A FRAMEWORK FOR PRIORITIZING THE ESTABLISHMENT OF MARINE CONSERVATION RESERVES IN WESTERN AUSTRALIA

A Position Paper

Prepared for
the Marine Parks and Reserves Authority

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August 1998

INTRODUCTION

In July 1994, the Minister for the Environment released a report entitled *A Representative Marine Reserve System for Western Australia* (CALM, 1994). This report was compiled by the Marine Parks and Reserves Selection Working Group (MPRSWG) and identified 70 areas in the coastal waters of Western Australia that were worthy of consideration for marine reservation under the *Conservation and Land Management (CALM) Act (1984)*. In November that year, the Government of Western Australia released a document entitled *New Horizons in Marine Management* (WA Government, 1994) which provided the Government's policy framework for the conservation and management of the marine environment of Western Australia, with particular emphasis on establishing a system of multiple-use marine conservation reserves. In addition to reaffirming a commitment that "*… the principal thrust of the [Government's] marine conservation effort will be to have one comprehensive system [of marine reserves] under the CALM Act*", the *New Horizons* policy foreshadowed changes to the marine reserve provisions of the CALM Act and strengthening of the Department of Conservation and Land Management in relation to marine conservation and management. The legislative changes were enacted in the *Acts Amendment (Marine Reserves) Act 1997* which included the creation of a Marine Parks and Reserves Authority (MPRA), a Marine Parks and Reserves Scientific Advisory Committee (MPRSAC), the creation of a third category of marine conservation reserve under the CALM Act, called a Marine Management Area, revised statutory consultative protocols for creating marine conservation reserves in Western Australia and a clear framework for fishing, petroleum and mining activities in marine conservation reserves. In addition a specialist Marine Conservation Branch was established within CALM to 'drive' the marine conservation program.

In order to adopt a strategic approach to the establishment of a statewide system of multiple-use marine conservation reserves, the MPRA sought advice from the MPRSAC on an appropriate methodology to prioritize the consideration of the 70 areas identified in the MPRSWG report. This paper describes a proposed methodology and applies this framework, using both unweighted and weighted criteria, to eighteen of the areas identified in the MPRSWG report, as working examples. Although there is a logical basis for the proposed methodology it should be remembered this is not a strictly scientific exercise and should not be considered as such. The objective is simply to provide a way to develop a more rational and visible basis for considering priorities for marine reservation in Western Australia. It is worth noting that similar frameworks that could be used or modified for the purposes outlined above, do not appear to exist in Australia. Although most natural resource management agencies in Australia that were contacted about the above indicated that they prioritized their various activities, none could provide copies of formal prioritizing frameworks suitable for the above purposes.

PRIORITIZING FRAMEWORK

The proposed framework is focused around fourteen criteria in three broad categories involving ecological (E1-6) attributes and primary (H1-6) and secondary (L1-2) human values. The relative (between areas) value of each criterion is given a score of between 1 (low) to 5 (high). In the first working example no weighting is applied to the criteria and priorities are determined from a simple ranking of the summation of the criteria scores. In the weighted example, the ecological criteria (E1-6) have a weighting of three, the primary human values (H1-6) a weighting of two and the secondary human values (L1-2) a weighting of one. Priorities, in this case, are determined from a ranking of the summation of the weighted criteria scores.

The criteria broadly reflect the two major objectives of the multiple-use marine conservation reserve system in Western Australia which are (i) *to preserve representative, as well as special ecosystems in the marine environment and* (ii) *to put a formal framework in place to ensure the various uses of marine conservation reserves are managed in an equitable, integrated and sustainable manner* (WA Government, 1998). The weighting reflects the primacy of the conservation objective in terms of both the primary purpose of the marine reserve system and the dependency of many human uses on a healthy environment.

Criteria

Many sets of criteria, dating from the mid-seventies, exist for the selection and prioritization of areas for marine reservation and approved by the IUCN and other international and national bodies. At an *International Conference on Marine Parks and Reserves* (IUCN, 1976), criteria and guidelines for the identification and management of 'critical marine habitats' were presented (Ray, 1976). The criteria for selection were grouped into the following categories: (i) ecological criteria; (ii) cultural, recreational and educational criteria; and (iii) pragmatic criteria. These criteria are similar to the criteria of Kelleher & Kenchington (1992) for the selection of priority areas for marine reservation. The criteria used here to form the basis of the prioritizing framework for the establishment of marine reserves in Western Australia are, in general, derived from these primary sources. The Kelleher & Kenchington (1992) criteria have subsequently appeared in a number of documents relating to marine conservation reserves by the Resources Assessment Committee (1992); Kelleher *et al.* 1995; Thackway (1996) and Environment Australia (1998). The Kelleher & Kenchington criteria have also been adopted by the International Maritime Organization for use in the identification of Particularly Sensitive Sea Areas and by the parties to the Helsinki Convention for identification of a system of marine protected areas for the Baltic Sea.

A brief description of the criteria is given below:

Ecological value (E1)

Ecological values include the physical, chemical, geological and biological attributes and processes of natural systems. Spatial scales range from local and regional to global scales. Temporal scales range from seconds to evolutionary timescales. Biological attributes include species, populations, communities and ecosystems.

The ecological value of natural systems can be assessed from the following characteristics:

- *Uniqueness*: Contains unique species, populations, communities or ecosystems. Global uniqueness would afford an area a conservation value of international significance (eg stromatalites in Hamelin Pool Marine Nature Reserve).

- *Representativeness*: Representativeness is the degree to which the area in question represents a species, population, community or ecosystem type within a particular marine bioregion. Physiographic features and ecological processes or other natural characteristics can also contribute to the representativeness of an area.

- *Dependency*: Ecological processes are highly dependent on biotically structured systems. Examples include coral reefs, kelp 'forests', mangrove 'forests' and seagrass meadows. For example, these areas may contain nursery or juvenile areas or contain feeding, breeding or rest areas for migratory marine fish, reptiles, birds or mammals or are a source of larvae for downstream ecosystems.

- *Diversity*: The area has a high variety of species, populations, communities and ecosystems.

- *Productivity*: The species, populations, communities or ecosystems of an area have a high natural biological productivity.

- *Naturalness*: The area has a high degree of naturalness (ie is not disturbed or degraded by anthropogenic activities).

- *Integrity*: The area is a biologically functional unit (ie an effective, self-sustaining ecological entity).

- *Vulnerability*: The area is highly susceptible to degradation by natural events or anthropogenic activities. Biotic communities associated with coastal populations may have a low tolerance to changes in environmental conditions, or may exist close to the limits of their tolerance (defined by water temperature, salinity, turbidity or depth).

Comprehensiveness (E2)

A stated aim of the Western Australian Government is that "… *the principal thrust of the [Government's] marine conservation effort will be to have one comprehensive system [of marine reserves] under the CALM Act*" (WA Government, 1994; 1998). This criterion addresses the issue of comprehensiveness and, therefore, applies at a statewide scale. Thus, areas for consideration as marine reserves that are not already represented within the state bioregional framework (eg South coast, Pilbara, Kimberley) will rate highly (ie they increase the comprehensiveness of the statewide system).

Bioregional representation (E3)

This criterion relates to the extent to which a proposed reserve would be representative of the ecological attributes of the marine bioregion that it is situated within (IMCRA, 1998; Appendix I) and acknowledges the ecological 'sense' and practical benefits in managing fewer but larger ecosystem-scale reserves than numerous smaller scale reserves. For the purposes of this framework, if a proposed area is equal to or greater than 30% (Bohnsack, 1996; Ballantine, 1997) of the bioregion, it is considered to have a high degree of bioregional representation and, as such, scores highly for this criterion. The application of this criterion within the prioritizing framework should not be confused with the overall goal of achieving adequate representation of ecosystem types within each marine bioregion. The target can also be achieved by numerous smaller marine reserves within the bioregion.

The level of existing and/or potential threats (E4)

This criterion reflects one of the two major objectives of the marine reserve system which is to provide a formal framework to ensure integrated, equitable and sustainable management of human activities. The level of existing and potential threats is related to the nature and intensity of current and future uses, respectively, of an area on the assumption that as usage increases the level of threat to ecological and social values also generally increases. As such, the higher the level of current or projected use, the higher the score for this criterion.

For example, the recommended northern extension of the Shoalwater Islands Marine Park (CALM, 1994) would be considered to have a relatively high degree of potential threat to its ecological and cultural values due to the discharge of contaminants from a wastewater outfall that is adjacent to the area in question. This reserve would therefore rate highly for this criterion. In contrast, a low score would be allocated to this criterion for area of the proposed southern extension to the Ningaloo Marine Park due to the relatively low usage and, therefore, low level of threat to the values of this area.

Functional integrity (E5)

This criterion explicitly acknowledges the critical issue of spatial scale in marine management and is based on the assumption that management based on ecological boundaries is likely to be more effective, from an ecological perspective, than management based on sociological boundaries. Ideally, the spatial scales of marine conservation reserves should be reconciled with the spatial scales of key ecosystem processes, given the primacy of the conservation objective (ie the area is maintained as a biologically functional unit; ie is an effective, self-sustaining ecological entity). Thus, the more a proposed marine conservation reserve complies with this condition, the greater the functional ecological integrity of the reserve and the higher the score for this criterion.

For example, the functional integrity of the Ningaloo Marine Park would be greatly improved by the addition of the remaining unreserved portion of this reef system to the south of the marine park. Similarly, adding the Bernier and Dorre Islands area to the Shark Bay Marine Park would increase the functional integrity of this reserve.

Integration of terrestrial and marine management (E6)

This criterion acknowledges the functional linkages between terrestrial and marine systems and, as such, the importance of integrating marine and terrestrial management frameworks. Because integrated management is obviously easier to achieve within a single agency, proposed marine reserve areas adjoining CALM-managed lands would score higher for this criterion than marine areas adjoining terrestrial areas that are not managed by CALM.

Examples of the former include the marine waters adjacent to the terrestrial reserves of Fitzgerald River National Park and the Dampier Archipelago, both of which are managed by CALM.

Cultural value (H1)

'Cultural' values are defined here in the broadest sense of the word and include the entire range of human uses of the natural environment.

- *Social significance*: The area has existing or potential value to the local, regional, national or international communities because of its heritage, historical, cultural, traditional, aesthetic, educational or recreational qualities.

- *Economic significance*: The area has existing or potential economic value. For example, the area has important commercial activities such as fisheries, aquaculture and nature-based tourism, is a food source and/or a source of income for indigenous communities, or is a nursery area or replenishment area for economically important species.

- *Scientific significance*: The area has particular significance for scientific study at local, regional, national and international scales.

- *International and National values*: The area is listed or has the potential to be listed on the World Heritage List, as a Biosphere Reserve, as a Ramsar Wetland of International Importance, or is included on lists of areas of international or national importance, or is the subject of international or national conservation agreements.

Existing information (H2)

This criterion acknowledges the high up-front information demand of the 'new' marine conservation reserve provisions of the CALM Act which require ecological and socio-economic resource assessments as part of the planning process prior to the release of the Notice of Intent (NOI) to reserve. As there are obvious costs attached to the acquisition and interpretation of these data, and resources are limited, the more existing relevant information that is available the lower the cost to establish the reserve, which is clearly advantageous. Thus, within the proposed framework, the greater the level of existing relevant information the higher the score for this criterion.

The level of existing and/or potential conflict (H3)

This criterion reflects one of the two major objectives of the marine conservation reserve system which is to provide a formal framework to ensure integrated, equitable and sustainable management of human activities. The level of existing and potential conflict is often related to the nature and intensity of current and future uses, respectively, of an area on the assumption that as usage increases, the level of conflict also generally increases. This, in turn, increases the need for more formal management arrangements. As such the higher the level of current or projected use, the higher the score for this criterion.

Socio-political considerations (H4)

This criterion reflects the revised consultative approach of the recently amended marine conservation reserve provisions of the CALM Act and relates to the level of State Government, local government, stakeholder, community, and industry support for a proposed marine reserve area. As stakeholder advisory committees will generally have a pivotal role in the planning and establishment of marine conservation reserves, a high level of support for a proposal is obviously advantageous. As such, the more support there is the higher the score for this criterion.

Strategic importance (H5)

This criterion relates to the relative strategic importance of the proposed reserve areas in relation to the overall marine conservation reserve program. Historically, particular sectors such as commercial fishing and the petroleum industry have viewed the establishment of marine conservation reserves as, at best, an impediment and, at worst, a 'threat' to their own interests. Thus proposed marine reserve areas which, if successfully established, effectively demonstrate that conservation objectives and sustainable commercial activities are not mutually exclusive, have a higher strategic importance than areas where these concerns are less evident.

Opportunity (H6)

This criterion addresses the implicit forward-looking (ie visionary) aspect of the reserve system objectives by acknowledging that timing is an important consideration in prioritizing the establishment of marine conservation reserves in that opportunities which exist in the present may not exist in the future. Thus areas where conservation values are high and where human activities are currently low (ie the traditional barrier of perceived major social dislocation is absent), would rate highly. Examples could be that significant areas in remote regions of Western Australia (eg Kimberleys, east of Cape Arid on the south coast) are reserved primarily as 'insurance' for the future.

Linkages to public sector programs (L1)

This criterion addresses a key responsibility of Government agencies which is to work in an integrated and co-operative manner. Ecological studies and monitoring programs relating to marine conservation reserve management have significant relevance to fisheries management, and vice versa. Similarly, compliance monitoring of fisheries and marine safety regulations by marine park officers have significant benefits through the sharing of surveillance and enforcement costs. Thus the greater the benefits a marine conservation reserve would bring to other State Government marine management and regulatory programs, and vice versa, the higher the score for this criterion.

Linkages to private sector programs (L2)

This criterion addresses a mutual responsibility of Government agencies and the private sector to work in a cooperative manner. Ecological studies and monitoring programs relating to the management of marine conservation reserves have significant benefits in relation to the environmental management

responsibilities of marine-based industries, and vice versa. Thus, for this criterion, the greater the benefits a marine conservation reserve would bring to the private sector, and vice versa, the higher the score.

DATA SOURCES

There are few documents available that provide the statewide comparative data required to help 'quantify' the above criteria. The report of the Marine Parks and Reserves Selection Working Group (CALM, 1994), the State of the Marine Environment Report (Zann & Sutton, 1996) - Western Australia, the State of the Environment Report for Western Australia (DEP, 1998) and Stoddart & Simpson (1996) provided sources of information to assist this process. These reports have been consulted to complement the 'professional judgment' used to generate the raw data for Tables 1 and 2.

RESULTS

Working Examples of the Prioritizing Framework

This section outlines working examples of the prioritizing framework using both unweighted and weighted criteria. The rationale for the selection, scoring and weighting of the criteria is outlined above in the section headed "Prioritizing Framework". The use of individual area scores to provide individual area rankings (priorities) provides a basis to compare the results of the two approaches. The results are presented in Tables 1 and 2.

In the unweighted example, the first six priorities were (in order) the Dampier Archipelago, Montebello-Barrow Islands, Broke Inlet, Fitzgerald, Abrolhos and the northern extension of the Shoalwater Islands Marine Park. In the weighted example, the first six priorities were the Dampier Archipelago, Montebello-Barrow Islands, Fitzgerald, Broke Inlet, Recherche and Geographe/Capes/Hardy Inlet region. The Jurien Bay area was priority number seven in the unweighted example and nine in the weighted example.

The lowest six priorities (in descending order) in the unweighted example were the Beagles, Buccaneer Archipelago, Albany, Exmouth Gulf, Southern Ningaloo and Cambridge Gulf. In the weighted example the six lowest priorities were the Buccaneer Archipelago, Beagles, Albany, Exmouth Gulf, Southern Ningaloo and Cambridge Gulf.

These results demonstrate a degree of coherence between both approaches in that the results of both the weighted and unweighted examples identify many of the same areas in both the top and bottom six priorities. Given the level of coherence between the two approaches and the subjectivity of much of the data, it would appear pointless to refine the prioritizing framework much beyond the level of complexity presented here.

In summary, the weighted framework appears to be the most sensible option in that it more closely reflects the hierarchy of the objectives of the marine conservation reserve system and, as such, provides a rational and visible basis for considering priorities for marine reservation in Western Australia.

Table 1: MARINE CONSERVATION RESERVE IMPLEMENTATION PRIORITIES (unweighted example)

AREA/CRITERIA	E1	E2	E3	E4	E5	E6	H1	H2	H3	H4	H5	H6	L1	L2	SUM	PRIORITY
Cambridge Gulf	4	5	1	1	1	1	1	1	1	2	1	3	1	1	22	18
Buccaneer Archipelago	5	5	3	1	2	1	2	1	1	2	3	2	1	1	30	14
Roebuck Bay	5	5	1	1	1	1	2	2	1	5	3	3	2	2	36	11
Dampier Archipelago	4	5	3	4	3	5	5	5	5	5	2	1	3	2	52	1
Montebello-Barrow Islands	4	5	3	3	3	5	4	4	4	4	5	1	3	2	50	2
Exmouth Gulf	4	1	3	1	3	1	3	3	1	3	1	1	1	2	28	16
South Ningaloo MP	5	1	1	1	5	1	3	1	1	2	1	3	1	1	27	17
Bernier-Dorre	4	1	1	2	3	5	3	4	1	3	1	2	1	1	32	12
Abrolhos	5	5	2	3	2	1	5	4	5	2	1	1	3	3	42	5
Beagles	4	1	2	1	1	5	3	2	1	5	1	1	2	2	31	13
Jurien	4	1	2	3	1	3	4	5	2	5	5	1	2	2	40	7
Nth SIMP	3	1	2	5	3	2	5	5	5	3	1	1	3	2	41	6
Geographe/Capes/Hardy Inlet	4	1	3	4	3	3	5	2	5	4	2	1	2	1	40	7
Walpole-Nornalup	4	5	2	3	3	5	4	2	3	3	1	1	2	1	39	10
Broke Inlet	5	5	2	2	5	5	5	2	1	3	1	3	5	1	45	3
Albany	3	5	2	2	1	2	3	2	2	2	1	1	2	1	29	15
Fitzgerald	5	5	4	1	5	5	2	5	1	2	3	3	1	1	44	4
Recherché	5	5	4	1	5	5	3	2	1	2	1	3	2	1	40	7

Score: 5 = high; 1 = low

Table 2: MARINE CONSERVATION RESERVE IMPLEMENTATION PRIORITIES (Weighted example)

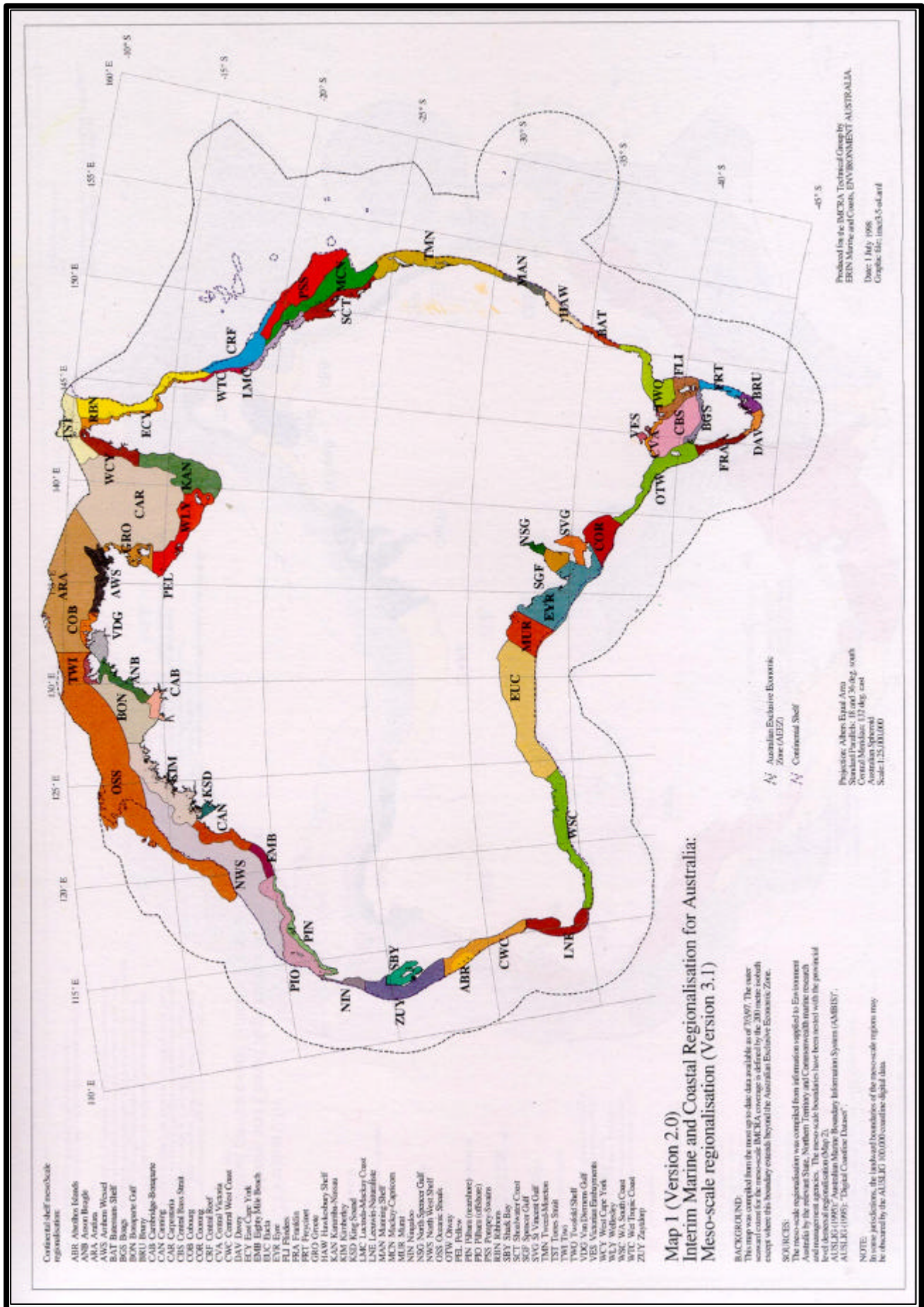| AREA/CRITERIA	E1	E2	E3	E4	E5	E6	Sum	Weighted Sum (*3)	H1	H2	H3	H4	H5	H6	Sum	Weighted Sum (*2)	L1	L2	Sum	Weighted Sum (*1)	PRIORITY
Cambridge Gulf	4	5	1	1	1	1	13	39	1	1	1	1	1	3	8	16	1	1	2	57	18
Buccaneer Archipelago	5	5	3	1	2	1	17	51	2	1	1	2	3	2	11	22	1	1	2	75	13
Roebuck Bay	5	5	1	1	1	1	14	42	2	1	1	5	3	3	15	30	2	2	4	76	12
Dampier Archipelago	4	5	3	4	3	5	24	72	5	5	5	5	2	1	23	46	3	2	5	123	1
Montebello-Barrow Islands	4	5	3	3	3	5	23	69	4	4	4	4	5	1	22	44	3	2	5	118	2
Exmouth Gulf	4	1	3	1	3	1	13	39	3	3	1	3	1	1	12	24	1	2	3	66	16
South Ningaloo MP	5	1	1	1	5	1	14	42	3	1	1	2	1	3	11	22	1	1	2	66	16
Bernier-Dorre	4	1	1	2	3	5	16	48	3	4	1	3	1	2	14	28	1	1	2	78	11
Abrolhos	5	5	2	3	2	1	18	54	5	4	5	2	1	1	18	36	3	3	6	96	8
Beagles	4	1	2	1	1	5	14	42	3	2	1	5	1	1	13	26	1	1	2	70	14
Jurien	4	1	2	3	1	3	14	42	4	5	2	5	5	1	22	44	2	2	4	90	10
Nth SIMP	3	1	2	5	3	2	16	48	5	5	5	3	1	1	20	40	3	2	5	93	9
Geographe/Capes/Hardy Inlet	4	1	3	5	3	3	19	57	5	2	5	4	2	1	19	38	2	1	3	98	6
Walpole-Nornalup	4	5	2	3	3	5	22	66	4	2	3	3	1	1	14	28	2	1	3	97	7
Broke Inlet	5	5	2	2	5	5	24	72	5	2	1	3	1	3	15	30	5	1	6	108	4
Albany	3	5	2	2	1	2	15	45	3	2	2	2	1	1	11	22	2	1	3	70	14
Fitzgerald	5	5	4	1	5	5	25	75	2	5	1	2	3	3	16	32	1	1	2	109	3
Recherché	5	5	4	1	5	5	25	75	3	2	1	2	1	3	12	24	2	1	3	102	5

Score: 5 = high; 1 = low

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Map 1 (Version 2.0)
Interim Marine and Coastal Regionalisation for Australia:
Meso-scale regionalisation (Version 3.1)