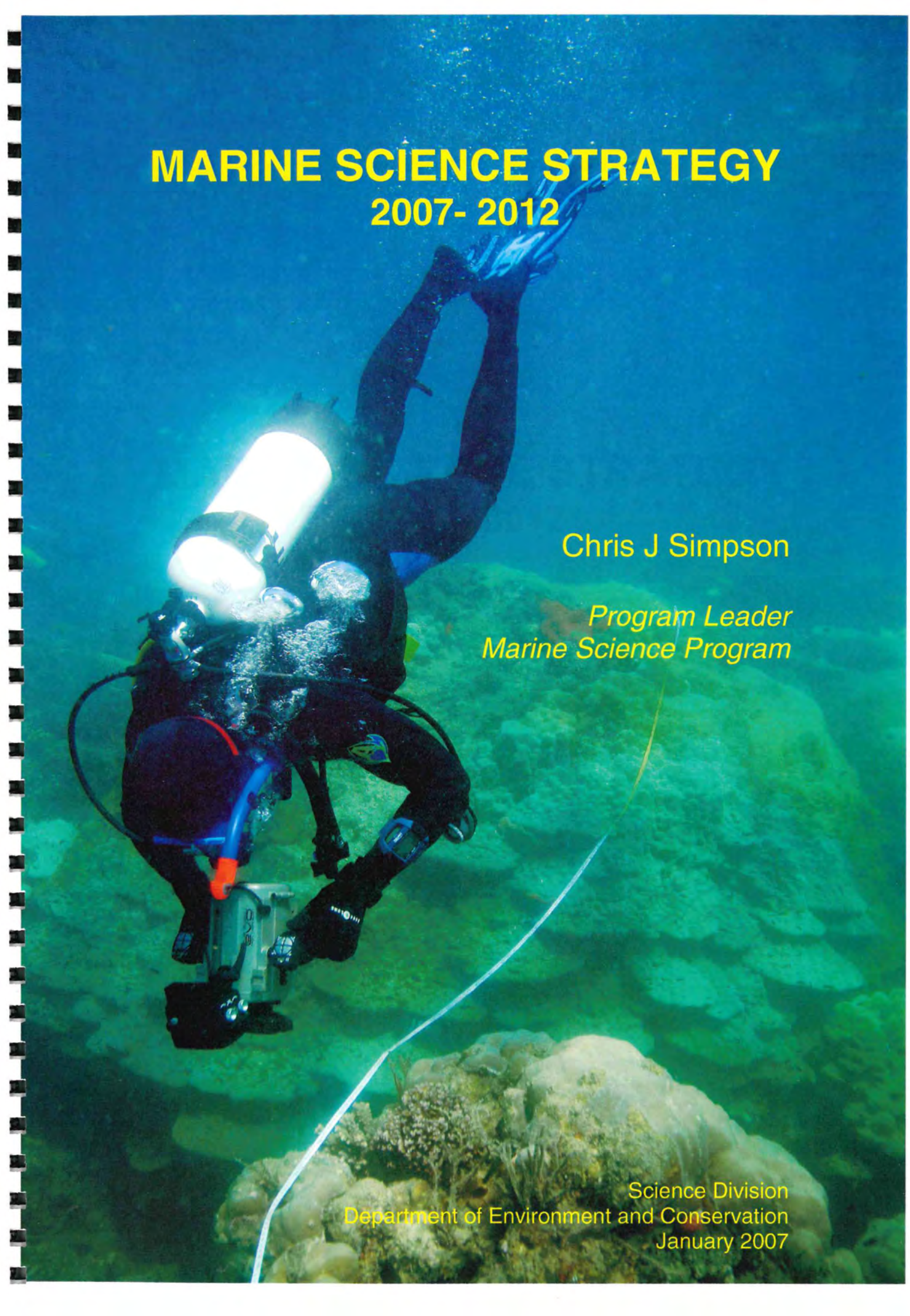
MARINE SCIENCE STRATEGY
2007- 2012



Chris J Simpson

Program Leader
Marine Science Program

Science Division
Department of Environment and Conservation
January 2007

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EXECUTIVE SUMMARY

Marine science in Western Australia is in a period of rapid growth. Recent investment by the State Government, combined with co-investment from Commonwealth research agencies and local and interstate universities, will exceed $100M over the next five years. Much of this science is directly relevant to the objectives of the Department of Environment and Conservation (DEC). The Government has also substantially increased consolidated funding to implement the management plans of 'new' and existing marine protected areas, including significant specific allocations for marine research, monitoring and education/science communication of approximately $3M pa.

The Marine Science Program (MSP) was established in the Science Division of the then Department of Conservation and Land Management in May 2006. The Science Division currently employs approximately 140 scientists and support staff spread over eight science 'Programs'. The MSP currently has three permanent staff and two contract staff. One permanent staff member is on secondment to the International Oceanographic Commission.

The roles of the MSP are:

(i) *To conduct, or cause to be conducted, scientific research and monitoring programs necessary to manage existing marine parks and reserves; conserve marine biodiversity generally; assist in identifying and planning for new marine parks and reserves; and contribute to regional marine planning;*
(ii) *To provide policy advice to DEC Corporate Executive and the Minister for the Environment, and scientific and technical advice and support to DEC's regions and branches;*
(iii) *To provide a strategic focus for scientific and technical liaison with DEC's clients and stakeholders in relation to marine conservation; and*
(iv) *To assist the Marine Parks and Reserves Authority in the performance of its statutory duties as required.*

In July 2006, a workshop was held with staff from the MSP, Regional Services and relevant specialist branches to discuss and agree on a general approach to developing a marine science capacity in DEC. A Marine Science Strategy (the Strategy) has been developed at the request of the Director General of DEC.

The purpose of the Strategy is to provide a broad blueprint for the development and implementation of a marine science capability within DEC over the next five years. The Strategy balances the need to influence, collaborate with and support external marine science providers with the need to develop an appropriate 'in-house' marine science capability. The 'in-house' capability is a partnership model based on the development of a centralised marine science capability within the MSP, based in the Science Division, and an operational capability in the Regions. The partnership also includes senior regional staff and key specialist branches within DEC including the Marine Policy and Planning Branch, Marine Ecosystems Branch, Environmental Management Branch and the Parks Policy and Service Branch. This general approach was agreed *in principle* at a July 2006 workshop and will ensure that the marine science capability is closely integrated with the marine policy, planning and management activities of the department.

The Strategy proposes the MSP be expanded to form a centralised group of 20 scientists and support staff in three integrated units, a Marine Research Unit, a Marine Monitoring Unit and a Marine Science Communication Unit to support external and internal/collaborative research delivery and departmental marine monitoring, science communication, policy support and advisory functions. This group would, in collaboration with senior Regional staff and specialist branches, provide the technical oversight, co-ordination and implementation for DEC's marine science programs. Regional staff will provide the operational support for internal research and monitoring programs.

The Strategy provides staff profiles and FTE allocations across the research, monitoring, science communications and policy/advice functions, budget considerations and details of the specific objectives, tasks, outputs and expected outcomes of the proposed research, monitoring and science communication units. The Strategy does not outline specific research, monitoring and science communication projects to be undertaken. These will be developed from the science priorities outlined in MPA management plans and other departmental documents following consideration of the Strategy by the DEC Corporate Executive.

Current and projected consolidated funding to DEC for MPA marine science (as defined here) is estimated to be over $3M pa for the next three financial years and is adequate to support this Strategy. Currently, funds reside in the Marine Science Program and five regional cost centres. Individual MPA budgets are inadequate to deliver the required marine science outcomes. The collaborative marine science delivery model proposed in this Strategy is based on the premise that a significant proportion of the funding for marine science is used to support a centralised capability within the MSP with sufficient funding remaining in regional budgets to support an appropriate regional involvement. This approach will, over time, be able to meet many of the department's marine science needs across the state.

Initial priorities would focus on external research delivery (e.g. WAMSI Node 3), MPA management plan research, monitoring and science communication requirements and co-ordinating the research and monitoring of threatened marine fauna. The Strategy proposes that the science needs and capabilities for systematic surveys of WA's marine biodiversity, regional and MPA planning and marine environmental protection would be determined over the next year with the appropriate internal and external groups, all of whom have been consulted on this approach. A Marine Science Co-ordinating Committee will be established to ensure integration and co-ordination. The timeframe to implement the Strategy and become fully operational would be 12-18 months.

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1. Introduction

Marine science in Western Australia is in a period of rapid growth. Recent investment by the State Government combined with co-investment from Commonwealth research agencies and local and interstate universities will exceed $100M over the next five years. Much of this science is directly relevant to the objectives of the Department of Environment and Conservation (DEC). At the same time, the State Government established a number of 'new' marine protected areas (MPAs) in the coastal waters of Western Australia and extended the boundaries and updated the management arrangements of two existing iconic, coral reef MPAs; the Ningaloo and Rowley Shoals marine parks. The Government also substantially increased funding to implement the management plans of these reserves, including significant allocations for marine research and monitoring.

In anticipation of these changes, the former Marine Conservation Branch developed two 'way forward' papers entitled *Managing the Marine Reserve System in WA: The Next Ten Years - Part I: A Discussion Paper* (Simpson, 2005a) and *Managing the Marine Reserve System in WA: The Next Ten Years - Part II: Funding Options* (Simpson, 2005b) that outlined recommendations and funding options to improve management across the state-wide system of MPAs. One major deficiency that was identified was the absence of a dedicated marine science capability within DEC to support the Department's marine conservation program. The two papers were forwarded to the Corporate Executive for consideration in early 2005.

The Marine Science Program (MSP) was established[1] in the Science Division of the Department of Conservation and Land Management (CALM) in May 2006. In July 2006, a workshop was held with staff from the MSP, Regional Services and relevant specialist branches to discuss and agree on a general approach to developing a marine science capacity in CALM. About the same time, CALM and the Department of the Environment were amalgamated into the Department of Environment and Conservation (DEC) by the WA State Government.

A Marine Science Strategy (the Strategy) has been developed at the request of the Director General of DEC.

2. Scope and Purpose of the Marine Science Strategy

2.1. Scope

The roles of the MSP, outlined in section 3, were developed to support the marine conservation and management programs of former CALM. Logically, the Strategy should consider the new department's entire marine science needs. While the Strategy does not consider the specific marine science needs of the former Department of the Environment's marine environmental assessment, regulatory and audit responsibilities, it does contain a recommendation to address these issues.

The Strategy has broadly considered the relevant sections of the State Sustainability Strategy, A 100-year Biodiversity Conservation Strategy for Western Australia and the draft 2006 State of the Environment Report and is framed within the context of the draft DEC Corporate Plan and the draft Science Division Strategic Plan. While the Strategy includes social science, this is considered mainly within the context of marine biodiversity conservation and marine environmental protection (i.e. human uses as potential threatening processes). The document, *A Strategy for Social Science in the Environment*, has been developed by the Parks and Visitor Services Division, and considers the department's social science needs in relation to the public benefits (i.e. from a recreation and tourism context) derived from DEC programs. The Strategy builds on the internal reports of Simpson (2001) and D'Adamo, Simpson and Burrows (2003) which examined the issue of CALM's marine science needs.

2.2. Purpose

The purpose of the Strategy is to provide a broad blueprint for the development and implementation of a marine science capability within DEC over the next five years. The Strategy addresses the need to influence, collaborate with and support external marine science providers with the need to develop an appropriate 'in-house' marine science capability. The 'in-house' capability is a partnership model based on the development of a centralised marine science capability within the MSP, based in the Science Division, and an operational capability in the Regions. The partnership also includes senior regional staff and key specialist branches within DEC including the Marine Policy and Planning Branch, Marine

[1] See memo from the Executive Director of CALM on 4 May 2006.

Ecosystems Branch, Environmental Management Branch and the Parks Policy and Services Branch. This general approach was agreed *in principle* at the July workshop and will ensure that the marine science capability is closely integrated with the marine policy, planning and management activities of the department. The Strategy provides staff profiles and FTE allocations across the research, monitoring, science communication and policy/advice functions (Table 1, Appendices 2b, 3b and 4b), budget considerations (Tables 2 and 3) and details of the specific objectives, tasks, outputs and expected outcomes of the proposed research, monitoring and science communication units (Appendices 2a, 3a and 4a).

The Strategy does not outline specific research, monitoring and science communication priorities to be undertaken. Many of these are outlined in the MPA management plans and other priorities will be developed according to the framework outlined in section 5, once a decision has been made after consideration of the Strategy by DEC Corporate Executive. The Strategy will also provide a vehicle to communicate the MSP to both internal groups and external stakeholders.

3. Roles of the Marine Science Program

The roles of the MSP are:

(i) *To conduct, or cause to be conducted, scientific research and monitoring programs necessary to manage existing marine parks and reserves; conserve marine biodiversity generally; assist in identifying and planning for new marine parks and reserves; and contribute to regional marine planning;*

(ii) *To provide policy advice to DEC Corporate Executive and the Minister for the Environment, and scientific and technical advice and support to DEC's regions and branches;*

(iii) *To provide a strategic focus for scientific and technical liaison with DEC's clients and stakeholders in relation to marine conservation; and*

(iv) *To assist the Marine Parks and Reserves Authority in the performance of its statutory duties as required.*

A summary of the MSP roles and responsibilities, in relation to other marine functions in DEC, are outlined in Appendix 1.

4. Marine Science: Definitions

Marine science is defined here as: marine *research*, *monitoring* and *science communication* and refers to both the bio-physical and social environments. These are defined as:

- ***Research*** is about increasing the understanding of: (i) the structure and functioning of ecosystems (i.e. fundamental or strategic research) and (ii) human interactions with the natural environment (i.e. applied research). Research has four generic elements: *inventory*, *baseline*, *process* and *prediction*;

- ***Monitoring*** is about measuring trends in the environment, particularly marine resource *condition*, *pressure* and the effectiveness and efficiency of management *responses*. Ecological monitoring includes monitoring of *reference sites* to assess *natural variability*, routine *surveillance* or ecosystem 'health' monitoring and *compliance* (usually by industry) monitoring. Social monitoring is about measuring trends in human use, attitudes and aspirations.

- ***Science communication*** is about communicating scientific knowledge in a way that facilitates a better public understanding of the natural and social environments in order to positively influence public and stakeholder attitudes and behaviour to science, management and conservation.

5. Marine Science Needs and Priorities

5.1. Spatial Framework

Marine science is best considered within a functional ecological context (i.e. at an ecosystem level within 'regions' of ecological similarity) as this will allow an integrated, regional approach to be taken across ecologically similar areas. This approach will be significantly more effective and efficient from both scientific (e.g. science in one area can be used or adapted for another area within the region) and operational perspectives. An example of the science links between MPAs in the same 'region' is the recent year-long water quality survey in the Jurien Bay Marine Park. Not only did this survey provide

specific baseline data for Jurien but, as importantly, has contributed to the data needed to develop background estimates of key water quality parameters for the temperate coastal areas of south-west WA. One example of the broader utility of these data is in managing current and future water quality issues in the metropolitan coastal MPAs arising from sewage discharges into coastal waters off Perth.

Four marine science 'regions' have been identified: ***Tropical*** - Northern Territory border to Broome; ***Sub-tropical*** - Broome to Carnarvon; ***Warm Temperate*** - Carnarvon to Windy Harbour; ***Cool Temperate*** - Windy Harbour to the South Australian border. Each region is further sub-divided into IMCRA bioregions and each marine bioregion contains one or more marine ecosystems. The above spatial framework will be adopted by the MSP.

5.2. Information Requirements for Marine Management

Effective and efficient management of human pressures on complex ecosystems is not possible without science. The natural and social sciences are needed to understand the structure and functioning of ecosystems, to understand how human-induced problems can be solved and how human aspirations can be met in an equitable and sustainable way. Science in NRM agencies like DEC should be driven by management needs. Science should provide answers to questions such as:

- What are the key structures and functions maintaining the managed system?
- What is the *condition* of the managed system?
- What are, or have been, the *pressures* on the system (both natural and human-induced)?
- What is, or has been the effect of the management response?
- Is management meeting its objectives?
- Are people complying with the rules?
- What are the social and economic benefits?

The information needs can be, for convenience categorised into two broad categories: primary and secondary information.

5.2.1. Primary Information

Primary information, sometimes referred to as foundational knowledge, consists of the fundamental information that characterise, in space and time, priority systems of interest from ecological and social perspectives (i.e. *inventory* and *baseline* data). These data are needed to determine the condition (current status and trends) of the natural resources to be managed, characterise the surrounding physical and social environment, and identify threats and potential risks to these resources. An understanding of the existing relevant scientific information also enables key knowledge gaps to be identified.

Ecological data include:

(i) *Biological information* such as the distribution and extent of the major marine habitats/communities, abundance of the major flora and fauna species within these communities, the list of threatened large marine fauna species and their population sizes and distributions, lists of endemic and exploited species;

(ii) *Physical information* such as bathymetry, seabed topography, tidal regime, wave, wind, current, water clarity and temperature;

(iii) *Chemical information* such as a range of water and sediment quality data for biostimulants, toxicants and pathogens; and

(iv) *Geological information* on the geomorphology, seabed topography and sediment characteristics and the recent and past geology of the area; and

(v) Knowledge of historical, current and proposed ecological science.

Social and economic data include:

(i) Historical, current and future commercial, recreational and cultural uses;

(ii) Attitudinal, aspirational and 'level of knowledge' data of local residents and visitors relevant to marine management; and

(iii) Knowledge of historical, current and proposed social/economic science.

A further account of the information requirements for non-fisheries marine management can be found in Simpson and Cary (1998).

Although some of these data are routinely collected by Government agencies (e.g. real-time wave and tide data is collected throughout WA by the Department of Planning and Infrastructure) and industry, most are collected on an 'as needs' basis. At present, there is no systematic, state-wide data acquisition program to comprehensively characterise the coastal waters off WA and provide the basic data needed to

proactively manage these waters. Particular deficiencies are the poor knowledge of the state's marine biodiversity and the absence of a state-wide system of reference sites to understand the nature and extent of the natural variability of key bio-physical parameters. A systematic cross-sectoral program of strategic research to obtain these fundamental datasets should be a high priority for Western Australian marine NRM and planning agencies.

5.2.2. Secondary Information

Secondary[2] information results from studies that provide an understanding of key ecosystem maintenance processes (e.g. growth, maintenance and reproduction) and studies that link natural and human influences with changes in the environment (e.g. cause-effect studies). This type of research is generally referred to as *process* and *prediction* studies. As well as providing a better understanding of how natural systems function and respond to human disturbance for current management concerns, the improved knowledge and understanding resulting from process and modelling studies can significantly enhance management capability and flexibility to address 'problems' that have not been anticipated. This last point is obviously crucial if management is to be proactive and avoid repeating the mistakes so often seen when environmental management does not have a sound scientific underpinning.

5.3. Marine Science Priorities

Priorities for the MSP will be driven by existing Government/DEC obligations such as the implementation of MPA management plans and marine wildlife programs, Government/DEC policy commitments, such as the Biodiversity Conservation Strategy, MPA establishment and regional marine planning timelines, departmental and MPRA audit requirements and, to some extent, by external influences such as industrial development agendas that impact on the marine environment. Institutional priorities summarised in the NC and PVS Key Result Areas (which are subsets of the above longer-term 'drivers') will also be a key influence on marine science priorities over shorter timeframes (i.e. 1-3 years).

At an ecological value or asset level, science priorities are developed through a risk assessment approach. Research priorities are based on relative conservation value, degree of pressure and level of existing scientific knowledge. A detailed outline of this prioritizing framework is provided in Simpson *et al.* (2002). Social science research priorities are outlined in the social science strategy.

6. Marine Science Delivery Models

DEC's marine science needs can be delivered either via internal or external marine science capacity or, preferably, through strategic collaborations that utilise both internal and external capacities. The balance of internal, external and collaborative delivery will be different for marine *research, monitoring* and *science communication* because of the varying organisational objectives, capacities, expertise and interests of the external science providers and the institutional imperatives of DEC. For example, external science providers are more focussed on research, rather than monitoring and science communication, because research, rather than management, is their primary focus. Research is also of greater professional interest to most scientists and has, by definition, a broader application which is more amenable to scientific publication. NRM agencies, like DEC, require an appropriate balance between these three areas of science to achieve their objectives. Within the research area, external science providers' interests relate more to strategic or basic research than applied research for much the same reasons. Furthermore, they are primarily interested in the process/prediction (see above) part of the knowledge continuum and are significantly less interested in the bio-physical and social inventories and baseline data that are also 'core' knowledge for management agencies.

To date the marine research needs of DEC have been largely serviced by external providers or by limited 'in-house' research supported by external funding. Over the same period there has been no long-term systematic integrated marine monitoring or marine science communication programs within DEC. The proposed delivery of marine research, monitoring and science communication is outlined in more detail in sections 6.1 to 6.4.

6.1. Marine Research Delivery

This strategy proposes that a Marine Research Unit is established within the Marine Science Program to deliver the research needed to support DEC's marine conservation program. The staff profile, nominal FTE allocations and specific functions are outlined in Table 1 and Appendix 2. This approach is based on

[2] The use of the term *secondary information* does not infer these data are less important than *primary information* but rather, reflect a priority need of NRM agencies to firstly characterise (in space and time) the bio-physical structure and human use of ecosystems, as well as collating existing scientific knowledge about these areas. This information is needed to undertake the risk assessments to identify and prioritise research gaps to inform management of how these systems function and respond to human pressures.

a collaborative implementation model where the Marine Research Unit (see Table 1 and Appendix 2b) provides the major scientific input and coordination, in collaboration with appropriate senior regional staff (e.g. NC and PVS leaders, Marine Park Co-ordinators, regional marine ecologists), and regions provide operational field support by supplying staff and non-specialist field equipment. The collaborative framework will include opportunities for DEC staff from other regions and specialist branches with marine expertise and/or responsibilities (e.g. MPPB, MEB, EMB, PPSB) to assist which, in turn, will broaden their knowledge and expertise.

This will allow the MSP to focus on building the necessary scientific capacity and, through the active involvement of local staff, also utilise important local knowledge and expertise in the research programs. Operational efficiencies will be enhanced by local knowledge and costs will be significantly reduced by using regionally-based field equipment (e.g. cars, boats, diving equipment etc). Secondary benefits of this approach include an increased understanding by regional staff of the importance of science in underpinning operational management, enhanced appreciation by regional staff of the need to measure the outcomes of management (i.e. an adaptive management approach), enhanced professional development, capacity building and increased job diversity. Similarly, MSP scientists will gain a better understanding of the links between science, policy and day to day management.

6.1.1. External Research Delivery

As mentioned above, DEC has pursued its marine research needs through external providers or by limited 'in-house' research. This has been achieved by: (i) building strategic alliances and influencing the core programs/interests of external research providers (i.e. CSIRO, AIMS and local and interstate universities); (ii) implementing a 'seed-funding' approach with local and interstate universities; (iii) participating in the development and implementation of state/commonwealth-funded collaborative research programs (i.e. SRFME, WAMSI, NHT); and (iv) obtaining funding from the Commonwealth Government to undertake bio-physical and social research for the planning of MPAs.

A limitation of this approach is that, with the rapid escalation of marine science in WA over the past five years, DEC has not had the capacity to be other than peripherally involved in much of this research, resulting in a decline in influence and lost opportunities to build institutional marine science capacity. By contrast, the DoF is centrally involved in several major marine biodiversity/ecosystem research programs (e.g. WAMSI Node 4 and the NHT-funded Marine Futures and introduced marine pest research) and projects such as the NHT Resource Condition Monitoring project. Building marine science capacity to be more centrally involved in these types of research projects and capture the direct and indirect benefits of this involvement will be a priority of the MSP.

The staff profile and the nominal FTE allocations for the management of external research are outlined in Table 1 and Appendix 2b. The recommended MSP involvement is equivalent to just over two FTEs at a senior scientist level. The focus will be primarily on Research Theme 1 (i.e. WAMSI) and relevant NHT and university research areas of direct relevance to DEC.

6.1.2. Internal/collaborative Research Delivery

The external research delivery approach, particularly as outlined above, will continue to serve DEC well. It will not, however, provide all of DEC's science needs for the future. This approach will not, for example, build the marine scientific capacity needed internally to support marine policy development, MPA and regional marine planning, operational management of MPAs, including the design and scientific oversight of marine monitoring programs, threatened marine fauna conservation programs, emergency (e.g. wildlife, oil spill) responses and environmental impact assessment processes. All of these key functions require scientists to have the well-developed scientific and technical skills and a good understanding of the current political climate, institutional context and regional sociology surrounding these issues. This combination of skills is rare. These skills can, however, be developed internally by creating career pathways that attract and retain young scientists and providing research scientists already in DEC with opportunities to develop these skills.

The external research delivery model also requires significant resources to be managed effectively (see 6.2.1 below), is not sufficiently responsive to changing institutional priorities and timeframes (e.g. recent oil and gas developments off the Kimberleys coastline) and, importantly, it can not address the criticism by some stakeholders that the marine programs in DEC are not underpinned by science (e.g. historical and recent criticism in the press of the MPA program). The importance of developing a strong 'in-house' marine science capability is given further emphasis when considering the proposed extensive industrial development in WA planned for the coming decades and the ever increasing recreational and commercial usage of the State's coastal waters (see section 6.2.6).

As mentioned above, external research providers are primarily interested in the process/prediction areas of science. They are significantly less interested in bio-physical and social inventories and baseline information needed to manage MPAs or the human impacts on threatened and exploited marine species and the marine environment generally. Similarly, there is little interest in maintaining a current understanding of historical and current marine science relevant to the range of DEC's marine activities or providing scientific training to operational marine management staff. These areas are high priorities for natural resource management agencies like DEC for both planning and operational management purposes. The development of a significant internal marine science capacity within DEC to undertake the above tasks will be a priority of the MSP.

The staff profile and the nominal FTE allocations for the management of internal/collaborative research are outlined in Table 1 and Appendix 2b. The recommended MSP involvement is equivalent to approximately 6 FTEs, primarily across Research Themes 2 and 3 (below). It is anticipated there will also be regional involvement in Research Themes 2 and 3.

6.2. Marine Research

6.2.1. Theme 1: Western Australian Marine Science Institution

The MSP will continue to pursue some of DEC's research needs through external providers, primarily through participation in the Western Australian Marine Science Institution (WAMSI). While DEC is the agency leader for Node 3, other Nodes in WAMSI require significant input from the MSP if the research needs of the Department are to be serviced. Node 1, for example, should service the strategic needs of WA by taking a longer term view (e.g. 5 years out and beyond) of the state's marine scientific information needs. Along with Node 1, Node 2 (Climate Change), Node 4 (Sustainable Fisheries) and Node 5 (Products from the Sea) all have direct links with DEC's core research needs and significant input from DEC marine scientists is required to ensure maximum benefits are achieved.

Currently the WAMSI Node 3 role is carried out by a senior scientist (L7, 0.8 FTE) with some administrative support (L3, 0.3 fte) and with the assistance from the MSP Program Leader (L8, 0.2 FTE). The administrative and scientific focus of Node 3 has concentrated to date on the development of the Node 3 Science Plan, project specifications, project contracts and integration within and external to WAMSI. Over the next five years, other areas requiring major effort will include integration across the multiple organisations involved in the >$20M of research planned for the Ningaloo and Jurien Bay marine parks, Node 3 science communication, WAMSI administrative and reporting obligations and ensuring the science can be transferred into operational management. While, the current level of resources currently committed to this task is likely to be needed to maintain our involvement over the next five years, it may be configured differently to better use the available expertise.

The staff profile and nominal FTE allocations for the management of external research (including WAMSI Node 3) is outlined in Table 1 and Appendix 2b.

6.2.2. Theme 2: Marine Protected Area Management

Marine research designed specifically to support marine conservation and non-fisheries marine management programs in WA has been relatively limited in the past. From a MPA perspective, however, the biophysical and social datasets needed for planning processes also provide some of the primary datasets that are essential for reserve management. Significant environmental research and monitoring programs have also been undertaken by State Government departments in the metropolitan coastal waters of Perth which include the Marmion and Shoalwater Islands marine parks.

With the recent advent of increased science funding for strategic research (i.e. SRFME, WAMSI), State Government funding for MPA management and Commonwealth funding for marine environmental management (i.e. NHT), significant research programs are/have been recently undertaken in candidate MPAs (e.g. University of WA research in the Recherche Archipelago), and are underway in the Jurien Bay Marine Park (e.g. University of Tasmania, SRFME/WAMSI) and the Ningaloo Marine Park (e.g. WAMSI, (particularly Node 3), AIMS, CSIRO, Tourism CRC and local universities). NHT-funded research is also underway in the metropolitan marine parks and the proposed 'Capes' MPA. While departmental staff have been/are involved in the development of these research programs, direct participation by DEC scientists has been limited to date.

There is a requirement for MSP staff to become more directly involved in this externally-funded MPA research, primarily to facilitate the transfer of the science outputs into operational management, but also as a vehicle to promote further collaborations and to continue building scientific networks and internal

scientific capacity. Building capacity to transfer scientific knowledge into operational management is an important priority for the MSP.

While the external research delivery model approach has, and will continue to, serve DEC well, it will not provide all of DEC's science needs for the future. For example, this approach does not build the marine scientific capacity, internally, needed to better support the operational management of MPAs, including the design and scientific oversight of marine monitoring and science communication programs, marine policy development, MPA and regional marine planning, threatened marine fauna conservation programs, emergency (e.g. wildlife, oil spill) responses and environmental impact assessment processes. As outlined in section 6.1.2, these key functions require scientists to have a diverse range of technical, policy and institutional skills. This combination of skills is rarely developed or available, externally. Building an 'in-house' capacity with these skills to service the above key areas is an important priority for the MSP.

Marine science, being undertaken in other parts of Australia and overseas to support the design and management of MPAs, is growing rapidly and much of this work is relevant to Western Australia. Maintaining a current knowledge, of both national and international research that is relevant to DEC objectives is also a priority for the MSP.

The proposed staff include scientists with tropical and temperate ecological expertise, a marine biodiversity mapping specialist, a scientist with fisheries expertise, a social scientist and three junior scientist positions and support staff. The staff profile and the nominal FTE allocations for the management of internal/collaborative MPA research are outlined in Table 1 and Appendix 2b. Approximately six FTEs are proposed for this function.

6.2.3. Theme 3: Marine Fauna Conservation

Over the past two decades DEC has allocated funding to support internal and external research and monitoring of selected large marine fauna. Much of this science has been externally-funded and undertaken by local and overseas scientists. For example, long-term ecological research on dolphins and other large marine fauna has been on-going for 20 years in the Shark Bay Marine Park. Similarly, a long-term program of research studying migratory birds and their intertidal habitats is on-going in Roebuck Bay, near Broome. Both of these studies involve large contingents of overseas scientists.

Significant research on turtles, seabirds, dugong, whales, whale sharks, sea-lions, little penguins and other large marine fauna has been and is being carried out in various parts of the State by a variety of scientists from local, interstate and overseas universities. Large marine fauna research is often well supported by industries whose activities may impinge upon these species. Currently, DEC is providing ~ $100,000 pa for the next two years to Dr Richard Campbell to undertake research on sea-lions and fur seals while also supporting research into turtles, dugong, little penguins, dolphins, whales and manta rays, to name a few.

Many of these species are iconic and are threatened both nationally and globally and, as a result, external funding to support conservation research is often readily available from Government and industry sources. The iconic nature of many of these species, combined with the relative ease of obtaining research funding, results in a high degree of interest by scientists. There is a clear need from a DEC perspective to ensure this research addresses the critical conservation requirements of the various species, can be used to formulate state-wide operational management prescriptions and assists in the design of monitoring programs.

The Research Scientist (Marine Fauna) position, outlined in Table 1, will specifically address these tasks state-wide across the range of fauna species.

6.2.4. Theme 4: Understanding the Distribution and Patterns of WA's Marine Biodiversity

In the past, marine bio-physical information for MPA planning and management, and marine conservation generally, has been obtained largely from collating existing marine habitat and marine flora and fauna distribution data, personal knowledge of coastal areas by DEC staff and limited field habitat mapping and biological surveys. Social data for these processes were also collected largely by departmental staff. Field surveys were funded partly through NHT or similar programs specifically for MPA planning purposes and were undertaken in collaboration with local universities and the WAM. These external funding arrangements no longer exist.

While this approach has been useful, the lack of accuracy and detail inherent in this approach could result in poorly designed MPAs, inappropriate use of this information in MPA management and other DEC processes (e.g. EIA) and an undermining of DEC's credibility. An example of the latter concern is when

members of community-based advisory committees use their local knowledge to highlight inaccuracies in the information provided. This can potentially be very damaging and has, on several occasions, been used by protagonists to undermine the planning process and perpetuate the perception of a non-scientific approach. The past approach will be significantly less useful in the more inaccessible and less well-known south coast and the Kimberley coast. Hence, a different approach is needed.

Over the past 20 years, the Western Australian Museum (WAM) has been documenting the State's marine fauna and hold extensive collections of many marine faunal groups, particularly fish, molluscs, echinoderms and sponges. Most of these surveys have been externally funded, either by the Commonwealth Government or, more recently, by industry. A DEC-initiated project, between the Coastal CRC in Brisbane, Curtin University and UWA, has resulted in the development of high resolution, broadscale marine biodiversity mapping technologies. A group of marine scientists at UWA, led by Dr Gary Kendrick, is currently using this technology to map marine biodiversity off WA funded by NHT. AIMS and, to a lesser extent, the CSIRO, are also developing capacity in this area. The Department of Fisheries (DoF) Fish and Fish Habitat Program have responsibilities in this area and a marine biodiversity unit within the Research Division has recently been established.

The Biogeography Program in the Science Division fulfils the above role in the terrestrial environment through strategic and tactical biodiversity surveys. This group has about thirty staff and receives significant Government funding to undertake this role. The data gained from these surveys informs departmental processes such as land acquisition for, and management of, the terrestrial CAR reserve system, provides a regional biodiversity context for development proposals and EIA, threatened species recovery and translocation programs and managing exploited flora and fauna. The strategic nature of the Biogeography Program is fundamental to the conservation of WA's terrestrial biodiversity and a similar capability is urgently needed for the marine environment.

Obviously one approach would be to build an in-house capacity akin to the Biogeography Program. A potentially more cost-effective approach, in the short to medium-term, would be for DEC to establish a formal collaboration with the marine section of the Division of Natural History of the WA Museum, UWA and DoF to systematically document the State's marine biodiversity.

A collaborative approach would need significant funding to engage the existing marine expertise in the WAM and UWA and to establish a complementary DEC marine survey capability in marine flora and other marine fauna not covered by the collaborating institutions.

RECOMMENDATION: That the MSP, in collaboration with the WA Herbarium, WAM and the DoF, undertake a review of the feasibility, practical implications and costs of developing a collaborative DEC/WAM/DoF marine biodiversity survey capability (as described above) and undertaking a long-term systematic program to document the State's marine biodiversity in support of the Government's marine conservation agenda.

6.2.5. Theme 5: Marine Planning

Biophysical and social data are needed to support planning for marine protected areas (MPA) and regional marine strategies (RMS) and these data are best presented, for these purposes, within a geographic information system platform. Priority information include: marine biodiversity data, usually marine habitats and species distributions; a suite of physical data such as seabed topography, water quality, current patterns, bathymetry and wave, tide and wind data; and social and economic data including historical, existing and future commercial and recreational human usage as well as attitudinal, aspirational and 'level of relevant knowledge' data of local communities and visitors. The absence of high quality ecological, social and economic data has been a major deficiency in the marine planning processes to date, and this deficiency is particularly obvious when resource allocation issues (e.g. establishment of sanctuary zones) arise. An understanding of the level of scientific knowledge relevant to the area is also a priority data layer for obvious reasons.

In the past, much of this information has been obtained from collating existing data, personal knowledge of coastal areas by DEC staff and limited field biological and social surveys. Biological field surveys were funded externally through NHT or similar programs specifically for MPA planning purposes. These funding arrangements no longer exist. While this approach has worked reasonably well in the past, it is likely a more strategic approach is needed in the more remote and less well-known areas of the state if future marine planning processes are to be adequately informed. Dedicated funding and a forward program of future priority areas is needed well in advance (cf. 5 years) of the formal planning processes to allow the biophysical and social resource assessment studies to be planned and implemented.

The current MPA marine planning effort is focussed on completing the Dampier, 'Capes' and Walpole MPA processes. Some of the proposed MPAs on the south coast, and off the Pilbara and west Kimberley coastlines (e.g. Recherche, Fitzgerald and Roebuck Bay), have significant existing information that can be used for marine planning. However, more ecological and social data is needed to support planning processes in these areas. In other MPA candidate areas on these coasts (e.g. the recent areas identified by the state Government to assist with the conservation of the flatback turtle) there is even less data. If a regional approach to MPA planning (i.e. groups of candidate MPAs are established through one process) is adopted then significant resources will be needed to provide the information needed for these processes. Similarly, revisions of marine park management plans (e.g. Shark Bay and Marmion marine parks) will require significant resources to provide the information needed for these processes.

The MSP will continue to influence the research priorities of external providers such as WAMSI Node 1 and AIMS' and CSIRO's core programs (in relation to the Kimberley), and the NHT Marine Futures project (in relation to the south coast) to focus some of their research effort on areas of relevance to DEC. Some financial support is also being provided to local university researchers working in south coast estuaries and the MSP will continue to assist the regions in obtaining information to support the revision of the Shark Bay and Marmion marine parks management plans.

The field component of the bio-physical and social resources assessments needed for MPA planning and RMP should be undertaken in close collaboration with the MPPB. In community-based planning processes, marine planners need to have direct experience and knowledge of the candidate areas, from both ecological and social perspectives. This approach will enhance the knowledge, professional confidence and personal authority needed by planners to run these difficult processes successfully. This, in turn, will provide reassurance to local communities and stakeholders that the process is in competent hands.

A more systematic and strategic approach is needed to obtain the necessary ecological and social data that will be required for the next round of MPA and regional marine planning. The recommendation below addresses this issue.

RECOMMENDATION: That the MSP, the Social Research Unit, Marine Policy and Planning Branch develop a fully-costed strategy for consideration by DEC Corporate Executive to ensure the information needs for future marine planning (MPA and RMP) processes are acquired in a more strategic and timely manner.

6.2.6. Theme 6: Marine Environmental Protection

DEC, in support of the EPA, has responsibilities to develop statutory and non-statutory environmental policy and undertake the environmental impact assessment (EIA) of development proposals, endorse and audit the implementation of environmental management plans of approved developments, regulate the potentially environmentally harmful impacts of existing industries and audit overall environmental performance. Given the scale of these marine infrastructure developments (e.g. Port construction/expansion) and the magnitude and quality of domestic and industrial wastewater discharge streams (e.g. domestic sewage, desalination), the potential for serious or irreversible damage to the marine environment is high. These EIA and regulatory processes are most effective (and equitable and consistent) when undertaken within a statewide/regional policy context that duly considers the issue of cumulative impacts. The development of operational policy frameworks (e.g. for habitat protection; environmental quality management) and the development-specific evaluation, regulatory and audit processes need to be based on appropriate science (see proposed DEC Gorgon audit capacity in section 6.3.3).

To date, most of the technical information used in the EIA of these proposals is provided by the proponents, through consultants, and DEC's current role is to assess and advise on the validity of the data, assumptions and interpretations presented. To do this effectively, DEC must have access to scientists who have specialist expertise in the range of issues that arise, a comprehensive knowledge of the structure and functioning of the ecosystems in question, a good understanding of the current political climate and the institutional and policy context surrounding these issues and a willingness and capacity to be involved. This combination of professional skills and personal traits is rare.

From a marine perspective, the current situation relies mainly on marine scientists within DEC's Marine Ecosystems Branch (MEB) and staff from the Environmental Management Branch (EMB). These groups develop marine environmental protection policy to guide project planning, environmental impact

assessment, regulation and management. The MEB and EMB also assess and advise the EPA on the validity of data, the proponent's assumptions, interpretations and conclusions of the information presented. This process often takes place under circumstances where both the specific content and delivery of this information is largely controlled by the proponent. The timing of DEC advice to the EPA is determined by statutory timelines. An approach of assessing and advising the EPA on the environmental impacts of numerous development proposals (often simultaneously) that, out of financial necessity, rarely utilises external expertise, does not have access to industry-independent data for impact assessment or environmental performance auditing, and is required to be undertaken within tight statutory timelines, is clearly fraught with risk.

Many of these developments are/will be located within, or in the vicinity of, the State's marine conservation estate and threatened marine fauna habitats. Hence, many of the MPA management and threatened marine fauna species conservation programs and the marine environmental approvals, regulatory and industry management plan audit processes are intertwined. As such, the research programs for marine conservation and marine environmental protection should be closely linked.

This is occurring, to some degree, both scientifically and operationally. For example, the (former) DoE seagrass studies designed to better predict and manage the effects of dredging and organic enrichment on temperate coastal systems in WA have used the Special Purpose (scientific reference) zones in the Jurien Bay Marine Park as reference sites. The baseline water quality studies in JBMP were undertaken collaboratively by CALM and the former Department of Environment DoE to ensure the data obtained met Park management objectives and also the requirements for setting environmental quality criteria to guide EIA and regulation of developments in the region. Reference sites for water quality parameters and seagrass health have been established in the Shoalwater Islands Marine Park (SIMP) and these criteria are formally established under the State Environment (Cockburn Sound) Policy 2005 to guide the management and evaluation of environmental quality in Cockburn Sound which is the most intensively used (and politically contentious) marine embayment in WA.

The State Environmental (Cockburn Sound) Policy 2005 (SEP) was prepared through extensive community and stakeholder consultation consistent with the State Water Quality Management Strategy (SWQMS). The CSSEP is a scientifically-based policy that includes a comprehensive set of 'Environmental Quality Objectives, Guidelines and Standards', 'Standard Monitoring Procedures' and 'Evaluation Schemes'. Under the SWQMS, DEC is the resource management agency with day-to-day responsibility for environmental quality of marine waters, both inside and outside MPAs, and the EPA is responsible for evaluating and publicly reporting to Government on the environmental performance of the day-to-day management agency. In the case of the Cockburn Sound SEP, the Cockburn Sound Management Council has been established to coordinate environmental management and this function is supported by DEC. Elsewhere, this responsibility lies directly with DEC.

The EPA has requested that DEC prepare a State Marine Waters SEP to establish Environmental Values, Quality Objectives and Criteria for all marine waters under State jurisdiction. The SEP will guide environmental impact assessment of new proposals and management and regulation of existing developments that have the potential to contaminate or pollute the environment. Clearly, there are significant scientific challenges associated with establishing a comprehensive and robust set of criteria that can cover the range of marine ecosystem types from the Timor Sea to the Great Australian Bight and the range of potential threats to them. In the meantime, development pressure continues in WA with some $35.4 billion of marine-based projects either underway or planned in the oil, gas and condensate sector alone.

RECOMMENDATION: That the MSP, EMB and the MEB develop a fully-costed strategy for consideration by the Corporate Executive to service the marine environmental protection science needs of DEC.

6.3. Marine Monitoring

Monitoring, together with evaluation and reporting, is vital for measuring success of management actions towards objectives, both ecological and social, and for applying active adaptive management principles to marine conservation. Long-term monitoring is also critical to assessing the impacts of climate change. Monitoring can also contribute to maintaining interest and support of stakeholder groups by demonstrating short- and long-term successes. MPA management plans and marine fauna management plans all have monitoring requirements needed to assess management performance and service the MPRA's audit requirements (see below). Ecological monitoring includes monitoring to assess natural

variability, routine surveillance or ecosystem 'health' monitoring and compliance (usually by industry) monitoring.

Monitoring (and evaluation and reporting) is the key feedback mechanism in a 'best practice' natural resource adaptive management approach. Hence, it is primarily the responsibility of management agencies. Monitoring, for measuring success of management actions towards objectives (of MPA management plans and marine fauna conservation programs) and for applying active adaptive management principles to marine conservation, will be a priority for the MSP.

A Marine Monitoring Unit will be established within the MSP to coordinate this function. Monitoring will be undertaken collaboratively with DEC's regional offices with the MSP and senior regional staff providing the centralised scientific functions, co-ordination and technical oversight and local staff providing logistical and operational support (Table 1). As monitoring programs mature and regional capacity improves, the regions will take increasing responsibility for the field component of the monitoring programs. The collaborative framework will also include opportunities for DEC staff from other regions and specialist branches with marine skills and/or responsibilities (e.g. MPPB, MEB, EMB, PPSB) to assist which, in turn, will broaden their knowledge and expertise.

The recommended MSP involvement is equivalent to approximately 7 FTEs. It is anticipated there will be significant regional involvement. The staff profile, nominal FTE allocations and specific functions of the Marine Monitoring Unit are outlined in Table 1 and Appendix 3.

6.3.1. Natural Variability

An understanding of the nature, extent and causes of natural variation in the environment is necessary to distinguish between environmental changes caused by human activities and changes caused by natural influences. This can be achieved by establishing reference sites at representative and relatively undisturbed locations (preferably in sanctuary zones in marine parks or in marine nature reserves) in all WA IMCRA bioregions and measuring a suite of ecosystem condition indicators, particularly indicators that are reflective of human induced changes to ecosystem condition, at the appropriate temporal and spatial scales. Natural variability monitoring has close links with the establishment of baseline data mentioned above (section 5.2.1).

The CSIRO and AIMS currently maintain a limited set of long-term monitoring sites in WA. Some industries and Government departments (e.g. Water Corporation, DoF) also have long-term marine monitoring programs in place and the NHT Monitoring and Evaluation framework may well establish reference sites in the coastal waters of WA over the next few years. A recent initiative by the Commonwealth Government, the Integrated Marine Observing System, will also establish three long-term monitoring sites in WA. The MSP will continue to encourage external agencies like CSIRO and AIMS to expand their long-term monitoring programs in WA. However, while many of the natural variability monitoring programs outlined above are broadly relevant to DEC, the MSP will need to establish a comprehensive system of reference sites as part of internal monitoring programs.

6.3.2. Surveillance Monitoring

Surveillance monitoring programs are generally broad-scale, on-going and are generally used to provide regular (e.g. annual) overall status reports on the 'health' of ecosystems and as a 'safety net' to account for uncertainty in our understanding and predictions. As well as providing status and trends in resource 'condition', pressures and management response, surveillance monitoring programs also provide the spatial context necessary to interpret the results of local-scale compliance monitoring programs (see below). The nature, extent and frequency of surveillance monitoring programs will reflect the nature, extent and frequency of natural and human pressures.

Monitoring programs to support the management of WA's state-wide system of MPAs and marine fauna conservation programs will be a priority focus of the MSP. These programs will be implemented in close collaboration with DEC regions.

6.3.3. Compliance Monitoring

Compliance monitoring programs are used to assess compliance with agreed environmental management targets for approved commercial activities. Compliance monitoring programs are generally spatially and temporally constrained. The nature, extent and frequency of compliance monitoring programs will reflect the nature, extent and frequency of the pressures (e.g. waste inputs) associated with the approved activities. In Western Australia, compliance monitoring programs are an essential part of the conditional approvals process undertaken by appropriate regulatory and management agencies.

The MSP's role in relation to compliance monitoring programs will be to provide advice and assistance to DEC's Environmental Management Branch, Parks and Visitor Services Division and Marine Ecosystems Branch as required. A complementary approach is to also develop an internal science capacity to undertake this function[3].

6.3.4. MPA Management Plan Audit by the MPRA

A major statutory role of the MPRA is to audit the implementation of MPA management plans by DEC. This process is guided by the MPRA's Audit Policy and performance assessment framework and is co-ordinated by the Marine Policy and Planning Branch, in collaboration with the regions. The MSP's role in this process will be to report on the marine science component of the marine conservation program and, as outlined above, in providing the monitoring data, in collaboration with the regions, to support assessments of management effectiveness in achieving the ecological and social objectives and targets of MPA management plans.

6.4. Science Communication

Education/communication programs should promote community awareness and increase public understanding. In a marine conservation context, awareness programs provide the public with information, for example, what they can and cannot do in protected areas and where the attractions and facilities are. Programs to increase understanding, on the other hand, provide the reasons why certain rules and regulations are in place and how the natural and social environment function and interact. This process-based approach increases understanding and appreciation of both governance arrangements and the natural environment. Science communication, therefore, is a major part of education/communication programs.

6.4.1. Marine Science Communication

From an internal departmental perspective, science communication is about transferring scientific knowledge into improved operational management, including building science capacity in regional staff. From an external departmental perspective, science communication is principally about communicating scientific knowledge to positively influence community attitudes and behaviour towards conservation and sustainable use of the marine environment. Science communication is also about influencing the attitudes of politicians, media and industry groups with an aim of building confidence about governance, regulation and the use of science and technology. Confidence in the role of science also helps to sustain and increase funding for science.

Science communication also promotes a better public understanding of the natural and social environments and their interaction, and positively influences both attitudes and behaviour of user and interest groups. Research indicates there is a high degree of public trust in scientists and, therefore, scientists can play a key role in conveying key conservation and management issues to the wider community.

6.4.2. Marine Community Monitoring

Over the past five years the former Marine Conservation Branch, in collaboration with the WA Museum, developed and implemented a Marine Community Monitoring Program (MCMP). Funding (~$0.5M over three years) for this initiative was provided by the Commonwealth Government with significant Departmental support. The MCMP is a 'tool box' of simple but effective marine monitoring methods to assist local interest, stakeholder, industry and school groups to participate directly in marine conservation and marine environmental management projects by monitoring ecological or social parameters of interest. Currently a number of groups around the State are actively engaged in projects. The MCMP provides an excellent vehicle to promote science communication with local community and school groups and build community support for marine conservation planning and management programs. The MCMP can also provide useful data to support institutional scientific monitoring programs if programs are designed correctly, implemented under supervision and data management and reporting processes comply with standard protocols.

A Marine Science Communication Unit will be established within the MSP to coordinate these functions. Marine science communication will be part of the responsibilities of each scientist in the MSP and will be undertaken collaboratively with DEC's regional offices and specialist branches and the Strategic

[3] One example of the perceived internal capacity required to undertake this function is the current DEC proposal to undertake marine compliance monitoring of the GORGON development. This is costed at over $2.5M over 2 years for auditing dredging impacts on benthic communities and over $1M pa over 30 years for turtle conservation research and monitoring.

Development and Corporate Affairs Division. The staff profile, nominal FTE allocations and specific functions of the Marine Science Communication Unit are outlined in Table 1 and Appendix 4. The recommended MSP involvement is equivalent to approximately 3 FTEs. It is anticipated there will also be some regional involvement.

7. Marine Science Program

7.1. Structure and Staff Profile

The current internal marine science capacity needs to be significantly increased to support the functions and priorities outlined in section 6. The most effective approach, over the next five years, would be to establish integrated Marine Research, Marine Monitoring and Marine Science Communication units within the MSP and engage a diverse group of mostly experienced scientists to support the research, monitoring and communication priorities outlined above. The group would continue the current level of participation in WAMSI, engage more centrally in externally-provided marine research of interest to the department (e.g. NHT Marine Futures, Tourism CRC) and actively seek external funding to support internal and collaborative research programs. The group, in collaboration with senior regional staff, would also collectively provide the scientific oversight for the progressive development and implementation of comprehensive MPA and marine fauna departmental research, monitoring and science communication programs and provide the scientific expertise and advice to support a range of departmental activities in the marine environment (e.g. marine planning, policy development, EIA).

Table 1: Recommended staff profile of the Marine Science Program (grey) and the level of regional scientific and operational involvement.

Position	Level	Research		Monitoring	Science Communication	Advice/ Policy	Current occupant (permanent/ 1 yr contract position)
		External	Internal				
MARINE SCIENCE PROGRAM							
Program Leader	L8	0.2	0.2	0.2	0.2	0.2	Chris Simpson (P)
Administrative assistant	L3	0.3	0.3	0.2	0.1	0.1	New position
Marine Research Unit Co-ordinator	L7	0.5	0.2	0.1	0.1	0.1	New position
Marine Monitoring Unit Co-ordinator	L7	-	-	0.8	0.1	0.1	New position
Marine Science Communication Unit Co-ordinator	L6	-	-	-	1.0	—	New position
Research Scientist (Fish)	L6	0.2	0.4	0.2	0.1	0.1	New position
Research Scientist (Social)	L6	0.3	0.3	0.2	0.1	0.1	New position
Research Scientist (Marine fauna)	L7	0.25	0.25	0.35	0.1	0.05	New position
Research Scientist (Tropical ecology)	L5/6	0.15	0.5	0.2	0.1	0.05	Suzanne Long (C) L5
Research Scientist (Temperate ecology)	L5/6	0.15	0.5	0.2	0.1	0.05	New position
Research Scientist (Biodiversity patterns)	L5/6	0.3	0.4	0.15	0.1	0.05	Kevin Bancroft (P) A/L5
Research Scientist	L2/4	-	0.5	0.4	0.1	-	Shannon Armstrong (C) L2/4
Research Scientist	L2/4	-	0.5	0.4	0.1	-	New position
Research Scientist	L2/4	-	0.5	0.4	0.1	-	New position
Technical support	L2	-	0.3	0.6	0.05	0.05	New position
Technical support	L2	-	0.3	0.6	0.05	0.05	New position
Technical support	L2	-	0.3	0.6	0.05	0.05	New position
Marine Data Officer	L5	-	0.5	0.5	-	-	New position
Marine Community Monitoring Officer	L5	-	-	0.5	0.5	-	New Position
Marine Operations Officer	L5	-	0.4	0.6	-	-	New position
REGIONAL SCIENTIFIC INVOLVEMENT							
Regional Manager	L8	?	?	?	?	?	Existing position
District Manager	L7	?	?	?	?	?	Existing position
Regional PVS Leader	L7	?	?	?	?	?	Existing position
Regional NC Leader	L7	?	?	?	?	?	Existing position
Regional Marine Ecologist	L6	?	?	?	?	?	Existing position
District NC Leader	L5	?	?	?	?	?	Existing position
District PVS Leader	L5	?	?	?	?	?	Existing position
Marine Park Co-ordinator	L5	?	?	?	?	?	Existing position
REGIONAL OPERATIONAL INVOLVEMENT							
Marine NC Officer	?	?	?	?	?	?	Existing Position
Marine PVS Officers	?	?	?	?	?	?	Existing Position
Marine Rangers	?	?	?	?	?	?	Existing Position
Marine Rangers	?	?	?	?	?	?	Existing Position
Other District staff	?	?	?	?	?	?	Existing Position

The senior scientists would be supported scientifically by less experienced scientists and technical staff and, operationally, by regional staff. The structure, staff profile and contribution of each officer to a range of generic MSP responsibilities is outlined in Table 1. The staff profile and nominal FTE allocations, across a range of functions, for the three units are outlined in Tables 2, 3 and 4. The nominal specific objectives, strategies, outputs and outcomes of the three units are shown in Appendices 2, 3 and 4.

While the range of expertise outlined in Table 1 primarily addresses Research Themes 1, 2 and 3 and the institutional monitoring, science communication and policy/advice functions, Themes 4, 5 and 6 are also catered for to some extent. However, the additional DEC research capacity needed to support a program to systematically survey the marine biodiversity of the State, the resource assessment needs for marine planning and the information requirements for marine environmental protection will be more comprehensively determined following the implementation of the recommendations in sections 6.2.4 and 6.2.5, 6.2.6. The time frame to implement the Strategy and become fully operational would be 12-18 months.

7.2. Budget Considerations

7.2.1. Achieving The Balance

Individual MPA budgets for marine science are too small to deliver, on a park by park basis, the marine science outcomes outlined in management plans (Tables 3 and 4). Similarly, the budget for the MSP is inadequate to build the necessary capacity to undertake the centralised technical and co-ordinating functions. However, if used collectively, sufficient funds will be available to achieve, over time, the required state-wide marine science outcomes. The collaborative marine science delivery model, proposed in this Strategy, is based on the premise that a significant proportion of the total funding for marine science is used to support a centralised capability within the MSP with sufficient funding left in regional budgets to support an appropriate level of on-going regional involvement in marine science. This approach will, with growth over time, be able to meet many of the department's marine science needs across the state.

A rationale for achieving the correct balance between complementary centralised and regional functions is outlined in *Managing the Marine Reserve System in WA: The Next Ten Years - Part I: A Discussion Paper*. Regional structures, responsibilities, staffing and work practices are conducive to a supporting role in delivering marine science outcomes. Existing constraints to an expanded regional role in marine science include professional isolation, difficulties maintaining expertise and current knowledge of what science has/is/will be done, both inside and outside of regions, and issues of quality control, data management and reporting.

The absence of standard protocols for monitoring, data analysis and evaluation, reporting and data storage, as well as limited scientific capacity, are current major barriers to regional involvement in long-term monitoring programs. As these constraints are progressively overcome over the next five to ten years, it is expected that regional involvement in marine monitoring programs, in particular, will increase. Similarly, the absence of a strategic state-wide framework for marine science communication is limiting local marine education/science communication programs.

7.2.2. Funding Forward Estimates

The total annual consolidated funding allocations for marine research and monitoring (regional and MSP budget) for 2006/07 is $1.95M (Table 3). These funds currently reside in five regional cost centres (53%) and the Marine Science Program cost centre (~ 47%). Forward estimates, based on existing budgets, recent Government approved budgets for individual MPAs, the budget formula outlined in Appendix 6 and DEC October 2004 forward estimates (Appendix 7), are projected to exceed $2.8M pa in 2007/08 and be almost $3M in 2008/09 (Table 3). Consolidated funding for marine science exists in other areas of the DEC but is not considered here[4].

Table 4 outlines the CF funding available from MPA budgets for education/science communication and totals over $1M for 2006/07 and is estimated to increase to almost $1.5M in 2007/08. All of this funding resides in the five regional cost centres. This strategy proposes that ~15% of this funding ($238K in 2007/08 to $251K in 2009/10) is used to support the two state-wide co-ordinating positions in the Marine Science Communication Unit (Appendix 4b).

[4] Significant funding for marine science is contained in the NC and PVS budgets and in the Fauna Conservation Program and Flora Conservation Program of the Science Division as well as in the Marine Ecosystems Branch of the former DoE.

Consolidated funding of approximately $1.3M and $1M for marine research and monitoring is estimated to be in regional and MSP cost centres, respectively, for 2007/08. These estimates could increase to ~$1.45M each for regional and MSP allocations by 2007/08 if the three proposed reserves have been established and budgets allocated (Table 3). Funding for strategic science communication, based on 15% of the total MPA education budgets, is projected to be $238K for 2007/08 (Table 4). These combined funds will support the implementation of the collaborative model proposed in this Strategy.

For example, the salary and on-costs to support the recommended positions range from ~ $1.47 M in 2007/08 to $1.57M in 2009/10 (Table 2). Operating costs for a group of this size would be ~ $0.7M pa (~30%) bringing the total for the MSP to about $2.2M for the 2007/08 financial year. The combined CF funds that will be/could be available range from $2.6M[5]/$3.1M[6] in 2007/08 to $2.7M/$3.2M in the 2008/9 financial year (from Tables 3 and 4). In 2007/08, this would leave at least ~ $0.5M and, potentially, up to ~$0.9M for regional involvement in marine research and monitoring[7] and over $1M pa for regional education programs across the reserve system. Even the minimum level of funding (i.e. $0.5M) represents a significant involvement by regional staff in marine research and monitoring projects.

The intention is to keep fixed costs of the MSP ≤70 % of the total CF MSP budget and to ensure adequate funds remain in regional budgets to ensure an appropriate level of technical involvement and operational support. The CF funding allocation for marine science will increase steadily as 'new' MPA budgets and budgets for under-funded MPAs are approved by Government (Appendix 6, Appendix 7).

Preliminary discussions have been held with some of the local universities, AIMS and CSIRO about the possibility of joint appointments and the use of ARC linkage-type[8] mechanisms to maximise the benefits of available funding. These mechanisms will be fully explored if the Strategy is approved by Corporate Executive.

Table 2: Salary and salary on-costs for the MSP for the next three financial years

Position	Level	Salary + on-costs ($ '000)			Current occupant	Funding source[9]
		07/08	08/09	09/10		
Program Leader	L8	118	118	118	Chris Simpson (P)	MSP
Administrative assistant	L3	56	58	60	New position	MSP
Marine Research Unit Co-ordinator	L7	96	100	104	New position	MSP
Marine Monitoring Unit Co-ordinator	L7	96	100	104	New position	MSP
Marine Science Communication Unit Co-ordinator	L6	82	85	88	New Position	RS
Research Scientist (Fish)	L6	82	85	88	New position	RS
Research Scientist (Social)	L6	82	85	88	New position	RS
Research Scientist (Marine fauna)	L7	96	100	104	New position	RS
Research Scientist (Tropical ecology)	L5/6	82[10]	85	88	Suzanne Long (C)	MSP
Research Scientist (Temperate ecology)	L5/6	82	85	88	New position	MSP
Research Scientist (Biodiversity patterns)	L5/6	82	85	88	Kevin Bancroft (P)	MSP
Research Scientist	L2/4	54	58	64	Shannon Armstrong (C)	MSP
Research Scientist	L2/4	49	52	55	New position	MSP
Research Scientist	L2/4	49	52	55	New position	MSP
Technical support	L2	49	50	51	New position	RS
Technical support	L2	49	50	51	New position	RS
Technical support	L2	49	50	51	New position	RS
Marine Data Officer	L5	71	73	75	New position	MSP
Marine Community Monitoring Officer	L5	71	73	75	New Position	RS
Marine Operations Officer	L5	71	73	75	New position	MSP
TOTAL	**20**	**$1,466**	**$1,518**	**$1,571**		

[5] $1.107M + $1. 298 (Table 3) + $0.192M (Table 4) = ~$2.6M

[6] $1.107M + $1. 298 + $0.462 (Table 3) + $0.238M (Table 4) =$3.1M; extra includes funding from proposed MPA budgets.

[7] For example, $500K for regional involvement in research and monitoring is equivalent to ~ 1100 person days of L2 (or equivalent) officer time (5 x L2 FTE = ~$300K), 220 person days of L5 (or equivalent) officer time (1 x L5 FTE = ~$100,000) plus ~$100,000 for operational costs.

[8] Australian Research Council universities/industry partner funding arrangements.

[9] Proposed funding sources to support these positions are shown: MSP = Marine Science Program cost centre; RS = regional cost centres (see section 7.2.2 for details).

[10] Level5/6 position salaries are costed at L6.

Table 3: Forward estimates of funds for marine research and monitoring.

Allocated Funding	RESEARCH & MONITORING ($,1000s)			
	Actual[11] 2006/07	2007/08	2008/09	2009/10
Marine Science Program	875 [12]	1007[13]	1087[14]	1087
WAMSI	100	100	100	100
Sub-total 1	**975**	**1107**	**1187**	**1187**
Existing MPAs				
RSMP	48	48[15]	48	48
MB/B Is	135	185[16]	185	185
NMP	555	555[17]	555	555
SBMP	46	70[18]	88[14]	88
JBMP	138	190[19]	190	190
MMP	4	90[20]	100[21]	100
SIMP	51	90[20]	100[21]	100
SEMP	1	70[20]	80[21]	80
Sub-total 2	**978**	**1298**	**1346**	**1346**
Proposed MPAs				
DA/CP	-	210[22]	210	210
Capes	-	200[22]	200	200
W/N I	-	52[22]	52	52
Sub-total 3	**0**	**462**	**462**	**462**
TOTAL[23]	**$1.953M**	**$2.867M**	**$2.995M**	**$2.995M**

[11] from 2006/07 regional and MSP work plans;

[12] 2006/07 CF allocation for the Marine Science Program includes$300K transferred from MCB budget, $415K from original Ningaloo MP allocation, $60K for RSMP and $100K for MB/B Is ;

[13] includes further allocation from Oct 2006 ERC budget decision (see DG memo 15 Dec 2006); does not include future allocations for the Dampier, Capes or Walpole MPAs.

[14] includes further allocation from Oct 2006 ERC budget decision and assumes 2007/08 allocation for RSMP is $52K; does not include future allocations for the Dampier, Capes or Walpole MPAs.

[15] based on 2006/07 regional allocation;

[16] based on 2006/07 regional allocation plus further allocation from Oct 2006 ERC budget decision (assumes MSP and regional R&M budget is 30% of total budget of $860K (DEC) + $290K (DoF);

[17] based on 2006/07 regional allocation and on Govt approved budget (assumes MSP and regional R&M budget is ~30% of total budget of $3M (DEC) + $500K (DoF);

[18] includes further allocation from Oct 2006 ERC budget decision and assumes R&M (MSP and district allocations) is 30% of budget of $390K for 2007/08 and $560K for 2008/09 and on-going; does not include MMia Trust funds etc

[19] based on Govt approved budget;

[20] includes further allocation from Oct 2006 ERC budget decision and assumes R&M (MSP and district allocations) is 30% of 3 metro MPAs budget of $1.008M for 2007/08;

[21] includes further allocation from Oct 2006 ERC budget decision and assumes R&M (MSP and district allocations) is 30% of 3 metro MPAs budget of $1.208M for 2008/09 and on-going;

[22] assumes the overall approved Govt budget will be ~70% of the requested budget in DEC forward estimates (Oct 2004);

[23] does not include $70K and $50K for 07/08 and 08/09 financial years to Dr Richard Campbell or $15-20K pa funding to Dr Bejder for dolphin monitoring at Monkey Mia or other marine science funding in SD, NC and PVS divisions or external marine science funding to DEC (eg NHT).

Table 4: Education/communication allocations for 2006/07 and forward estimates of proposed funds for strategic education/science communication

Funding	Allocation for education/communication ($'000s)		Proposed allocation for strategic education/communication[24] ($)		
	2006/07[25]	2007/08[26]	2007/08	2008/09	2009/10
Existing MPAs					
RSMP	14	29	5,000	5,000	5,000
MB/B Is	10	252	38,000	38,000	38,000
NMP	706	706	91,500	91,500	91,500
SBMP	10	73	11,000	17,000	17,000
JBMP	168	110	16,500	16,500	16,500
MMP	35	80	12,000	14,000	14,000
SIMP	68	80	12,000	14,000	14,000
SEMP	3	40	6,000	9,000	9,000
Sub-total 1	**$1,014,000**	**$1,170,000**	**$192,000**	**$205,000**	**$205,000**
Proposed MPAs					
DA/CP	-	140	21,000	21,000	21,000
Capes	-	133	20,000	20,000	20,000
W/N I	-	35	5,000	5,000	5,000
Sub-total 2	**0**	**$305,000**	**$46,000**	**$46,000**	**$46,000**
Total	**$1,014,000**	**$1,475,000**	**$238,000**	**$251,000**	**$251,000**

7.3. Staff Policy Considerations

The proposed staffing structure, outlined in Table 1, balances the need for scientists across a range of expertise to engage at a senior level with external science providers (e.g. universities, WAMSI, DoF, AIMS, CSIRO), undertake their own research to maintain and enhance their technical expertise and professional networks (and to attract them in the first place), assist in the development and implementation of a comprehensive state-wide marine monitoring program, ensure the marine science is communicated to stakeholders and provide technical and scientific advice and support for marine policy development and other activities of the department (e.g. EIA).

The proposed staffing policy is to recruit senior discipline specialists who can provide input across a range of strategic issues (e.g. tropical and temperate ecosystems specialists, threatened marine fauna, biodiversity survey, etc). The younger, less experienced scientists (L2/4) will be employed with a successional view in mind. These scientists will be engaged in a range of science activities across the state so that they have the opportunity to continually enhance their technical skills through involvement in a variety of internal research and monitoring projects and collaborative programs, to become familiar with the diversity of marine ecosystems in WA and progressively develop their policy and advisory skills. Support staff within the MSP will provide key central support functions (e.g. data management, marine operations) and technical and field support to the scientists. Regional staff will provide most of the operational field support. Opportunities will also be provided to regional staff to co-author publications.

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[24] Assumes 3% of total education budget (usually 20% of total MPA budget) is allocated for strategic education/science communication. Assumes the overall budget of proposed MPAs will be 70% of the requested budget in DEC forward estimates (Oct 2004) to DTF. Includes further education allocations (determined as above) from Oct 2006 ERC budget decision (see DG memo 15 Dec 2006).

[25] from 2006/07 regional work plans and includes further allocations from Oct 2006 ERC budget decision.

[26] from 2006/07 regional allocations and/or Govt approved budgets and includes further allocations from Oct 2006 ERC budget decision.

With the recent major expansion in marine science in WA, difficulty is being experienced by some research organisations in finding suitable staff. The buoyant state economy is also generating a demand for marine scientists in marine industries and in the marine environmental consulting sectors. Currently, there is a significant lack of parity of DEC scientific staff with other science organisations in WA (e.g. CSIRO). The degree to which these factors are likely to impact on the development of a DEC marine science capability is unknown but may well be significant.

7.4. Marine Science Program: Infrastructure Needs

7.4.1. Office and Laboratory Accommodation

At present, staff are accommodated in the Science Division complex at DEC Operational headquarters in Kensington. Three staff are currently occupying one large office in a demountable. While this arrangement is an interim measure, there is inadequate space for three people to work effectively and there is also limited storage or no laboratory facilities. Most of the MSP working library and equipment is not easily accessible and remains in boxes. The current marine science capacity is severely constrained by these issues.

Over the next few years, while the new Science building is being constructed, there will be a need for more accommodation and much better storage and laboratory facilities if the MSP is to function effectively. To this end discussions have been held with Mark Brabazon, who is currently co-ordinating the construction of more demountables at the Kensington site, to include the short- to medium-term accommodation needs of the MSP in this initiative. An indication of MSP needs over the next few years has been provided and he has indicated that these needs have been considered in developing the proposal. Reasonable facilities will also help in the employment of new staff.

The longer-term (five years on) office accommodation and science infrastructure needs of the MSP have been provided to the Director of the Science Division to be included in the plans for the new science building. These are detailed in Appendix 5 and provide for ~30 MSP staff. Specialist facilities, for example like those needed to maintain/repair electronic instrumentation, will be accessed on a fee-for-service basis with local universities, AIMS and CSIRO, all of whom have indicated a willingness to assist.

7.4.2. Marine Operations

General Safety

Marine operations, particularly scuba diving and boating, are inherently dangerous. The constant high wave energy in the south of the state and the macro-tidal, turbid waters and harsh climate and remoteness of WA's northern waters add further to these risks. Safe marine operations, as outlined in departmental diving and boating policies, will be a priority for the MSP. Few existing staff in DEC have adequate marine operational experience in the range of conditions that occur across the State. The MSP will be significantly involved in marine operations. The proposed staff structure of the MSP includes a position of Marine Operations Officer who will have advanced diving and boating qualifications and significant experience to ensure that all MSP marine operations are conducted safely and efficiently.

Vessels

The use of vessels in DEC is guided by the *Safe Marine Operations in CALM* policy. Vessels and skippers for undertaking departmental marine research and monitoring will be provided by DEC regional offices as part of the collaborative approach to be adopted. Other State (DoF, Water Police) and Commonwealth Government (e.g. AIMS, CSIRO, Customs) and university vessels will be utilised as part of collaborative marine science projects and/or on a fee-for-service basis. The DoF, in particular, have a fleet of large research and patrol boats and have dedicated budgets for surveillance and enforcement in CALM Act MPAs and, as a result, significant opportunities are available to increase efficiencies in marine operations through co-operative arrangements, particularly for more remote areas like the Rowley Shoals and Montebello Islands MPAs.

Diving

All diving operations will comply with the departmental diving code: CALM *Diving Code of Practice*. The proposed Marine Operations Officer will have responsibility for all diving operations and it is recommended that this position also act as the Departmental Dive Officer. The separation of scientific and marine operational responsibilities (particularly diving and boating) is crucial to ensure these activities are carried out safely.

Field Stations

A number of field stations that can be used to support DEC marine science programs exist in regional WA. DEC field stations are maintained in the Dampier Archipelago (Enderby Island) and the Montebello Islands and the DoF maintains a research station at the Abrolhos Islands. Murdoch University maintains a field station at Coral Bay, adjacent to the Ningaloo Marine Park, and a consortium, including the Exmouth Shire, is proposing to build a major research facility in Exmouth.

7.5. Marine Science Co-ordination

A Marine Science Co-ordinating Committee (MSCC) will be established with representation from the MSP, Regions and key specialist branches including the Marine Policy and Planning Branch, Marine Ecosystems Branch, Environmental Management Branch and the Parks Policy and Service Branch. The Chair of the MSCC will be the Marine Science Program Leader. The MSCC will ensure that all ecological and social marine science projects within DEC (both internally and externally funded) are planned and implemented in a strategic and co-ordinated manner and duly consider historical and current research programs of external research providers in WA (e.g. AIMS, CSIRO, universities). The MSCC will also provide a mechanism to discuss and consider emerging DEC science needs as well as ensuring science communications support departmental policies and operational programs. The MSCC will also ensure compliance with DEC Science Division quality control processes (e.g. Science Project Plans) and this will ensure the quality of the science and reporting is high, as well as ensuring the data and publications are accessible, appropriately distributed, stored and easily retrieved for future applications.

To ensure appropriate planning for each financial year, the Marine Science Program will consult with appropriate regional staff to develop an integrated annual marine science 'plan' across each 'region' and the level of regional involvement, as part of the marine work plan development process co-ordinated by the Marine Policy and Planning Branch.

The MSP will take responsibility for annual reporting on marine science to DEC Corporate Executive and the Marine Parks and Reserves Authority as part of their audit processes.

8. References

D'Adamo N, Simpson, C J and Burrows N (2003). *A strategic 'way forward' for research and monitoring in the Department of Conservation and Land Management's marine conservation program*. Unpublished report. Department of Conservation and Land Management. Pp 27.

Simpson C. J. (2001). *Meeting the marine research needs of the Department of Conservation and Land Management*. Presented to the Western Australian Science Council Natural Resources Management Working Group. Unpublished report. Department of Conservation and Land Management. Pp12.

Simpson, C J (2005a). *Managing the Marine Reserve System in WA: The Next Ten Years - Part I: A Discussion Paper.* Unpublished report to the CALM Corporate Executive. Department of Conservation and Land Management. Pp 16.

Simpson, C J (2005b). *Managing the Marine Reserve System in WA: The Next Ten Years - Part II: Funding Options.* Unpublished report to the CALM Corporate Executive. Department of Conservation and Land Management. Pp 8.

Simpson C J, Colman, J G and Hill A K (2002). *A strategic framework for marine research and monitoring in the Shark Bay World Heritage Property*. Unpublished report to the SBWHP Scientific Advisory Committee. Department of Conservation and Land Management. Pp 15.

Simpson C J and Cary J L (1998). *Generic information requirements for the management of marine conservation reserves in Western Australia*. Unpublished report. Department of Conservation and Land Management. Pp 6.

APPENDIX 1: CURRENT MARINE FUNCTIONS AND RESPONSIBILITIES IN DEC.

Functions	Primary role	Support role	Comments
Management and Administrative frameworks			
1. Policy	MPPB[27]/ **MSP**[28]/MEB[29]	Branches/Regions	Need to clarify MEB role in policy process.
2. MPA planning	MPPB/**MSP**	Regions	MSP role relates to science inputs (i.e. resource assessment, risk assessment, R&M and science communication/education). AC process support?
3. Regional Marine Planning	MPPB/**MSP**	Regions	MSP role relates to strategic advice, science input.
4. Marine fauna planning	MPPB?/ SCB[30] / **MSP**	Regions	Need to clarify co-ordinating role to ensure std approach.
5. MPRA support (incl. audit)	MPPB/**MSP**	Regions	MSP role to provide scientific advice and data to MPA PA/audit.
6. CTO licensing	PPSB[31]/**MSP**	Regions	MSP role relates to strategic advice, science input.
7. Scientific licensing (incl. d/Base maintenance)	SCB	**MSP**/ Regions	MSP role relates to science input. D/base mgt needs reviewing.
8. Marine EIA (including industrial development, ports, aquaculture/ pearling, Fisheries ESD)	EMB[32] / MPPB?/MEB	**MSP**/Regions	Need to clarify respective roles. Needs co-ordination.
9. Marine Operations (Safe boating/diving operations)	Regions/Shark Bay District	MPPB	Who is co-ordinating statewide?
10. Marine Data Management	MPPB/**MSP**/MEB/IMB/Regions	NA	Need to clarify co-ordinating role to ensure std approach.
Education and Interpretation/Communication			
1. Strategic	MPPB/**MSP**/SDCA	Regions	Need to clarify co-ordinating role to ensure std approach.
2. Tactical	Regions	MPPB/**MSP**/SDCA	
Public Participation			
1. MPA Management Advisory Committee	Regions	?	Need to clarify co-ordinating role to ensure std approach.
2. Indigenous Park Councils	Regions	PPSB?	
3. Industry Advisory committees	Regions	?	
4. Community monitoring	Regions	**MSP**	MSP role to co-ordinate.
Patrol and Enforcement			Who is co-ordinating across regions? Link here with MSP as science will
1. MPA	Regions/DoF	NPB?	assume compliance program is effective.
2. Off-reserve (marine fauna)	Regions	NPB	Who is co-ordinating across regions?
Management Intervention			
1. MPA	Regions	**MSP**	MSP role relates to technical advice.
2. Off-reserve (marine fauna)			
• Emergency response	NPB/Regions	**MSP**	MSP role relates to technical advice.
• Shark hazard response	NPB	Regions/**MSP**	MSP role relates to technical advice.
• Oil spill response	MEB/NPB	Regions/**MSP**	Need to rationalize DEC input. MSP role relates to technical advice.
• Marine fauna rescue	Regions/NPB		
Research			
1. Ecological	**MSP**/FCP[33]/MEB	Regions	Need to clarify respective roles and ensure co-ordination.
2. Social	**MSP**/PPSB	Regions	Need to clarify respective roles and ensure co-ordination.
Monitoring (+ evaluation)			
1. Ecological	**MSP**/FCP/Regions	?	Need to clarify respective roles and ensure co-ordination.
2. Social	**MSP**/PPSB/Regions	?	Need to clarify respective roles and ensure co-ordination.

[27] MPPB = Marine Policy and Planning Branch, Nature Conservation Division
[28] MSP = Marine Science Program, Science Division
[29] MEB = Marine Ecosystems Branch, EPA Service Unit
[30] SCB = Species and Communities Branch, Nature Conservation Division
[31] PPSB = Parks Policy and Services Branch, Parks and Visitor Services Division
[32] EMB = Environmental Management Branch, Nature Conservation Division
[33] FCP = Fauna Conservation Program, Science Division

APPENDIX 2a: MARINE RESEARCH UNIT: Nominal objectives, strategies, outputs and outcomes.

GOAL	To ensure appropriate scientific information is available to support DEC's marine conservation and management programs.
SPECIFIC OBJECTIVES	1. Conduct, or cause to be conducted, marine research consistent with MPA management plans, threatened species recovery plans and wildlife management programs. 2. Conduct, or cause to be conducted, marine research to support future MPA planning and regional marine planning processes. 3. Provide scientific and technical advice/support to DEC CE, Branches and Regions and the MPRA. 4. Provide a strategic focus for marine science liaison with DEC's clients and stakeholders. 5. Communicate DEC's marine research programs to the Regions and the scientific and wider community.
TASKS	1. Develop and progressively implement an integrated marine research plan for each 'region' [34]. 2. Develop and maintain marine research databases of historical and current marine research for each 'region'. 3. Communicate and facilitate uptake of DEC research priorities by external research providers. 4. Maintain up to date knowledge and marine scientific libraries and facilitate the dissemination of this information to Districts. 5. Administer a DEC Marine Science Co-ordinating Committee. 6. Administer a marine research seed-funding program for local universities. 7. Administer WAMSI Node 3 and co-ordinate DEC input into WAMSI. 8. Administer a DEC marine seminar series. 9. Co-supervise post-graduate projects. 10. Provide a direct link to the Regions for marine science liaison. 11. Provide mentoring to young scientists. 12. Communicate research findings through mechanisms such as the print and electronic media, workshops and conferences. 13. Provide scientific training to District staff as appropriate. 14. Support the Department and the Marine Parks and Reserves Authority on marine policy development. 15. Provide marine scientific advice and conduct or coordinate marine research as required by the Department in response to rapid information needs and emergency response situations. 16. Represent DEC on appropriate national and state marine research committees as appropriate (i.e. SRFME1, WAMSI, NHT, etc). 17. Undertake a risk assessment in each 'region' every three years, in collaboration with the Regions and the MPPB. 18. Co-ordinate marine research applications by DEC for external funding. 19. Act as a DEC focus for liaison with AIMS, CSIRO, local universities, industry, State Govt etc and build strategic alliances in relation to their research programs in WA.
OUTPUTS	1. Integrated regional marine research plans. (R)[35] 2. Annually updated historical and current research bibliography, marine research library and inventory of Western Australian marine scientific expertise. (R) 3. Annually prioritised and disseminated list of topics for 'seed' funding and the initiation of up to 10 associated funded research projects per year. (R) 4. Timely distribution of the annual schedule of MCB seminar presentations. 5. Annually updated strategic communication plan for marine research (R), convened workshop/conference and publication of proceedings. (R) 6. Annually updated regional marine research training program. (R) 7. Opportunistic development of marine biodiversity conservation priorities, relevant to the Government's marine conservation programs, in strategic planning initiatives of external marine research providers.
OUTCOMES	1. Improved scientific underpinning of DEC's marine management. 2. Efficient and effective delivery of marine research strategies in MPA management plans. 3. Efficient and effective delivery of marine research relevant to cross- reserve and regional biodiversity conservation requirements. 4. Improved public confidence that DEC's marine management is supported by good science. 5. Improved understanding and support by scientific institutions of DEC's marine program. 6. Improved understanding and support by Government and relevant agencies of DEC's marine program.

[34] Region = areas of ecological similarity: (Tropical: NT border to Broome; Sub-tropical: Broome to Carnarvon; Warm Temperate: Carnarvon to Windy Harbour; Cool Temperate: Windy Harbour to SA border).

[35] R = Report.

APPENDIX 2b: STAFF PROFILE FOR THE PROPOSED MARINE RESEARCH UNIT of the Marine Science Program (grey shade) and the level of regional scientific and operational involvement.

Position	Level	Research		Current occupant (permanent/ 1 yr contract position)
		External	Internal	
MARINE SCIENCE PROGRAM INVOLVEMENT				
Marine Research Unit Co-ordinator	L7	0.5	0.2	New position
Program Leader	L8	0.2	0.2	Chris Simpson (P)
Administrative Assistant	L3	0.3	0.3	New position
Marine Monitoring Unit Co-ordinator	L7	-	-	New position
Research Scientist (Social)	L6	0.3	0.3	New position
Research Scientist (Marine fauna)	L7	0.25	0.25	New position
Research Scientist (Fish)	L6	0.2	0.4	New position
Research Scientist (Tropical ecology)	L5/6	0.15	0.5	Suzanne Long (C)
Research Scientist (Temperate ecology)	L5/6	0.15	0.5	New position
Research Scientist (Biodiversity patterns)	L5/6	0.3	0.4	Kevin Bancroft (P)
Research Scientist	L2/4	-	0.5	Shannon Armstrong (C)
Research Scientist	L2/4	-	0.5	New position
Research Scientist	L2/4	-	0.5	New position
Technical Officer	L2	-	0.3	New position
Technical Officer	L2	-	0.3	New position
Technical Officer	L2	-	0.3	New position
Marine Data Officer	L5	-	0.4	New position
Marine Operations Officer	L5	-	0.4	New position
REGIONAL SCIENTIFIC INVOLVEMENT				
Regional Manager	L8	?	?	Existing position
District Manager	L7	?	?	Existing position
Regional PVS Leader	L7	?	?	Existing position
Regional NC Leader	L7	?	?	Existing position
Regional Marine Ecologist	L6	?	?	Existing position
District NC Leader	L5	?	?	Existing position
District PVS Leader	L5	?	?	Existing position
Marine Park Co-ordinator	L5	?	?	Existing position
REGIONAL OPERATIONAL INVOLVEMENT				
Marine NC Officer	?	?	?	Existing position
Marine PVS Officers	?	?	?	Existing position
Marine Rangers	?	?	?	Existing position
Marine Rangers	?	?	?	Existing position
Other District staff	?	?	?	Existing position
Local volunteers	?	?	?	Existing position

APPENDIX 3a: MARINE MONITORING UNIT: Nominal objectives, strategies, outputs and outcomes.

GOAL	To develop and implement an integrated, effective and efficient long-term marine ecological and social monitoring plan for each region.
SPECIFIC OBJECTIVES	1. To co-ordinate the implementation of the monitoring strategies outlined in MPA management plans, marine wildlife management/recovery programs. 2. To provide information to assess whether the objectives of the MCR management plans are being achieved. 3. To provide information on the effectiveness of management actions. 4. To provide information to meet Marine Parks and Reserves Authority and departmental audit and reporting requirements. 5. To provide the science base for adaptive marine management.
TASKS	1. Review existing marine monitoring programs in CALM. 2. Review appropriate MPA monitoring programs in other States (e.g. Victoria, Queensland) and worldwide. 3. Develop Standard Operating Procedures (i.e. ecological and social monitoring protocols, data management and analysis, reporting and presentation etc). 4. Develop an integrated, effective and efficient monitoring plan across each regional network of MCRs. 5. In collaboration with the District Offices, undertake monitoring of human usage and the health of MPA marine ecological and social values, under monitoring frameworks specified in regional marine monitoring plans. 6. Develop and maintain a Statewide marine monitoring database. 7. Establish collaborative arrangements with Districts for the implementation of marine monitoring programs. 8. Provide training to District staff as appropriate. 9. Implement and maintain the Marine Community Monitoring Program, including database maintenance of Coastbase. 10. Communicate key findings of CALM's monitoring programs to the scientific and wider community via the dissemination of information through reports, print and electronic media and conferences/workshops. 11. Support the Department and Marine Parks and Reserves Authority in the setting monitoring-related conditions of approval for development proposals. 12. Act as a central focus for external marine monitoring programs (eg industry, Government agencies, research institutions) to facilitate consistency, synergies and efficiencies with CALM's monitoring programs. 13. Provide strategic advice to the Marine Research Unit in respect of requirements for the refinement or development of monitoring indicators and monitoring protocols
OUTPUTS	1. Integrated regional marine monitoring plans. 2. Appropriate long-term information on human usage patterns and trends, and on the health of marine ecological and social values in MPAs. 3. A Statewide marine monitoring database. 4. A functioning and effective Marine Community Monitoring Program, including a Marine Community Monitoring Program database (ie Coastbase). 5. Manuals of monitoring methods and protocols, as required for CALM's MPA management programs. 6. Collaborative Regional/District-MCB MOU's for monitoring.
OUTCOMES	1. Improved management of MPAs underpinned by an effective monitoring program. 2. Efficient and effective delivery of information to CALM's Districts as relevant to Departmental and MPRA Performance Assessment requirements. 3. Improved public confidence that CALM's marine management is supported by an appropriate level and quality of monitoring information. 4. A stronger Statewide and Regional constituency in support of CALM's marine program. 5. Improved environmental management by users of the environment (eg industry) through more effective monitoring conditions set in environmental management programs. 6. Flexibility in CALM's ability to pro-actively manage potential environmental problems, through an improved predictive capacity underpinned by appropriate and effective monitoring.

APPENDIX 3b: STAFF PROFILE FOR THE PROPOSED MARINE MONITORING UNIT within the Marine Science Program (grey shade) showing the level of regional scientific and operational involvement.

MARINE MONITORING UNIT

Position	Level	(fte)	Current occupant (permanent/ 1 yr contract position)
MARINE SCIENCE PROGRAM INVOLVEMENT			
Marine Monitoring Unit Co-ordinator	L7	0.8	New position
Administrative assistant	L3	0.2	New position
Marine Data Officer	L5	0.6	New position
Marine Community Monitoring Co-ordinator	L5	0.5	New position
Marine Operations Officer	L5	0.5	New position
Research Scientist (Social)	L6	0.2	New position
Research Scientist (Marine fauna)	L7	0.35	New position
Research Scientist (Fish)	L6	0.2	New position
Program Leader	L8	0.2	Chris Simpson (P)
Marine Research Unit Co-ordinator	L7	0.1	New position
Research Scientist (Tropical ecology)	L5/6	0.2	Suzanne Long (C)
Research Scientist (Temperate ecology)	L5/6	0.2	New position
Research Scientist (Biodiversity patterns)	L5/6	0.15	Kev Bancroft (P)
Research Scientist	L2/4	0.4	Shannon Armstrong (C)
Research Scientist	L2/4	0.4	New position
Research Scientist	L2/4	0.4	New position
Technical Officer	L2	0.6	New position
Technical Officer	L2	0.6	New position
Technical Officer	L2	0.6	New position
REGIONAL SCIENTIFIC INVOLVEMENT			
Regional Manager	L8	?	Existing position
District Manager	L7	?	Existing position
Regional PVS Leader	L7	?	Existing position
Regional NC Leader	L7	?	Existing position
Regional Marine Ecologist	L6	?	Existing position
District NC Leader	L5	?	Existing position
District PVS Leader	L5	?	Existing position
Marine Park Co-ordinator	L5	?	Existing position
REGIONAL OPERATIONAL INVOLVEMENT			
Marine NC Officer	?	?	Existing position
Marine PVS Officers	?	?	Existing position
Marine Rangers	?	?	Existing position
Marine Rangers	?	?	Existing position
Other District staff	?	?	Existing position
Local volunteers	?	?	Existing position

APPENDIX 4a: MARINE SCIENCE COMMUNICATION UNIT: Nominal objectives, strategies, outputs and outcomes.

GOAL	To communicate marine science to the community and stakeholders to positively influence attitudes and behaviour towards marine conservation and sustainable use of the marine environment.
SPECIFIC OBJECTIVES	1. To increase public[36] understanding of the marine environment. 2. To increase public understanding of the role of science in marine natural resource management. 3. To increase public understanding of the role of science in underpinning DEC's marine management programs. 4. To increase public understanding of the role of MPAs in marine management. 5. To increase the understanding by DEC staff of the role of science in adaptive marine natural resource management.
TASKS	1. Develop and implement, in collaboration with DEC regions, an integrated marine science communication plan. 2. Communicate short- and long-term management successes to maintain interest and support of stakeholder groups in a variety of media. 3. Promote local community and schools direct participation in marine management via the Marine Community Monitoring Program. 4. Regularly contribute marine science information to departmental communication mechanisms such as *Landscope* and *Naturebase*. 5. Co-ordinate community workshops/briefings to communicate the results of local marine science programs. 6. Contribute regularly to scientific conferences and workshops. 7. Publish, distribute (both internally and externally) and archive the results of DEC marine research and monitoring programs. 8. Assist the regions in transferring the results of marine science into operational management. 9. Ensure all field surveys provide communication material to local media (e.g. press releases, radio interviews etc).
OUTPUTS	1. Integrated marine science communication plan. 2. Active participation by local communities in marine management programs. 3. Articles in media and *Landscope*, information on *Naturebase* etc. 4. Workshop and conference presentations. 5. Publish and distribute (both internally and externally) departmental technical reports. 6. Published papers in peer-reviewed scientific journals.
OUTCOMES	1. Improved public confidence that DEC's marine management is underpinned by appropriate science. 2. A stronger Statewide and regional public constituency in support of DEC's marine conservation program, particularly the role of MPAs. 3. Improved environmental behaviour by users of the environment through increased understanding. 4. Improved marine management by regional DEC staff as a result of a better technical understanding of the issues.

[36] Public = communities, stakeholders, industry groups, Government departments, politicians, media

APPENDIX 4b: STAFF PROFILE FOR THE PROPOSED MARINE SCIENCE COMMUNICATION UNIT within the Marine Science Program (grey shade) showing the level of regional scientific and operational involvement.

MARINE SCIENCE COMMUNICATION UNIT

Position	Level	Science Communication	Current occupant (permanent/ 1 yr contract position)
MARINE SCIENCE PROGRAM INVOLVEMENT			
Marine Science Communication Unit Co-ordinator	L6	1.0	New position
Administrative Assistant	L3	0.1	New position
Program Leader	L8	0.2	Chris Simpson (P)
Marine Research Unit Co-ordinator	L7	0.1	New position
Research Scientist (Fish)	L6	0.1	New position
Research Scientist (Social)	L6	0.1	New position
Research Scientist (Marine fauna)	L7	0.05	New position
Marine Community Monitoring Co-ordinator	L5	0.5	New position
Research Scientist (Tropical ecology)	L5/6	0.1	Suzanne Long (C)
Research Scientist (Temperate ecology)	L5/6	0.1	New position
Research Scientist (Biodiversity patterns)	L5/6	0.1	Kevin Bancroft (P)
Research Scientist	L2/4	0.1	Shannon Armstrong (C)
Research Scientist	L2/4	0.1	New position
Research Scientist	L2/4	0.1	New position
Technical Officer	L2	0.05	New position
Technical Officer	L2	0.05	New position
Technical Officer	L2	0.05	New position
REGIONAL SCIENTIFIC INVOLVEMENT			
Regional PVS Leader	L7	?	Existing position
Regional NC Leader	L7	?	Existing position
Regional Marine Ecologist	L6	?	Existing position
District NC Leader	L5	?	Existing position
District PVS Leader	L5	?	Existing position
Marine Park Co-ordinator	L5	?	Existing position
REGIONAL OPERATIONAL INVOLVEMENT			
Marine NC Officer	?	?	Existing position
Marine PVS Officers	?	?	Existing position
Marine Rangers	?	?	Existing position
Marine Rangers	?	?	Existing position
Local volunteers	?	?	-

APPENDIX 5: MARINE SCIENCE PROGRAM ACCOMMODATION REQUIREMENTS.

Name of Room (each room required to be assigned a number and a name)	Purpose	Special Requirements	To be attached/close to other office/functional area	Area	Need on ground floor?	How many in this office	Name/Title of officers who will occupy this room
Senior Principal Research Scientist (Program leader)	Office Space	PC work station Filing & bookcases	P/A	20 m^2	No	1	Dr Chris Simpson Principal Research Scientist Fulltime permanent
Personal assistant to Program Leader	Office Space	PC work station Filing & bookcases	Program leader	12 m^2	No	1	P/A level 2-3 Fulltime permanent
Administrative assistant (finance)	Office Space	PC work station Filing & bookcases	Program leader	12 m^2	No	1	P/A level 2-3 Fulltime permanent
Principal Research Scientist (Marine Research Unit)	Office Space	PC work station Filing & bookcases		16 m^2	No	1	Dr Nick D'Adamo Principal Research Scientist Fulltime permanent
Research Scientist (Tropical Ecological processes)	Office Space	PC work station Filing & bookcases		12 m^2	No	1	Senior Research Scientist Fulltime permanent
Research Scientist (Temperate Ecological Processes)	Office Space	PC work station Filing & bookcases		12 m^2	No	1	Research Scientist Fulltime permanent
Research Scientist (Biodiversity assessment & inventory)	Office Space	PC work station Filing & bookcases		12 m^2	No	1	Research Scientist Fulltime permanent
Research Scientist (Threatened Marine Fauna)	Office Space	PC work station Filing & bookcases		12 m^2	No	1	Research Scientist Fulltime permanent
Research Scientist (Marine Flora)	Office Space	PC work station Filing & bookcases		12 m^2	No	1	Research Scientist Fulltime permanent
Research Scientist (Social research)	Office Space	PC work station Filing & bookcases		12 m^2	No	1	Research Scientist Fulltime permanent
Technical Officers x 6 ftes	Office space	Open plan with six work stations		30 m^2	No	6	6 x technical officers fulltime permanent
Graduate students x 6 **(Young scientists program)**	Office space/work stations	Open plan with six work stations		30 m^2	No	6	6 x graduate students
Research Dry Lab	Microscopy, ovens, process sampling, specimen fixation Specimen processing & sampling	Solid benches for microscopes; fume cabinet; gas outlets; 10 & 15 amp power; nitrous oxide outlet; sink with DI outlet; hot & cold water; vacuum outlet; chemical; store mono-coloured acid resistant floors & benches; 2x network connection; bund between wet lab to stop water	Research Wet Lab	35 m^2	Yes	Shared	
Research Wet Lab	Wet Lab- processing and storage of field samples, storage (wet) field equip	AC, Ground floor lab, Large trough, Sturdy shelving, Be able to hose out whole room, 10 & 15 amp power, ground floor delivery access from outside	Research Dry Lab Store room	35 m^2	Yes	Shared	
Specimen Reference collection Display room	Storage and display of invertebrate reference collection	Sturdy shelving Network collection		20 m^2	Yes	Shared	
Principal Research Scientist (Marine Monitoring Unit)	Office Space	PC work station Filing & bookcases		16 m^2	No	1	Senior Research Scientist Fulltime permanent
Research Scientist	Office Space	PC work station Filing & bookcases		12 m^2	No	1	Research Scientist Fulltime permanent
Marine Data Manager	Office Space	PC work station Filing & bookcases		12 m^2	No	1	Research Scientist Fulltime permanent
Marine Operations Officer	Office Space	PC work station Filing & bookcases		12 m^2	No	1	Research Scientist Fulltime permanent
Technical Officers X (4FTE)	Office Space	(4x) PC work station Filing & bookcases		20 m^2	No	4	Research Scientist Fulltime permanent
Video editing lab	Office Space	(x2) PC workstations desk space camera storage		20 m^2	No	Shared facility for whole program	
Senior Research Scientist (Marine Science Communication Unit leader	Office Space	PC work station Filing & bookcases		16 m^2	No	1	Senior Research Scientist Fulltime permanent
Storage (Indoor)	Storage of instrumentation/ 'fragile' field equip	Diving gear safe Camera equip safe	Research Wet Lab	50 m^2	Yes	NA	
Storage (outdoor)	Boats, trailers, other 'non-fragile' field gear			100 m^2	Yes	NA	

APPENDIX 6: FORMULATING MPA BUDGETS: Draft Guidelines.

The table below provides a basis for developing appropriate budgets for marine protected areas to ensure progressive implementation of the management plans over the ten years. The default budget attempts to integrate the different characteristics of WA MPAs (i.e. remote/accessible; high/low visitation; well understood/poorly understood; etc) and evolving management needs as the MPA 'matures'. Although the emphasis (and therefore the relative annual budget allocations) across the seven generic management strategies will change as MPA management needs evolve, other considerations also need to be taken into account and these are outlined below.

Generic Management Strategy	Management & Administrative Frameworks	Education & Interpretation	Patrol & Enforcement	Public Participation	Management Intervention & Visitor Infrastructure	Research	Monitoring
Default Budget (%)	20	20	10	10	10	10	20
Other considerations	May need to be higher in initial years (1-3) if : • If no other MPAs exist in the Region.	May need to be higher in initial years (1-3) if : • If no other MPAs exist in the region; • If visitation is high; • If the planning process has been contentious.	Allocation needs to be considered with the context of DoF allocation[37] for enforcement; and DEC allocation for Education May be lower if: • DoF allocation is appropriate; • MPA is remote. May need to be higher in initial years (1-3) if : • If no other MPAs exist in the region; • If visitation is high; • If local populations are more 'transient'; • If the planning process has been contentious.	May need to be higher in initial years (1-3) if : • If no other MPAs exist in the region; • If visitation is high; • If the planning process has been contentious; • If local communities want higher involvement. May be lower if : • Visitation is low; • MPA is remote.	Allocation needs to be considered with the context of DEC Capital Works program run thru PVS. May be lower if: Capital Works funding is available. May need to be higher if: • 'Inherited' problems are significant.	May need to be higher if : • knowledge base is particularly poor; • If visitation is high; • If the planning process has been contentious; • If internal/external 'threats' are high. May be lower if : • Relevant external research effort is high.	May need to be higher if : • knowledge base is particularly poor; • If visitation is high; • If the planning process has been contentious; • If internal/external 'threats' are high/increasing.

[37] Some MPA budgets (e.g. Ningaloo MP) include a specific Government allocation to DoF for patrol & enforcement activities while others (e.g. Shark Bay MP) do not.

APPENDIX 7: FORWARD ESTIMATES FOR EXISTING AND PROPOSED MARINE PROTECTED AREAS (OCTOBER 2004).

"CURRENT CALM ASK" MCR BUDGET	2005-06	2006-07	2007-08	2008-09
Consolidated Fund (CF)				
Montebello/Barrow	860,000	860,000	860,000	860,000
Rowley Shoals	292,000	292,000	292,000	292,000
Marine Conservation -Strategic co-ordination (MCB)	1,350,000	1,450,000	1,550,000	1,650,000
CF sub-total	**2,502,000**	**2,602,000**	**2,702,000**	**2,802,000**
Core capital infrastructure				
Montebello/Barrow	250,000	250,000	0	0
Rowley Shoals	150,000	150,000	0	0
Capital sub- total	**400,000**	**400,000**	**0**	**0**
CF + capital establishment TOTALS	**2,902,000**	**3,002,000**	**2,702,000**	**2,802,000**

"NEXT CALM ASK" MCR BUDGET	2005-06	2006-07	2007-08	2008-09
Consolidated Fund (CF)				
Dampier Archipelago	300,000	700,000	1,000,000	1,000,000
Cape Leeuwin/Cape Naturaliste	250,000	400,000	950,000	950,000
Ningaloo + Sunday/Muiron Isl [2]	2,100,000	2,100,000	2,100,000	2,100,000
Walpole/Nornalup	100,000	250,000	250,000	250,000
Shoalwaters Islands Marine Park extensions	100,000	100,000	400,000	400,000
Shark Bay Marine Park extensions	100,000	100,000	500,000	500,000
Recherche Archipelago Marine Park	0	100,000	200,000	800,000
Fitzgerald Marine Park	0	100,000	200,000	650,000
Roebuck Bay Marine Park	0	100,000	250,000	500,000
Marmion Marine Park review	100,000	200,000	500,000	500,000
CF Sub-total	**3,050,000**	**4,150,000**	**6,350,000**	**7,650,000**
Core capital infrastructure				
Dampier Archipelago	500,000	500,000	0	0
Cape Leeuwin/Cape Naturaliste	300,000	300,000	0	0
Ningaloo + Sunday/Muiron Isl	600,000	600,000	0	0
Walpole/Nornalup	200,000	100,000	0	0
Shoalwaters Islands Marine Park extensions			200,000	200,000
Shark Bay Marine Park extensions			300,000	300,000
Recherche Archipelago Marine Park			500,000	300,000
Fitzgerald Marine Park			300,000	150,000
Roebuck Bay Marine Park			250,000	200,000
Marmion Marine Park review			300,000	300,000
CF Sub-total	**1,600,000**	**1,500,000**	**1,850,000**	**1,450,000**
CF + capital establishment TOTALS	**4,650,000**	**5,650,000**	**8,200,000**	**9,100,000**

TOTALS	2005-06	2006-07	2007-08	2008-09
CF TOTAL	5,552,000	6,752,000	9,052,000	10,452,000
CORE CAPITAL ESTABLISHMENT TOTAL	2,000,000	1,900,000	1,850,000	1,450,000
GRAND TOTAL	7,552,000	8,652,000	10,902,000	11,902,000