-analytic approaches have been employed where there is detailed data with adequate spatial coverage. In some cases this has been detailed biological data; in others it has been good coverage of well-understood biophysical surrogates (e.g., for the siting and selection of land reserves, rainfall, vegetation cover, aspect and soil type are surrogates for the occurrence of terrestrial plant species).

The use of scientific-analytic methods with sparse data and 'plausible' but poorly understood surrogates with a high degree of interpolation or 'averaging' is now being

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explored, but there have been no critical studies of the reliability of the methods in these cases.

Data available for Commonwealth waters of the South-east Marine Region
Data to be used in developing a comprehensive, adequate and representative system of MPAs for the South-east Marine Region will include:

1. IMCRA –on the continental shelf.
2. The data sets used for the draft interim bioregionalisation for the South-east Marine Region (beyond the continental shelf) prepared in 2001 for the National Oceans Office. These were:

- a high-resolution bathymetric model of the Region, including Macquarie Island.
- maps of geomorphologic units.
- seafloor sediment data (grain size, sorting, carbonate, mud, gravel and sand content).
- Interpreted echo-sounder and swath bathymetry backscatter data
- GIS coverage of ocean crust age, tectonic elements and sedimentary basins.
- GEOMAT sediment modelling outputs, including wave and tide data presented as a series of maps, showing their relative importance in mobilising sediments.
- A gridded dataset of seasonal nutrient distributions (nitrate, phosphate, silicate)
- A gridded dataset of seasonal temperature and salinity
- A dataset of seasonal dissolved oxygen
- A dataset of seasonal currents covering the South-east Marine Region
- An assessment of provincial structure (Level 1) and sub-biomic structure (Level 2b) within the region, based on the distributions of fish species, assembled from fisheries databases, fish collection databases, and published data.
- A database of collection data relating to key invertebrates (echinoderms, decapods and pycnogonids) from the South-east Marine Region shelf and slope.

3. Data layers on human uses prepared by CSIRO and Bureau of Rural Sciences for the National Oceans Office during 2002, including those presented in the Bureau of Rural Sciences *Marine Matters*, such as fisheries, ports and shipping, petroleum activities, natural and cultural heritage values, and human population distribution. Additional layers are still being developed.

In offshore waters, and especially below 2000 metres depth, we depend entirely on surrogates such as depth, temperature, oxygen, and geomorphology or plate age

Approach to be used for the South-east Marine Region
Given the available data, and the existing substantial work done for the bioregionalisation process for the National Oceans Office, the approach to be applied in the South-east Marine Region is a modified Delphic-judgemental technique. The key steps in the methodology are as follows:

1. Using the proposed hierarchical bioregionalisation framework for the South-east Marine Region and the available data, we will seek more refined characterization of areas within the South-east Marine Region based on their environmental similarity.
2. This refinement will be done by a team of people who were involved in the bioregionalisation exercise and who are familiar with the data (including the

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limitations of those data). Bases for their decisions (which will be partly analytical and partly Delphic) will be recorded. Steps 1. and 2. *precede* the use even of the Delphic-judgemental methods outlined above, which begin with a set of candidate areas that emerged from this regionalization.

3. Addition of data layers concerning human uses, which may indicate preferences for broad areas that are 'otherwise equal'. At this point, we have options for 'Broad Areas of Interest' based on the data plus expert knowledge. These broad areas will be further refined and shaped with input from stakeholders. In other words, we will be at the starting point for any of the above families of methods. Now, stakeholders, managers and scientists must work together to make the choice, on the basis of clear criteria.
4. Application of a Delphic method to selection of preferred candidate sub-areas within the broad areas. This may or may not be aided by software such as TRADER or C-PLAN, to ensure that the objectives of the entire reserve system are not compromised and that the various values, economic interests, and risks are kept in sight; but at this point stakeholders *must* be involved.
5. Application of a Delphic-judgemental method to refining the choice between candidate areas (again, a variety of software tools may assist the process, but stakeholders must be involved).

Conclusion: Role of stakeholders

This paper is about methods, not about objectives and criteria, but we note that objectives and criteria as well as the conservation and management targets *must* be specified, for any of these methods to be used. While difficult, specifying objectives to achieve comprehensive representation of species and ecosystems is reasonably well understood, and limited primarily by the availability of data. What is less well understood is how to ensure that a system of MPAs is *adequate*; that is, that ecosystems and populations within the MPA system will persist in the long term. There has been some recent work on this issue and in particular on how to account for the effects of catastrophic events.

In the present case, the overall objectives and criteria are stated in the Strategic Plan of Action for a NRSMPA, developed by the ANZECC Task Force on Marine Protected Areas (ANZECC Task Force on Marine Protected Areas 1999) and Environment Australia and the National Oceans Office, with stakeholder consultation, are developing a simplified set of those criteria for the present case (continental shelf and deep water). In situations such as the present case in the South-east Marine Region, which is data-sparse, it is a task for scientists with sufficient knowledge of the data to proceed as far as the development of options for Broad Areas of Interest as a starting point for stakeholder discussion and input.

Even in data rich cases, there is a need for extensive stakeholder involvement. It is a task not for scientists as scientists, but for society to evaluate the costs and benefits and the trade-offs between different choices, to make the final choice of sites, and to develop designs, management arrangements and performance measures. These steps can be aided by scientific information, but are ultimately not scientific choices.

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Appendix B Identified conservation measures utilised in the South-east Marine Region

A meeting of Commonwealth agencies convened by the National Oceans Office on 19 March 2003 identified the following means, taken by various agencies under various Acts, all of which have conservation effects (list prepared by National Oceans Office).

Attachment A: Identified conservation measures utilised in the South-east Marine Region

- Impact assessment:
  - In MPA development through stakeholder consultation
  - Fisheries auditing
  - Strategic environmental assessments/ coordination of industry info
  - Sensitive sea areas - International Maritime Organisation (IMO) controls on navigation/ vessel usage
  - Assessment of matters of national environmental significance (including listed species)
- Strategic Assessment:
  - Auditing
  - Status reports, annual reporting
  - Strategic assessment under EPBC Act
  - Guidelines for strategic assessment
  - Impact assessment for sea dumping
- Environmental Management Plans (risk assessment, mitigation measures, review/monitoring):
  - Delegated to states, stakeholder involvement
  - Navy for all activities
  - Zone plans and plans of management
  - Fisheries Management Plans
  - Bycatch action plans
- Stakeholder driven research:
  - Oil & gas companies conduct research for EMPs
  - Habitat mapping
  - FRDC research
  - Shipping industry; Place of refuge guidelines
- Incident response:
  - Contingency planning
  - Species stranding protocols
  - Oil spill response protocols
- Information base (agency driven research):
  - Funding and in kind support
  - Networks of scientific exchange

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- Ecological risk assessment for commonwealth fisheries, including target/ bycatch/ byproduct
- Identifying appropriate ecological indicators
- Data acquisition plan/ collection program - logbooks/ research surveys
- National fisheries data strategy
- Mapping habitat/ fish info
- Funding of ecosystem and species research

- Voluntary guidelines and agreements:
  - Conservation agreements
  - Fisheries codes of conducts
  - Codes of conduct
  - Guidelines for seismic industry for interaction with cetaceans
- Permiting Systems:
  - Quotas for tourism/research
  - Permits for interactions (ie which may cause injury/death) with protected species or cetaceans
  - Permits for sea dumping & wildlife trade
- Statutory plans:
  - Compatible plans of management across jurisdictions (eg MPAs)
- Spatial management:
  - Critical habitat of threatened species
  - Exclusion zones around oil and gas activities
  - Legislative closures (short term/site specific)
  - Spatial data collection
  - MPAs
  - Spatial fishing closures, temporal fishing closures
  - Telecommunications cable exclusion areas
- Species plans:
  - output controls (eg quotas/ total allowable catches)
  - Stock assessments
  - Recovery plans for threatened species/ threat abatement plans
- Gear and equipment:
  - Turtle exclusion/ bycatch reduction devices
  - Output controls (eg trip limits, gear restrictions)
  - Black box for shipping vessels/ vessel monitoring systems (compliance tools)
- Compliance:
  - developing compliance (with EPBC Act) strategy for marine areas
  - integrated compliance networks
  - Compliance/ operational plans
  - 3rd party audits
  - AMSA surveyors (MARPOL)
- Accreditation processes:
  - accreditation system for tourism operators
- Stakeholder consultation/education:
  - establishment of management advisory committees
  - National species recovery groups for sharks, cetaceans, seals and turtles
  - Seanet; educating fishers
  - stakeholder consultation through EMP process

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- consultation part of impact assessment work

- Joint management:
  - MOUs
  - Compatible plans of management (eg states/commonwealth for MPAs)
- Legislation
  - legislative objectives (ie ecologically sustainable development/ stakeholder consultation)
  - Fishing rights
  - listed species (protected)
  - MARPOL convention
  - Prevention of pollution from ships (POPS Act)
  - Most relevant legislation have environmental/conservation components
- Audit & Review:
  - 3rd party audits
  - performance measures/monitoring assessment
- Integration/ partnerships:
  - Southern fisheries management forum
  - International conventions (eg migratory species)
  - ship safety/ search & rescue
  - jurisdictional cooperation eg squid fishery
- Full cost pricing – eg pollution

Appendix C Representative contacts

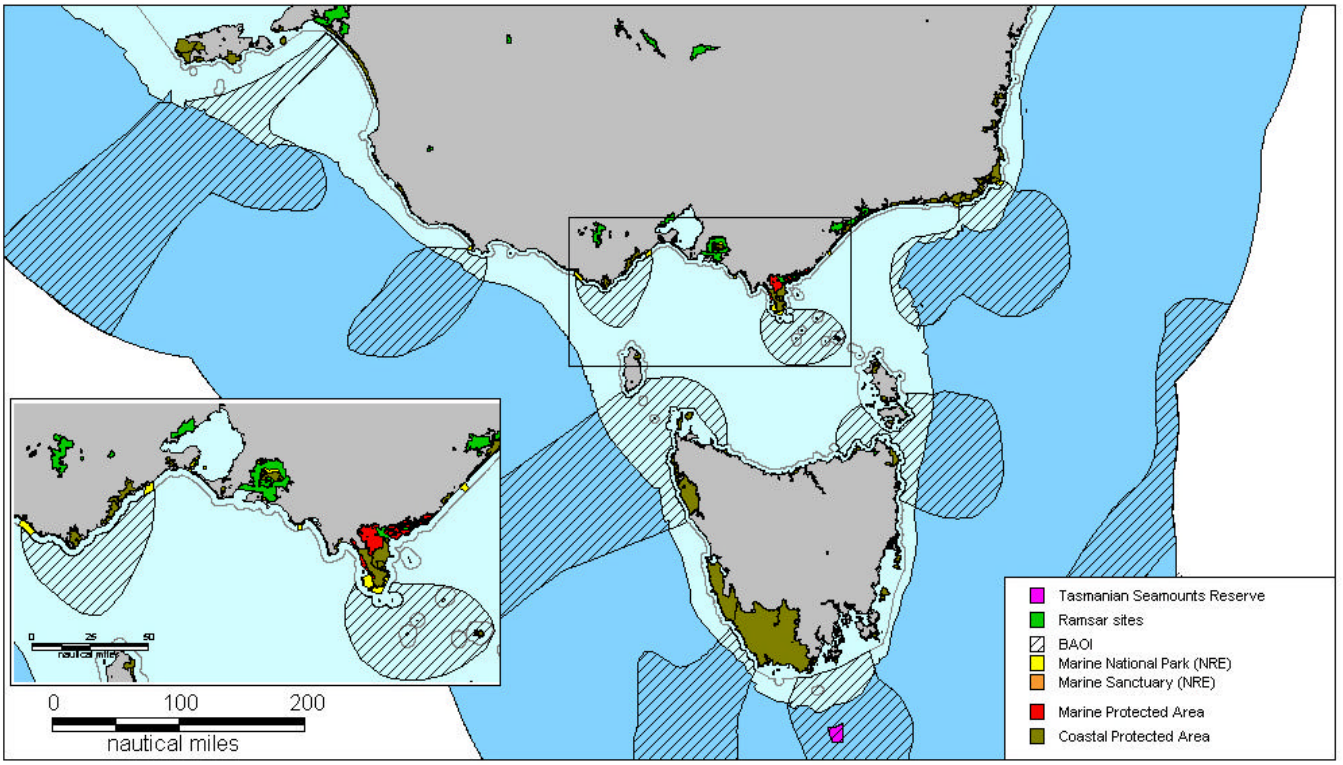
The following organisations are represented on the Commonwealth Stakeholder Reference Group, MPA Focus Group and the South-east Regional Marine Plan Working Group.

To contact one of these representatives, please call Environment Australia on 02 6274 1767.

Aboriginal And Torres Strait Islander Commission
Australian Petroleum Production and Exploration Association
Association of Australian Ports and Marine Authorities
Austral Fisheries Pty Ltd
Australian Conservation Foundation
Australian Marine Conservation Society
Australian Seafood Industry Council
Australian Shipowners Association
Complete Fisheries Management Pty Ltd
Environment and Resource Consultants
Fishwell Consulting
Marine and Coastal Community Network
Minerals Council of Australia
National Oceans Advisory Group
Ports Corporation of Queensland
Recfish Australia
Tasmanian Fishing Industry Council
Tourism Task Force
Whale and Dolphin Conservation Society
Woodside Petroleum Ltd
World Wide Fund for Nature, Australia
Centre for Maritime Policy, University of Wollongong
Museum of Victoria
Flinders University of South Australia
Tasmanian Aquaculture Council
Seafood Industry Victoria
Tasmanian Minerals Council
BHP Billiton
Esso
Shipping Australia Ltd
Sea Charter Boat Operators of Tasmania
Polperro Dolphin Swims
Marine Recreational Fishing Council
Victorian National Parks Association
Department of Primary Industries, Water and Environment
Department of Environment and Heritage, SA
Department of Natural Resources and Environment
NSW Fisheries

Appendix D Existing marine and coastal protected areas

Figure D.1 Existing marine and coastal protected areas in the South-east Marine Region. This map does not include the MPAs at Macquarie Island and the Broad Areas of Interest are not all shown for ease of display.



Appendix E Broad Area of Interest descriptions

This appendix contains descriptions of the 11 Broad Areas of Interest in terms of conservation features, human uses and other considerations. The process used to identify the Broad Areas of Interest is briefly described in Sections 1.3 and 2.3.

The descriptions of the Broad Areas of Interests were originally developed by a small group, which included members from CSIRO, Geoscience Australia, National Oceans Office, Environment Australia and stakeholders from the forums listed in Section 1.3. The descriptions have been available to the stakeholder groups for comment since 21 November 2002 and at the conclusion of the comment period were reconsidered by CSIRO Marine Research, working with scientists from a number of institutions in the south-east of Australia. Due to time constraints the descriptions are not comprehensive and there may be resources that have not been accessed to date. New data will continue to be acquired and included as part of the process of identifying candidate MPAs.

Description of the provinces, bioregions and geomorphic characteristics

Figure E.1 is a map of the South-east Marine Region showing the Broad Areas of Interest, the IMCRA regions (ANZECC 1998) and the deepwater Level 3 bioregionalisations (Butler et al. 2001). As discussed in Section 2.3 these regionalisations provide the basis of the descriptions of the bioregions and geomorphic characteristics for each Broad Area of Interest[5].

Table E.1 describes the three large-scale biogeographic provinces of the region (Level 1 units – also see Table 2.1). Each Broad Area of Interest (Tables E.2 to E.11) is assigned a name and number (e.g. Murray, 1A) based on its province. The IMCRA mesoscale regions have three letters (e.g. BRU) and the Level 3 offshore bioregional units have simple numbers (e.g. 28) (and see Figure 3.1). Further detail on the characteristics of the bioregions and geomorphic features accompanies the map of each BAOI in Tables E.2 to E.12.

'Conservation' column, Tables E.2 to E.12

This column contains two lists, conservation 'features' (primarily benthic) and 'additional factors' (primarily flora and fauna). Some of the features were obtained from the data underlying the regionalisation, while others were provided by the stakeholders and scientists. The 'additional factors' list primarily contains information on the visible species such as seals, cetaceans, and birds. For example, we have not attempted to identify the foraging grounds of all bird and seal species, rather we have tried to indicate regions that appear to be important foraging sites in general. We have also noted sites of repeated sightings of critically endangered birds and known important breeding locations.

'Human uses' and 'other considerations' columns

The descriptions of human uses and other considerations such as existing conservation mechanisms serve as a reminder of the broader issues to be considered in the development of the MPA system. A full list of the identified conservation measures used in the South-

[5] A brief description of the IMCRA and Level 3 bioregionalisations can be found in *Ecosystems – Nature's Diversity. The South-east Regional Marine Plan*. National Oceans Office (2002) (available from www.oceans.gov.au).

east Marine Region is in Appendix B. Other conservation measures include recovery plans for the great white shark, grey nurse shark, albatross and petrels. These recovery plans are available from the Environment Australia web site: http://www.ea.gov.au/coasts/species/index.html (sharks) and http://www.ea.gov.au/biodiversity/threatened/recovery/albatross/index.html (albatross and petrels). Recovery plans for blue whale, southern right whale, fin whale, sei whale and humpback whale, marine turtles, southern elephant seal and the sub-antarctic fur-seal are currently in preparation.

Existing marine and coastal protected areas are likely to have positive edge effects on MPAs and already provide for representation of key bioregions in the NRSMPA. A map showing these areas with the Broad Areas of Interest overlaid is in Appendix D.

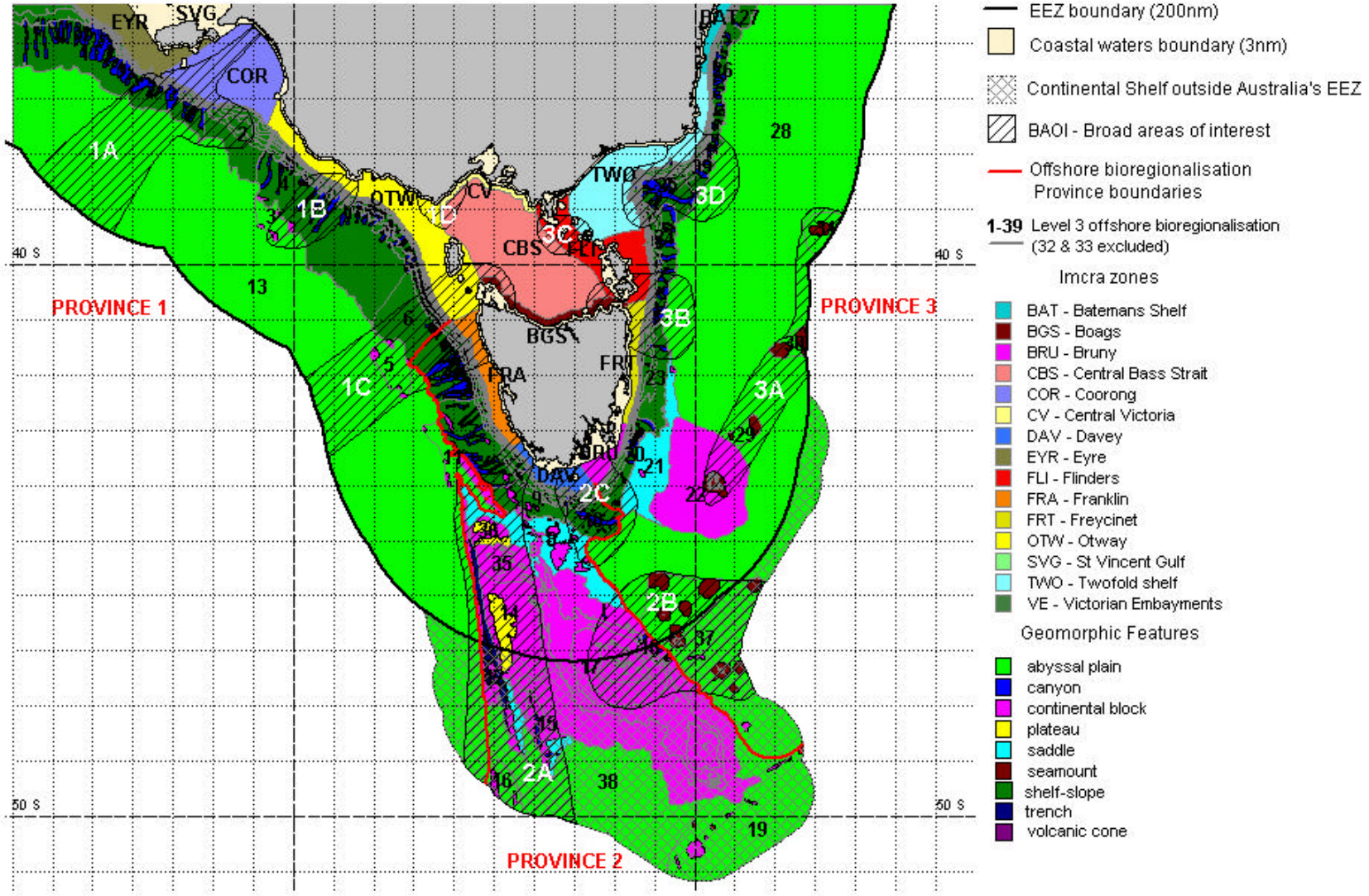


Figure E.1 The South-east Marine Region showing the Broad Areas of Interest, Interim Marine and Coastal Regionalisation for Australia regions and geomorphic features as displayed in these descriptions.

Caveat: This is a preliminary map compiled in May 2003. The final outer limit of Australia's extended continental shelf beyond the 200 nautical mile Exclusive Economic Zone will only be determined following submission of particulars of the outer limit, along with supporting scientific and technical data, to the United Nations Commission on the Limits of the Continental Shelf in accordance with Article 76 and Annex II of the United Nations Convention on the Law of the Sea. The outer limit will become final and binding when it is established on the basis of the commission's recommendations.

Descriptions of bioregions and geomorphic characteristics, conservation features, human uses and other considerations for the Broad Areas of Interest

The 11 Broad Areas of Interest (Tables E.2 to E.12) are:
Murray (1A)
Nelson (1B)
Zeehan (1C)
Apollo (1D)
Tasman Fracture (2A)
South Tasman Rise (2B)
Huon (2C)
Offshore Seamount (3A)
Banks Strait (3B)
Bass Basin (3C)
East Gippsland (3D)

Due to time constraints the information in Tables E.2 to E.12 compiled by CSIRO from a variety of sources is not comprehensive and there may be resources that have not been accessed to date. New data will continue to be acquired and included as part of the process of identifying candidate MPAs.

Table E.1 Description of the three large-scale biographic units termed 'provinces' in the South-east Marine Region.

Offshore Demersal Province 1 (P1) incorporates the continental slope and abyssal plain west of Tasmania and the South Tasman Rise. The provincial boundaries are recognised, on the upper continental slope, by the distributions of fish species parallel to the coast; there is a discontinuity in these distributions broadly west of the north-west tip of Tasmania and in the deeper water by the underlying geologic structure of oceanic crust and plate age. In fact, it is likely that, when examined in a whole-continental context, this area will be found to be a biotone between two well-defined faunal provinces – one being our Province 2 (P2) in the South-east Marine Region and the other lying further to the north and west. Invertebrate data broadly corroborates this picture but is sparse and therefore does not give a clear pattern. Beyond the upper slope, the lower slope and abyssal plain contain several small, rotated blocks of underlying continental crust protruding above the seafloor. These blocks are remnant continental crust that has locally subsided during and after the separation of Australia from Antarctica. The seafloor of the abyssal plains has broadly east-west trending features that have been inherited from the underlying structure of the oceanic plates.
Offshore Demersal Province 2 (P2) incorporates the southern continental slope of Tasmania and the large continental block of the South Tasman Rise. Its boundaries on the slope are determined by discontinuities in the distributions of fish species parallel to the coast; these are broadly corroborated by discontinuities in the much more limited data available on invertebrate animals. Beyond the slope, the province has been defined to incorporate the continental block of the South Tasman Rise, and the abyssal plain further south. The western boundary is the escarpment of the Tasman Fracture Zone, its eastern boundary the eastern edge of the South Tasman Rise. The South Tasman Rise is geologically and biologically (fish) related to the western Tasmanian Margin (i.e. P1). East of the South Tasman Rise, the boundary curves eastward because the abyssal seafloor to the south is structurally related to the spreading of Australia from Antarctica, rather than the earlier opening of the south Tasman Sea. Consequently, the provincial boundary has been placed at the boundary between these two structurally different regions.
Offshore Demersal Province 3 (P3) incorporates the continental slope (including Bass Canyon), East Tasman Rise, and abyssal plain east of Tasmania. The boundary with P2 is recognised, on the upper slope, by the distributions of fish species parallel to the coast; there is a discontinuity in these distributions broadly south of Hobart. In fact, it is likely that, when examined in a whole-continental context, this area will be found to be a biotone between two well-defined faunal provinces – one being our P2 in the South-east Marine Region and the other lying further to the north. Invertebrate data broadly corroborate this picture but are sparse and therefore do not give a clear pattern. Beyond the slope, this province includes the submerged continental block of the East Tasman Rise, which locally subsided from Tasmania and the South Tasman Rise during the opening of the south Tasman sea approximately 80 million years ago. Beyond the continental slope, the seafloor of the abyssal plains has broadly north-south trending features that have been inherited from the underlying structure of the oceanic plates, and thus differs from associated regions in P1 and P2.

Murray (1A)

Bioregions and Geomorphic Characteristics

- Murray Broad Area of Interest occurs wholly within P1.
- Entirely within IMCRA Western Bassian Demersal Biotone; regarding pelagic waters the entire shelf of the South-east Marine Region is in the Southern Pelagic Province with the exception of a small part of the East Gippsland Broad Area of Interest.
- Level 3 geomorphologic regions: 1, 2, 13
  - 1 - Continental slope, extensively incised with submarine canyons spaced 14 to 17km apart
  - 2 - No canyons, slope more gradual
  - 13 - Continental rise/abyssal plain, mean easterly currents

- IMCRA meso-scale region: Coorong. (see ANZECC 1999 for descriptions).
- Murray River mouth→ continental shelf bearing relict deposits.

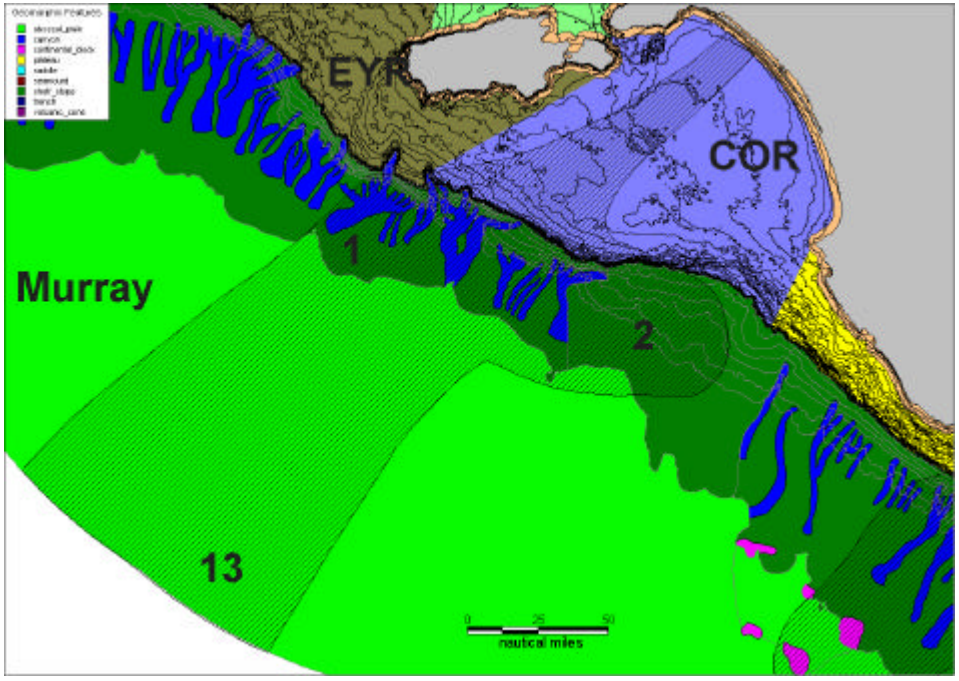


Figure E.2 Murray (1A).

Conservation	Human Uses	Other Considerations
Features • Canyons extending across entire slope (encompassing all sub-biomes). • Canyon-rich area abutting canyon-poor area. • Major biotone of cool-temperate species from Tasmanian and Bassian provinces (IMCRA). **Additional Factors (Flora and Fauna)** • Adult female New Zealand Fur Seals (lower risk) forage 40-150km S-SE of Kangaroo Island, in waters about 80m deep. Adult males forage 140-250km SE of Kangaroo Island (benthic and pelagic feeders).[6] • Australian sea lions likely to forage (benthic feeders) 40-150km S-SE of Kangaroo Island, in waters about 80m deep.[7] • Area of high-order predator foraging and breeding grounds (penguin, seal, whale, shark). • Residence area for school shark.[8] • Southern right whale breeding and migrating, humpback whale migrating.	• Shipping routes.[9] • Commercial fishing area: - Traps – rock lobster - Trawl – bottom trawl - Non-trawl – longline/dropline/hook/traps - Netting/hooking – shark - Giant crab fishery • Recreational fishing • Indigenous fishing • Non extractive uses – diving, yachting.[3] • Defence areas to north-west of Broad Area of Interest (south of Kangaroo Island). • Data available from petroleum, and fisheries and none available for non-extractive use, recreational fishing.	• Borders SA waters – talk to state government. • Potential Indigenous Protected Areas/future native title (also some existing in adjacent state waters?). • Cultural (Aboriginal and European) heritage around Kangaroo Island. • Land based (agriculture) influences. • Bonney Upwelling conservation assessment area. • Captures inshore-abyssal plain transect.

[6] Page (2002)
[7] Page, B. (personal communication) and Costa and Gales (2003)
[8] Grant West (personal communication)
[9] Larcombe, Brooks, Charalambou, Fenton, Kinloch and Summerson (2002)

Conservation	Human Uses	Other Considerations
• Number of other pelagic cetacean species (e.g. southern right whale, dolphin, spectacled porpoise, dusky dolphin) that use deep oceanic regions to feed, breed and migrate. • Blue, fin, minke, sperm, beaked, killer, pilot whale migrating and likely feeding.		

Table E.2 Considerations for the Murray (1A) Broad Area of Interest.

Nelson (1B)

Bioregions and Geomorphic Characteristics

- Nelson Broad Area of Interest occurs wholly within P1.
- Level 3 geomorphologic regions: 3, 4, 13
  - 3 - Several rotated continental blocks between 11-30km diameter
  - 4 - Extensively incised with submarine canyons spaced every 15km. From 2000 m depth to the bottom of the slope the bottom currents are part of a clockwise gyre centred at 40.8°S and 141°E
  - 13 - Continental rise/abyssal plain

- Entirely within IMCRA Western Bassian Demersal Biotone.
- IMCRA meso-scale region: Otway (see ANZECC 1999 for descriptions).

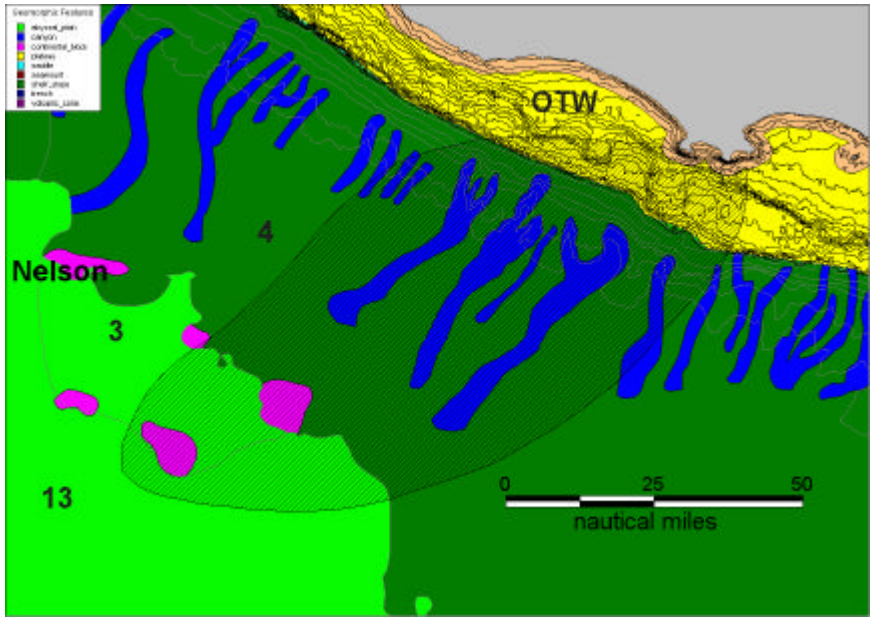


Figure E.3 Nelson (1B).

Conservation	Human Uses	Other Considerations
Features Encompasses part of Bonney Upwelling, which is highly productive.[6, 13] **Additional Factors (Flora and Fauna)** • Southern right whale breeding and migration, and humpback whale migration. • Blue, fin, sei, minke, sperm, pilot, killer, beaked whale feeding and migrating. [13] • Common, bottlenose dolphin feeding, breeding and migrating. • Number of other pelagic cetacean species (e.g. southern right whale, dolphin, spectacled porpoise, dusky dolphin) that use deep oceanic regions to feed, breed and migrate. • Leatherback turtles. • Feeding ground for many species of birds.[10] • Zone of faunal overlap from Tasmanian and Bassian provinces (IMCRA). • Krill and fish abundance, and fish diversity. • Female Australian fur seals from Lady Julia Percy Island feed on continental shelf between Portland and Cape Otway (benthic feeders).[7]	• Projected to be highest area of multiple use if petroleum and fishing expand. • Whole shelf taken by petroleum acreage (more than half is existing leases).[11] • Commercial fishing area: - Traps – rock lobster - Trawl – bottom trawl - Non-trawl – longline/dropline/hook/traps (includes squid) - Netting/hooking – shark - Giant crab fishery - Eel fishery (eels migrate inshore-offshore) • Recreational fishing.[3] • Indigenous fishing. • Shipping routes.[3] • Non-extractive use – diving, yachting? • Petroleum interest in eastern Duntroon Basin.	• Bonney Upwelling conservation assessment area.[12] • Narrowest piece of continental shelf in province. • Potential Indigenous Protected Areas (existing on Deenmarr Island).

Table E.3 Considerations for the Nelson (1B) Broad Area of Interest.

[13] Gill, P. 2002 (Gill, P.C. (2002)
[10] For more information see Reid, Hindell, Eades and Newman (2002)
[7] Data from J.P.Y. Arnould (University of Melbourne and R. Kirkwood (Philip Island Nature Park)
[11] See www.industry.gov.au/petexp
[3] Larcombe et al. (2002)
[12] Butler, Althaus, Furlani and Ridgway (2002a)

Zeehan (1C)

Bioregions and Geomorphic Characteristics

- Zeehan Broad Area of Interest occurs in the transition between P1 and P2.
- Level 3 geomorphologic units: 5, 6, 34, (13)
  - 5 - Continental rise with several rotated continental blocks of 7-28km diameter
  - 6 – Rough continental slope extensively incised with submarine canyons every 7km
  - 34 – Smooth and rough continental slope extensively incised with submarine canyons every 7km
  - 13 - Continental rise/abyssal plain.

- Incorporates IMCRA Bassian and Tasmanian Demersal Provinces and Western Bassian Demersal Biotone.
- 4 IMCRA meso-scale regions: Otway, Boags, Central Bass Strait, Franklin (see ANZECC 1999 for descriptions).

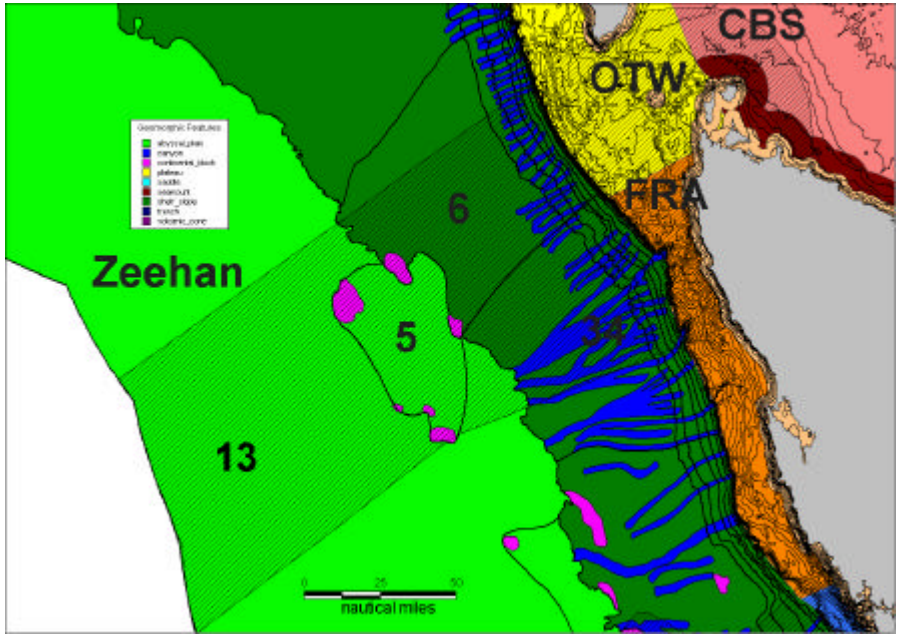


Figure E.4 Zeehan (1C).

Conservation	Human Uses	Other Considerations
Features • Focus on overlap (transition in fish fauna) zone of two offshore provinces. • Canyons that extend down the entire slope (encompassing all sub-biomes). • Links between canyons, Zeehan current, upwelling processes and flows through Bass Strait. • Complex seafloor in the passage between King Island and the Fleurieu (Hunter) Group; likely associated with complex habitat structure and diverse flora and fauna. • Exceptionally diverse range of habitats across the shelf and to the abyssal plain. **Additional Factors (Flora and Fauna)** • Blue grenadier/ling spawning. • Female Australian fur seals from Lady Julia Percy Island feed on continental shelf (benthic feeders).[7] • Blue, fin, sei, minke, sperm, pilot, killer, beaked whale feeding and migrating. [13, 9] • Residence area for school shark (winter).[16] • Number of other pelagic cetacean species	• Existing petroleum industry lease areas. • Petroleum leases over the shelf. • 2003 petroleum exploration acreages release.[5] • Current petroleum industry gazettal areas. • Commercial fishing Crab fishery. Blue grenadier fishery. Ling, trap and line. State rock lobster. Scallop grounds –fishery assessment recommendations to result in fishery spatial arrangements to protect areas from benthic impacts. Crab area for the Tasmanian Giant Crab Fishery. Non-trawl - demersal longlining. • Shipping route Stanley – King Island.[3] • Ports.[3]	• Abuts areas of Indigenous heritage significance - cultural heritage significance of submerged lands, coastal Indigenous Protected Areas. • Borders Tasmanian state waters – talk to state government. • Bonney Upwelling conservation assessment area.

[7] Data from J.P.Y. Arnould (University of Melbourne and R. Kirkwood (Philip Island Nature Park)
[8] National Oceans Office (2002)
[6] Butler et al. (2002a)
[10] Eric Woehler (personal communication)
[5] www.industry.gov.au/petexp
[3] Larcombe et al. (2002)

(e.g. southern right whale, dolphin, spectacled porpoise, dusky dolphin) that use deep oceanic regions to feed, breed and migrate, likely southern right whale breeding and migration, and humpback whale migration. • Leatherback turtles west of King Island November-May.[8] • Includes part of old Bass Lake (sponge beds).[6] • Shy albatross [10] • Blue petrel occur May-October. • Trefoil Island has 700 000 breeding pairs of short-tailed shearwaters which feed on the shelf.		

Table E.4. Considerations for the Zeehan (1C) Broad Area of Interest.

Apollo (1D)

Bioregions and Geomorphic Characteristics

- Entirely on continental shelf (IMCRA) with overlap between Western Bassian Demersal Biotone and Bassian Demersal Province.
- Sill separating Bass Basin from open ocean; includes outlet channel from old Bass Lake and mainland river systems.
- 3 IMCRA meso-scale regions: Otway, Central Victoria and Central Bass Strait zones (see ANZECC 1999 for descriptions).

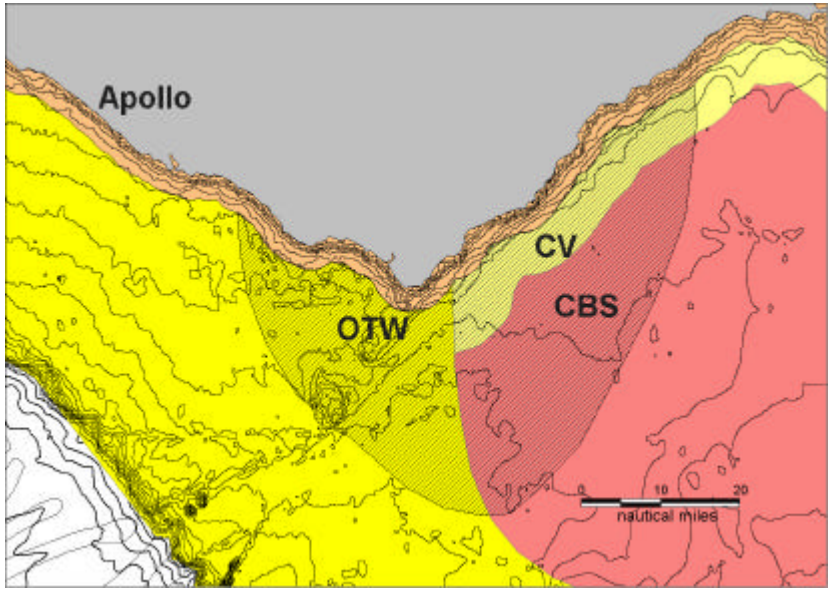


Figure E.5 Apollo (1D).
Note: Apollo is situated entirely on the continental shelf, thus no features are available for this Broad Area of Interest.

Conservation	Human Uses	Other Considerations
Features • Includes zone of faunal overlap from Tasmanian and Bassian Provinces (IMCRA). • Elements of South Western Province and Tasmanian Province. **Additional Factors (Flora and Fauna)** • Blue, fin, sei, minke, killer whale feeding and migrating. [13] • Common and bottlenose dolphin feeding. • Southern right whale breeding and migration, and humpback whale migration. • Includes part of old Bass Lake. • Southern right whale feeding. • Female Australian fur seals from Kanowna Island and Lady Julia Percy Island feed on continental shelf (benthic feeders).[7]	• Oil and gas development area, with existing leases.[5] • Shipping routes.[3] • Commercial fishing area: - Traps – rock lobster - Trawl – bottom trawl - Non-trawl – longline/dropline/hook/traps (includes squid) - Netting/hooking – shark - Giant crab fishery - Eel fishery (eels migrate inshore-offshore) • Recreational fishing.[3] • Indigenous fishing. • Non-extractive – boating etc.[3]	• Close proximity to ports.[3] • Native title claim pending. • Borders Victorian state waters – talk to state government. • Bonney Upwelling conservation assessment area.

Table E.5 Considerations for the Apollo (1D) Broad Area of Interest.

[7] Data from J.P.Y. Arnould (University of Melboume and R. Kirkwood (Philip Island Nature Park)
[5] www.industry.gov.au/petexp
[3] Larcombe et al. (2002)

Tasman Fracture (2A)

Bioregions and Geomorphic Characteristics

- Predominantly P2 with small inclusion of P1 in western extremity.
- Contains Level 3 geomorphologic units: 11 and 13 in P1, and 7, (8), 9, 12, 14, 15,16, 17, 35, 36, and 38 in P2
  - 7 – Continental slope, extensively incised with submarine canyons spaced 14km apart. Contains several rotated continental blocks. On the continental slope (<200 m) mean currents form complex clockwise and counter clockwise rotating gyres
  - 9 – Continental slope, with no submarine canyons. Contains several rotated continental blocks and a few seamounts
  - 11 – Abyssal plain contains several continental blocks and 180km long north-west-trending ridge. Mean currents form an anti-clockwise gyre (flowing into the area of L3-7 at depths of ≥2000 m on the continental slope)
  - 12 –Ridge/trench, Tasman Fracture Zone. Currents only associated with very north of area
  - 13- Abyssal plain
  - 14 – Continental block. Region of South Tasman Rise with extensive plateau areas. East boundary shifted to include acoustic facies classes IA and IIID indicative of flat plateau areas
  - 15 – Continental block. Region of South Tasman Rise containing prominent ridges and swales
  - 16 – Abyssal plain containing several small protruding continental blocks
  - 17 – Continental block. Low-relief extremity of South Tasman Rise
  - 35 – Continental block. Domed continental block of South Tasman Rise with extensive plateaus and ridges rising above 2000m isobath
  - 36 – Continental block. Domed continental block of South Tasman Rise with extensive plateaus and ridges below 2000m isobath
- Southern 50% of area outside the 200nm zone.
- Entirely within IMCRA Tasmanian Demersal Province.
- Southern sector of cool temperate Maugean province (IMCRA).
- 2 IMCRA meso-scale regions: Franklin and Davey. (see ANZECC 1999 for descriptions).

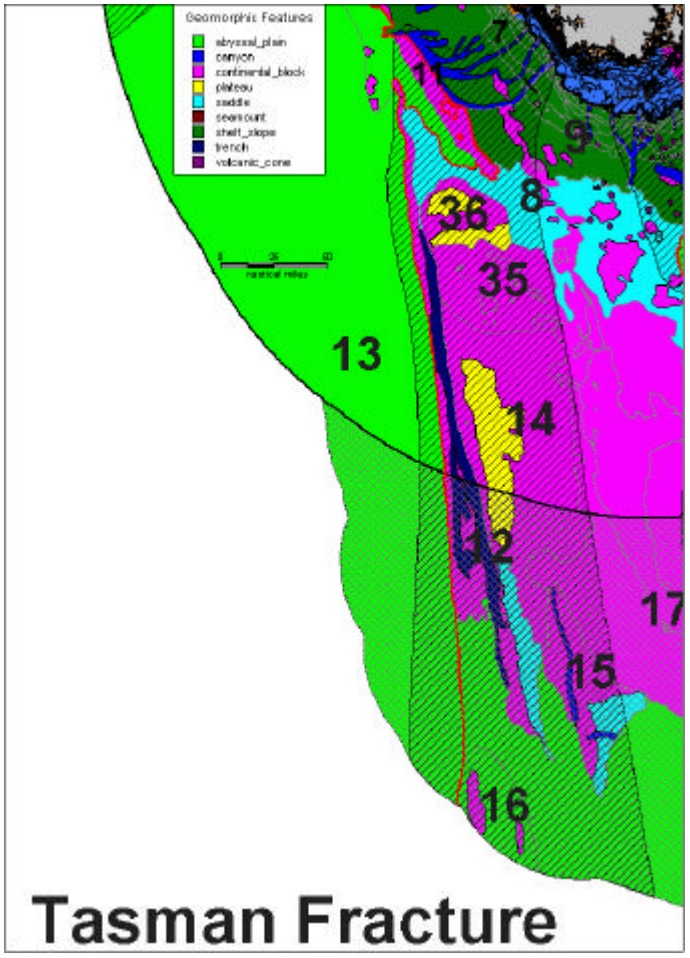


Figure 4E.6 Tasman Fracture (2A).

Conservation Features	Human Uses	Other Considerations
• Includes a range of habitats from rotated continental blocks, extensively incised canyons, abyssal plains, Tasman fracture zone which includes a very deep trench and 3000m high escarpment, plateaux, to prominent ridges and swales. This geology is likely to result in a rich, diverse and possibly unique fauna for this region. **Additional Factors (Flora and Fauna)** • Nearshore fish species-richness low, plant species-richness low (IMCRA). • 1 large drowned river valley (Bathurst Harbour) and 5 moderate-sized barrier estuaries grading into drowned river valleys adjoin and flow into this area. • Number of coastal and pelagic cetacean species (e.g. baleen spp., sperm, pilot, beaked and killer whale, southern right whale, spectacled porpoise, dusky dolphin) that use deep oceanic regions to feed, breed and migrate. • Only part of continent that abuts Antarctic region and likely to have unique fauna. • Circumpolar current influence. • Blue petrel occur May-January. • Shy albatross, wandering albatross .	• Commercial fishing Tuna fishery/pelagic: mackerel, squid. Rock lobster, giant crab, orange roughy. Droplining. Shark. Trawling – (limited). • Oil, gas and minerals (Sorrel Basin and South Tasman Rise).	• Minimal land-based sources of marine pollution. • Illegal foreign fishing - inside 200nm. • Native title? • Water column protection issue beyond 200nm. • Very limited access from coast. • Borders Tasmanian state waters – talk to state government. - Port Davey MPA proposal (state waters).

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Table E.6 Considerations for the Tasman Fracture (2A) Broad Area of Interest.

South Tasman Rise (2B)

Bioregions and Geomorphic Characteristics

- South Tasman Rise, a highly productive region, occurs in the transition between P2 and P3.
- Contains Level 3 geomorphologic units: (8), 17, 18 in P2, and (28) and 37 in P3
  - 17 –Dome (< 200nm) of South Tasman Rise (relatively shallow, encompassing 3 sub-biomes). The region within the Exclusive Economic Zone (within 200nm) still captures all identified elements.
  - 18 – contains submarine canyons spaced 30km apart
  - 37 - contains numerous seamounts and continental blocks
  - 8 and 28 - <5% inclusion.
- More than 50% of area outside the 200 nm zone.

No IMCRA regions, area entirely offshelf.

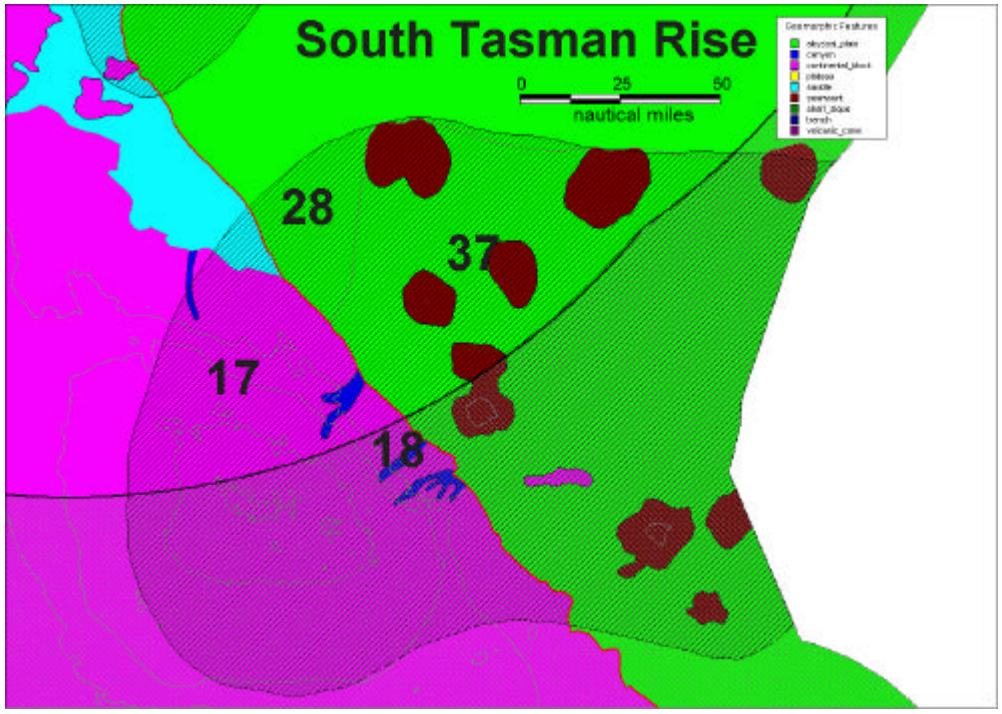

Figure E.7 South Tasman Rise (2B).

Conservation	Human Uses	Other Considerations
Features • Seamounts and continental blocks with deep canyons represented. • Upwelling and sub-Antarctic waters components.	• Straddling stock issues. • Commercial fishing catch includes Orange roughy/dory/bycatch (trevalla) & southern bluefin tuna. • Fishing potential – unexplored.	• Water column protection issue beyond 200nm. • Illegal foreign fishing • Circumpolar current influence.

[4] Reid et al. (2002)

Conservation	Human Uses	Other Considerations
• 3 sub-biomes represented on the shallower part of the South Tasman Rise (only sub-biomes that are not associated with the shelf-edge). • Only part of continent that abuts sub-Antarctic region and likely to have unique fauna. • Sub-tropical convergence north of region. **Additional Factors (Flora and Fauna)** • Blue petrel (vulnerable) increased sightings occur May-January.[4] • Number of coastal and pelagic cetacean species (e.g. baleen spp., sperm, pilot, beaked and killer whale, southern right whale, spectacled porpoise, dusky dolphin) that use deep oceanic regions to feed, breed and migrate. • Southern right whale migration through western side of region. • Humpback whales migration route through middle of region. • Concentration of sightings for many albatross species including wandering albatross.[4]	• Potential oil and gas interests. • Defence interests? • Armaments dump?	

Table E.7 Considerations for the South Tasman Rise (2B) Broad Area of Interest.

4.2.7 Huon (2C)

Bioregions and Geomorphic Characteristics

- Huon occurs in the transition between P2 and P3.
- Contains Level 3 geomorphologic units: 8 and 10 in P2, and 20, 21 and 28 in P3.
  - 8 –saddle with numerous protruding rotated continental blocks. Mean and maximum? currents form a clockwise gyre located at 45°S, 147°E
  - 10 – continental slope with no submarine canyons. Contains several rotated continental blocks and a few seamounts
  - 20 – southern 30% of bioregion only (bioregion description not relevant)
  - 21 –saddle, low relief surface
  - 28 –abyssal plain

- Entirely within IMCRA Tasmanian Demersal Province 2.
- IMCRA meso-scale regions: Davey and Bruny. (see ANZECC 1999 for descriptions).

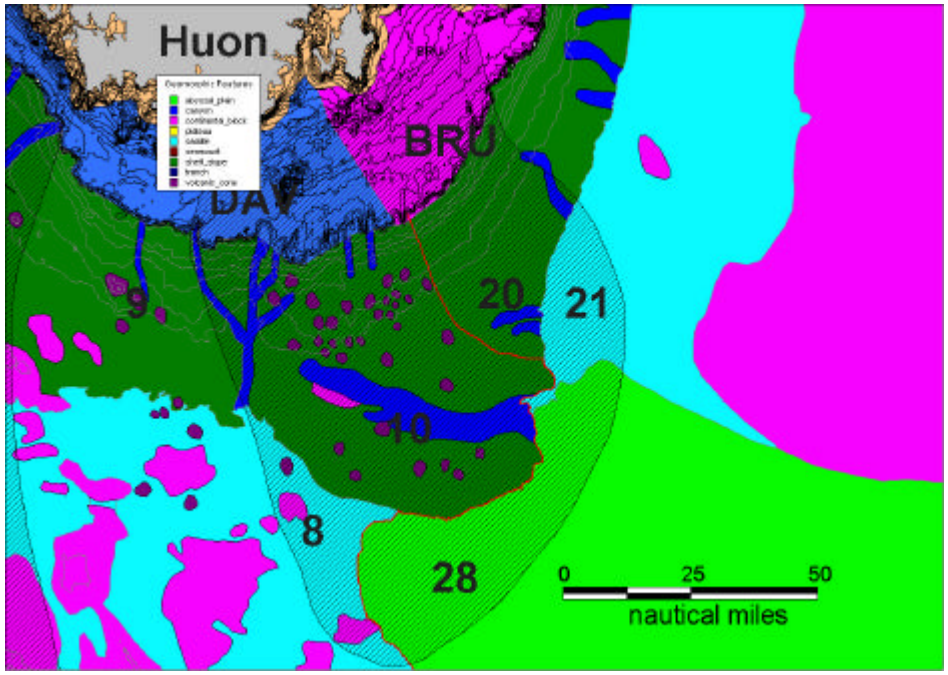

Figure 4E.8 Huon (2C).

Conservation	Human Uses	Other Considerations
Features • Cinder cones (seamounts), rotated continental blocks and abyssal plains represented. • Sub-tropical convergence south of region. • Reefs. • Pedra Branca (state government national park). **Additional Factors (Flora and Fauna)** • Blue petrel occur May-October.[4] • Shy albatross 250 pairs and Australasian gannet (8000 pairs) breed on Pedra Branca. • Soft-plumaged petrel. • Number of coastal and pelagic cetacean species (e.g. baleen spp., sperm, pilot, beaked and killer whale, southern right whale, spectacled porpoise, dusky dolphin) that use deep oceanic regions to feed, breed and migrate. • Southern right whales migration and feeding northern and western side of region?; humpback whales feeding and migration.[14]	• Oil and gas (Tasmanian Basin?). • Commercial fishing: - Trawl: orange roughy, top-of-shelf trawling. - Droplining shark? - Pelagic: tuna, mackerel, squid. - Rock lobster, king crab. • Shipping.[3] • Abalone diving. • Sailing.[3] • Recreational fishing, individual and charter.	• Borders Tasmanian state waters- talk to state government. • Native title claims? • Southern seamounts reserves. • Land-based sources of marine pollution.

Table E.8 Considerations for the Huon (2C) Broad Area of Interest.

[4] Reid et al. (2002)
[14] Gill, P.C., K.J. Evans and H. Wapstra. (1998)
[3] Larcombe et al. (2002)

Offshore Seamount (3A)

Bioregions and Geomorphic Characteristics

- The Offshore Seamount occurs entirely within P2 and is a highly productive region.
- Contains Level 3 geomorphologic units: 22, 28, 29, 30, 31
  - 22 – Continental block, East Tasman Rise, ~50 000 km2 locally subsided block containing the Cascade Seamount (67km in diameter). Maximum? currents part of a anticlockwise gyre located at 44.4°S, 148.2°E
  - 28 –abyssal plain
  - 29, 30, 31 – abyssal plains, containing seamounts

No IMCRA regions, area entirely offshelf.

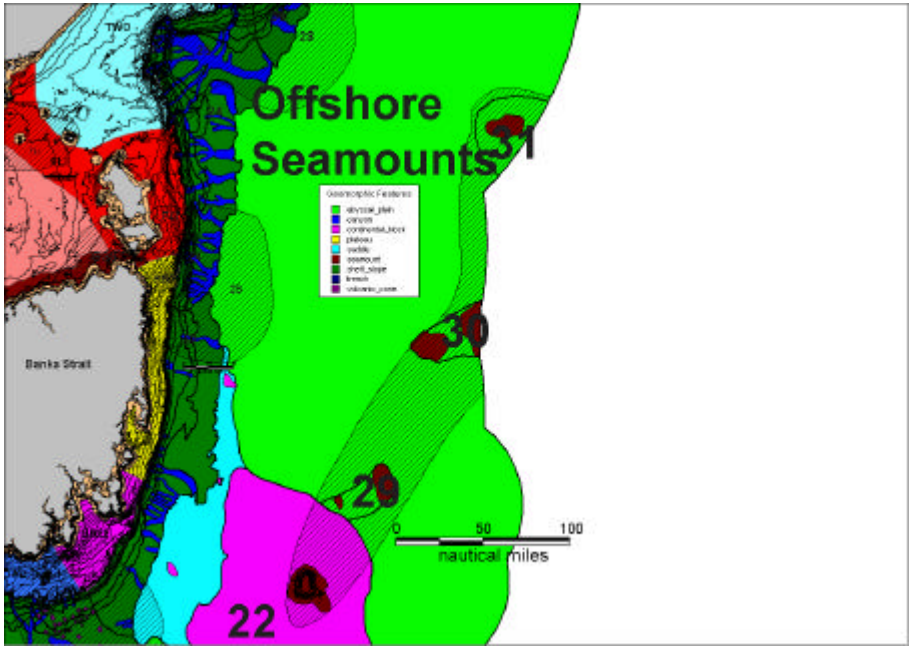

Figure E.9 Offshore Seamount (3A).

Conservation	Human Uses	Other Considerations
Features • Seamounts and abyssal plains, with areas of continental block in the southern portion of the area. • Some species likely to be unique to some level of groups of seamounts or even at level of individual seamounts, but unstudied. • Ancient Continental Blocks (potentially broken off in Cretaceous period) - could have led to evolution of distinct fauna. **Additional Factors (Flora and Fauna)** • Number of coastal and pelagic cetacean species (e.g. baleen spp., sperm, pilot, beaked and killer whale, southern right whale, spectacled porpoise, dusky dolphin) that use deep oceanic regions to feed, breed and migrate.	• Possible future petroleum interest in Cascade Plateau (East Tasmania Plateau). • No known recreational/ charter fishing. • Commercial fishing: - Tuna longlining/other pelagics? - Dropline - Cascade roughy trawl fishery.	

Table E.9 Considerations for the Offshore Seamounts (3A) Broad Area of Interest.

Banks Strait (3B)

Bioregions and Geomorphic Characteristics

Banks Strait occurs wholly within P3.

- Contains Level 3 geomorphologic units: 23, 24, 28
  - 23 – continental slope with few canyons
  - 24 – contains numerous, deeply-incised submarine canyons, spaced 16km apart
  - 28 – abyssal plain

- Includes part of old Bass Lake; incorporates IMCRA Bassian and Tasmanian Demersal Provinces and Southern Bassian Demersal Biotone.
- 4 IMCRA meso-scale regions: Central Bass Strait, Boags, Flinders, Freycinet (see ANZECC 1999 for descriptions).
-

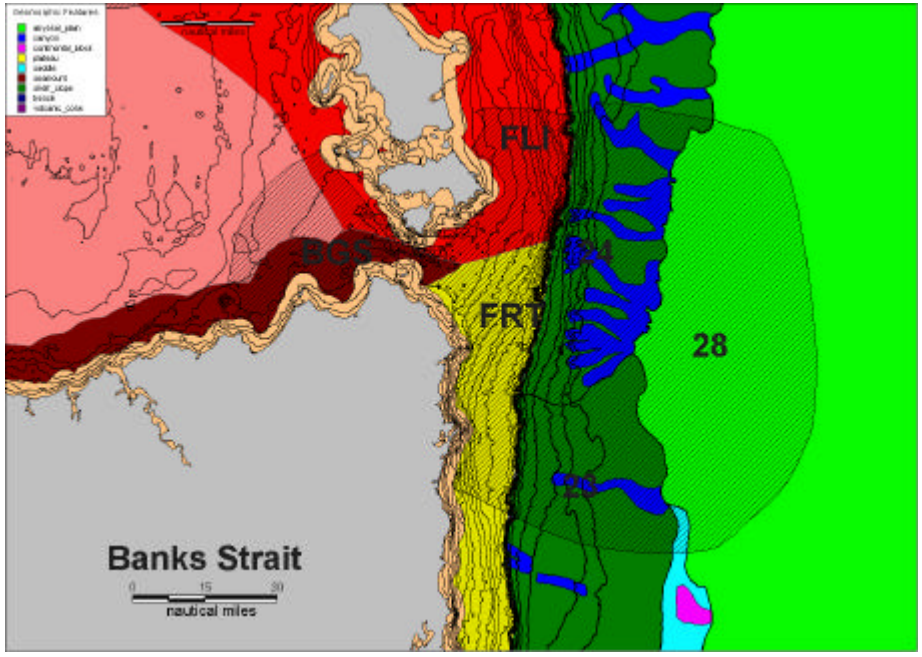

Figure E.10 Banks Strait (3B).

Conservation	Human Uses	Other Considerations
Features • Nearshore fish and plant species-richness both high (IMCRA). • Complex seafloor (between Tasmania and Flinders Island) and patterns of water movement (including a tidally scoured valley) in Banks Strait, likely to be associated with complex habitat and diverse flora and fauna. **Additional Factors (Flora and Fauna)** • Migration routes for pelagic species. • Number of coastal and pelagic cetacean species (e.g. baleen spp., sperm, pilot, beaked and killer whale, southern right whale, spectacled porpoise, dusky dolphin) that use deep oceanic regions to feed, breed and migrate. • Residence area for Harrisons dogfish and southern dogfish (both nominated as threatened species).[15] • Residence area for school shark (summer).[16] • Includes part of old Bass Lake (sponge beds).[11] • Leatherback turtles E-NE of St Helens Nov-May.[8]	• Commercial fishing dropline, trawl, lobster, crab, abalone. • Charter fishing/recreational fishing. • Yacht races.[3] • Shipping route (100 – 500 vessels).[3] • Major ports at St Helens, Lady Barron, Scamander, Bicheno, Welshpool, Bridgeport? • Potential petroleum industry interest in Durroon sub-basin on Bass Strait side (west) – on east, no basin.	• Shipwrecks.[3] • Borders Tasmanian state waters- talk to state government.

[11] Butler, Althaus, Furlani, Ridgway (2002b)
[3] Larcombe et al. (2002)
[8] National Oceans Office (2002)

Conservation	Human Uses	Other Considerations
• Oceanic foraging for benthic species. • Many albatross species sighted including wandering albatross. • Orange roughy spawning (St.Helens Hill). • Female Australian fur seals from Seal Rocks and the Skerries feed on continental shelf (benthic feeders).[7]		

Table E.10 Considerations for the Banks Strait (3B) Broad Area of Interest.

[7] Data from J.P.Y. Arnould (University of Melbourne and R. Kirkwood (Philip Island Nature Park)

Bass Basin (3C)

Bioregions and Geomorphic Characteristics

- Entirely on the continental shelf (IMCRA) with overlap between Bassian Demersal Province and South-eastern Demersal Biotone
- Includes part of old Bass Lake.[4]
- 3 IMCRA meso-scale regions: Central Bass Strait, Flinders and Twofold Shelf (see ANZECC 1999 for descriptions).

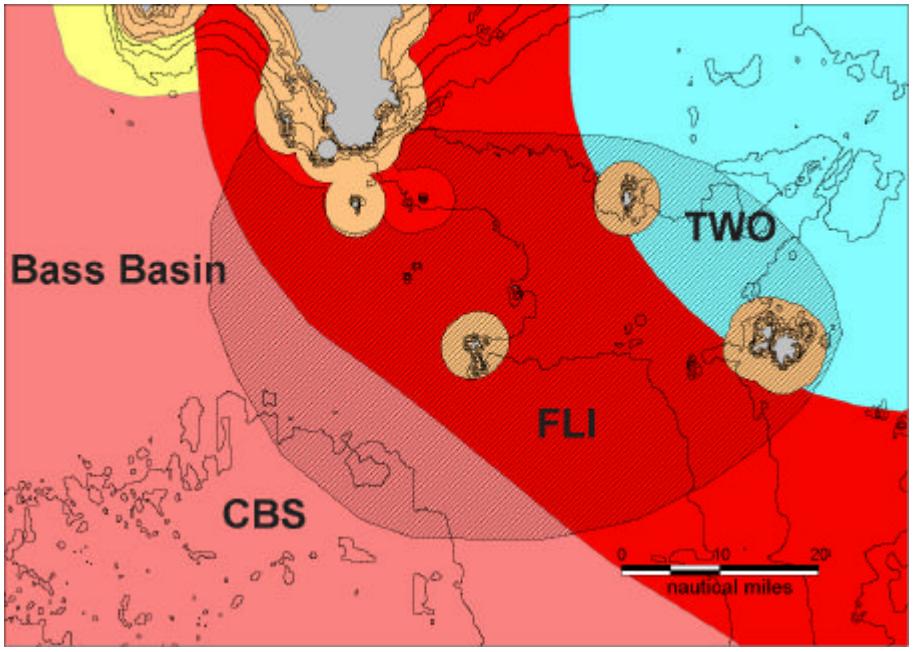

Figure E.11 Bass Basin (3C).
Note: Bass Basin is situated entirely on the continental shelf, thus no features are available for this Broad Area of Interest.

Conservation	Human Uses	Other Considerations
Features • Saddle between Bass and Gippsland Basins. • Devils Tower (146° 44' 30' E/39° 22' 36' S) Australian fur seals haul out site[12] and	• 2003 petroleum exploration acreages release.[5] • Commerial fishing Shark, rock lobster, scallop (fishery	• Pipeline and cable (Telstra).[3] • Registered native title. • Marine heritage.[3] • Shipwrecks.[3]

[12] Brothers N., Pemberton D., Pryor H. and Halley, V. (2001)

Conservation	Human Uses	Other Considerations
breeding colonies for fairy prions, short-tailed shearwaters and common diving petrels[12]. Note that Devils Tower comprises 2 islands with only 1 surveyed.[12] • Bass Pyramid currently a state government nature reserve. Australian fur seal haul out and seabird breeding site.[12] **Additional Factors (Flora and Fauna)** • Female Australian fur seals from Kanowna Island and Lady Julia Percy Island feed on continental shelf western side of Bass Basin (benthic feeders).[7] • Includes part of old Bass Lake (sponge beds).[11] • Blue, southern right and humpback whale migration. • Number of coastal and pelagic cetacean species that use coastal regions to feed, breed and migrate.	assessment recommendations to result in fishery spatial arrangements to protect areas from benthic impacts. • Recreational fishing and charter. • Shipping – passenger/cargo to Flinders Island.[3] • Yacht race (Bass Strait Cruise)[3] • Munitions dumps.[3] • RAAF air weapons ranges at Devils Tower 146° 44' 30' E/39° 22' 36' S and Bass Pyramid 147 14' E/39 49' S. • Welshpool fishing port, Inverlock, San Remo, Port Franklin.[3]	• Borders Victorian state waters - talk to • state government. • Adjacent to state MPA.

Table E.11 Considerations for the Bass Basin (3C) Broad Area of Interest.

[7] Data from J.P.Y. Arnould (University of Melbourne and R. Kirkwood (Philip Island Nature Park)
[11] Butler et al. (2002b)
[5] www.industry.gov.au/petexp
[3] Larcombe et al. (2002)

East Gippsland (3D)

Bioregions and Geomorphic Characteristics

- East Gippsland occurs in P3.
- Contains Level 3 geomorphologic units: 24, 25, 28, 39
  - 24 – continental slope with numerous deeply-incised submarine canyons 16km apart
  - 25 – Bass Canyon and associated continental slope
  - 28 – abyssal plain, varying currents except for a wide eastward jet from base to ~151^{o}E and an anticlockwise gyre
  - 39 – continental slope with canyons (incised, steep cliffs) 14km apart and several small, protruding continental blocks
- Entirely within IMCRA South-eastern Demersal Biotone; regarding pelagic waters this Broad Area of Interest is partly in IMCRA Eastern Pelagic Biotone (the entire rest of the South-east Marine Region shelf is in the Southern Pelagic Province).
- IMCRA meso-scale region: Twofold Shelf (see ANZECC 1999 for descriptions).

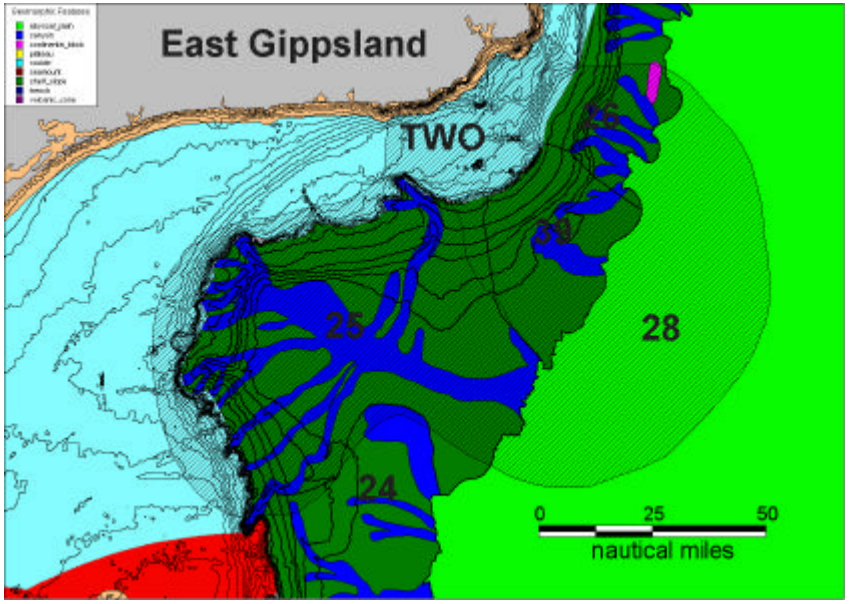

Figure E.12 East Gippsland.

Conservation	Human Uses	Other Considerations
Features • Bass Canyon (of which the well-known Horseshoe area is a part), with abyssal plain adjacent to canyon outlet. • Region includes both tropical and temperate waters.[16] • Canyon and neighbouring shelf have important productivity (including significant fishery) and unique oceanography, with winter cascade from Bass Strait, and little-understood upwelling processes. Important/unique oceanography and productivity. • Seasonal downwelling winter cascade feature. **Additional Factors (Flora and Fauna)** • Region includes both tropical and temperate phytoplankton communities.[6] • Female Australian fur seals from The Skerries Percy feed on continental shelf between Lakes Entrance and Jervis Bay (benthic feeders).[7] • Residence area for Harrisons dogfish and southern dogfish (both nominated for listing as threatened species).[15].Residence area for school shark (summer).[15] • Wandering albatross (critically endangered).[4]	• Gas supply area. • 2003 petroleum exploration acreages release.[5] • Areas of high existing and future petroleum interest in Gippsland and Southern Basin margin. • No drilling conducted deeper than 2000m. • Oil and gas development area, with existing leases.[5] • Commercial fishing: Shallower than roughly 600m is fishing area. - high value trawl, - mesh net, - trap, - demersal longline?, - tuna and billfish, shark, lobster, scallop?, - Danish seine. - Developing mid-water trawl. • Shipping route.[3] • Recreational fishing (game and bottom) including charter. • Yacht races.[3] Fishing stakeholders: Eden, Lakes Entrance,	• Borders state waters – talk to state government. • Adjacent to state MPAs. • Native title claims. • Registered native title claim. • Location of land-based sources of marine pollution (population centres). • Discharge from petroleum infrastructure.

[16] See Australian Marine Phytoplankton Zonation (IHO 2001)

[7] Data from J.P.Y. Arnould (University of Melbourne and R. Kirkwood (Philip Island Nature Park)
[15] Daley, Stevens, Last and Yearsley (2002)
[5] www.industry.gov.au/petexp

• Female Australian fur seals feed on continental shelf north of Lakes Entrance (benthic feeders).[7] • 'Passage' area for pelagic (small and large) species. • Contains intact benthic habitat. • Likely blue, fin, sei, minke, sperm, pilot, killer, beaked whale feeding and migrating. • Number of other pelagic cetacean species (e.g. southern right whale, spectacled porpoise, dusky dolphin) that use deep oceanic regions to feed, breed and migrate. • Southern right and humpback whale migration, penguin foraging (from Gabo Reef)?	Ulladulla → south. PanCanadian, BHP, Esso, Santos (confirm all relevant companies/lease holders have been included).	

Table E.12 Considerations for the East Gippsland (3D) Broad Area of Interest

[4] Reid et al. (2002)
[7] Data from J.P.Y. Arnould (University of Melbourne and R. Kirkwood (Philip Island Nature Park)