MARINE SCIENCE PROGRAM

Summary of Outputs and Expenditure for 2006/07

REPORT TO THE MARINE PARKS AND RESERVES AUTHORITY

REPORT No. 1, October 2007

Dr Chris Simpson
Program Leader, Marine Science Program
Science Division, Department of Environment and Conservation

MPRA ANNUAL PERFORMANCE ASSESSMENT WORKSHOP 25-26 October 2007

Front cover: High diversity fringing coral reefs of the northern Kimberley

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). At the same time, the State Government has 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 for these reserves, including significant allocations for marine research, monitoring and marine science communication.

This document summarises the outputs and expenditure of the Marine Science Program (MSP) for the 2006/07 financial year and is part of the department's reporting and accountability obligations, under the CALM Act, to the Marine Parks and Reserves Authority (MPRA). Copies of this report will also be provided to the Director General, Directors and all Regional, District and Specialist Branch Managers of DEC.

Throughout the 2006/07 financial year, the MSP's capacity to undertake marine research, monitoring and science communication projects has been limited as might be expected in the initial phase of establishing an in-house marine science capacity. Low staff numbers, limited office accommodation, laboratory and workshop facilities have all been major constraints over the past year. These issues are all being addressed but some are likely to remain as significant constraints over the next year or two.

MSP priorities for 2006/07 focused on developing the MSS, 'advertising' the MSP to internal and external stakeholders, finalising the project proposals and project agreements for the Ningaloo Research Program, developing a better understanding of historical and current marine science relevant to DEC's needs, ensuring the MSP's short-term and longer-term office and laboratory are included in departmental consideration of these matters, developing working relationships with regions and specialist branches within DEC and with external science providers and undertaking priority marine science projects and activities identified in MPA management plans.

Future MSP strategic directions are outlined in Appendix 1. External research projects that have received DEC funding are outlined in Appendix 2. This list does not include all of the projects funded by regions and specialist branches. Future lists will include all DEC-funded (i.e. cash and *'in kind'*) projects. Historical and projected trends in marine science funding, relevant to WA's MPAs, are outlined in Appendix 3. Funding figures are estimates only.

Funding for marine science in DEC occurs in the MSP, regional and specialist branch cost centres. This first report to the MPRA focuses primarily on expenditure and outputs for 2006/07 by the MSP and does not include expenditure and outputs on marine science by regions and specialist branches. Regional and specialist branch will report separately on their marine science outputs and expenditure to the MPRA in 2006/07. However, from 2007/08, the MSP will report to the MPRA on all DEC-supported marine science for that financial year.

The format and content of this first report, including better linkage with the financial reporting systems of the Science Division, will be further developed in 2007/08 following comments from the MPRA and DEC regions and specialist branches.

Acknowledgements

I would like to thank Dr Neil Burrows, the Director of the Science Division, for his considerable assistance, encouragement and support throughout 2006/07 in helping establish the MSP within the Science Division and for the many useful discussions in relation to the development of the Marine Science Strategy. Also, special thanks to Glenda Lindsey and other administrative staff for working so hard to assist us and make us feel so welcome. Thanks to all senior Kensington-based staff in the Science Division, particularly Dr Ian Abbott, Dr Dave Coates and Richard McKellar, and Keith Claymore, Acting Deputy Director on Nature Conservation, for many helpful discussions.

Thanks also to the many regional and specialist branch staff who provided considerable assistance on our field trips and senior staff in helping contribute to the development of the collaborative approach outlined in the Marine Science Strategy, particularly Alan Byrne, Jennie Cary, Kevin Crane, Peter Dans, Tim Grubba, Colin Ingram, Dr Alan Kendrick, Dr Ray Masini and Roland Mau.

Thanks to Dr Rick Fletcher, Dr Rod Lenanton and Dr Nick Caputi of the Department of Fisheries for a very useful discussion on the development of the Marine Science Strategy. Also thanks to WA Fisheries and the crew of the RV Walcott for making the vessel available for field trips at very short notice.

Special thanks also to Professor Paul Lavery of Edith Cowan University, Dr John Keesing and Dr Russ Babcock of CSIRO Marine and Atmospheric Research and Dr Andrew Heyward and Luke Smith from the Australian Institute of Marine Science.

Finally, I would like to thank the staff of the Marine Science Program for their continuing commitment to marine conservation, enthusiasm and professionalism over the 2006/07 year under very difficult working conditions. In particular, thanks to Kevin Bancroft who, despite having to coordinate major field trips to the Montebello/Barrow islands MPAs, worked tirelessly to get the MSP ‘up and running’. Thanks also to all MSP staff for the many fruitful discussions and contributions made during the development of the Marine Science Strategy and for helping contribute to a productive and enjoyable first year of the Marine Science Program.

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 has 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 for these reserves, including significant allocations for marine research, monitoring and marine science communication.

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* and *Managing the Marine Reserve System in WA: The Next Ten Years - Part II: Funding Options* 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 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. Also in July 2006, CALM and the Department of the Environment were amalgamated into DEC by the WA State Government. A Marine Science Strategy (MSS) and a Marine Science Business Plan 2007-2010 have been developed at the request of the Director General of DEC.

This document outlines the performance of the Marine Science Program for the 2006/07 financial year and is part of the DEC's reporting and accountability obligations under the CALM Act to the Marine Parks and Reserves Authority (MPRA). Copies of this report will also be provided to the Director General and appropriate Directors and Regional, District and specialist branch Managers of the DEC.

2. Report on Activities and Outputs for 2006/07

2.1. Context

The MSP's capacity to undertake marine science projects has been limited as might be expected in the initial phase of establishing an in-house capacity. Low staff numbers, limited office accommodation, laboratory and workshop facilities have all been major constraints over the past year. These issues are all being addressed but some are likely to remain as significant constraints over the next year or two.

MSP priorities for 2006/07 focussed on developing the MSS, 'advertising' the MSP to internal and external stakeholders, finalising the project proposals and project agreements for the Ningaloo Research Program, developing a better understanding of historical and current marine science relevant to DEC's needs, ensuring the MSP's

short-term and longer-term office and laboratory requirements are included in departmental consideration of these matters, developing working relationships with regions and specialist branches within DEC and with external science providers and undertaking priority marine science projects and activities identified in MPA management plans.

Future MSP strategic directions are outlined in Appendix 1. External research projects that have received DEC funding are outlined in Appendix 2. This list does not include all of the projects funded by regions and specialist branches. Future lists will include all DEC-funded (i.e. cash and *'in kind'*) projects. Historical and projected trends in marine science funding, relevant to WA's MPAs, are outlined in Appendix 3. Funding figures are estimates only.

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2.2. Activities and outputs for 2006/07

The major marine science projects, activities, outputs and budget expenditure of the Marine Science Program are outlined in Table 1. Table 2 shows the allocation and expenditure for each MPA for the 2006/07 financial year.

TABLE 1: SUMMARY OF MSP MARINE SCIENCE OUTPUTS AND EXPENDITURE FOR 2006/07

PI[1]	Co- I[2]	PROJECT TITLE	MPA	MSP Budget[3]	OUTPUTS		
					Science *What did we learn?*	**Communication** *Who did we tell?*	**Knowledge transfer** *What difference did it make?*
STATEWIDE							
CSI	SLO	Marine Science Program pamphlet	All	7000	• MSP Pamphlet	• Pamphlet on DEC Website • Distributed widely to internal and external stakeholders • Article in Conservation News	• Increased knowledge of internal and external stakeholders of the MSP.
CSI		Marine Science Strategy		38,000	• Report: Marine Science Strategy	• July 2006 DEC 'Marine Science Strategy' workshop • Survey of NRM agencies in Australia re: meeting their marine science needs • Draft provided to DG in Jan 2007 • Draft sent to RMs and marine staff in May 2007 • SD presentation • MPRA presentation • WAMSI presentation • AMSA presentation (SAR) at young marine scientists workshop • Presentation (SLO) to ED of GBRMPA and MPPB	• Resulted in workshop at AMSA conference in July 07 to discuss interstate collaboration in marine science.
CSI		Marine Science Program Business Plan for 2006/07	All	8,000	• Report: Marine Science Business Plan: July 2007-2010	• Distributed for comment to DEC RMs and managers of specialist branches in May	• Increased knowledge of internal and external stakeholders of the MSP activities.
CSI		Interaction of science and compliance in WA MPAs.	All	5,000	• Report: Fishing compliance in Western Australian marine protected areas: The interaction between compliance and science: A discussion paper.	• Circulated to DoF, MPPB and regions; discussions with DoF- decision to form WG	• Improved compliance programs for 2007/08
SAR		List of state-wide DEC-related marine research and monitoring projects for 06/07 financial year	All	2,000	• Access database on MSP T-drive (continuously up-dated) • Report		• Assisted with the development of the Marine Science Strategy and MSP 07/08 Business Plan

[1] PI = Principal Investigator
[2] Co-I = Co-investigator/s
[3] Rounded to nearest $1000

PI[1]	Co- I[2]	PROJECT TITLE	MPA	MSP Budget[3]	OUTPUTS		
					Science ***What did we learn?***	**Communication** ***Who did we tell?***	**Knowledge transfer** ***What difference did it make?***
SAR		Collation of all research and monitoring management strategies for existing MPAs.	All	1,000	• Report	IDC	• Assisted with the development of the Marine Science Strategy and MSP 07/08 Business Plan
SAR	PVA	WA Marine Science Inventory	All	4,000	• Access database on MSP T-drive (continuously up-dated)	• Regions/Specialist Branches	• Assists with planning of future marine R&M projects by providing DEC marine managers with an up-to-date list of current and completed state-wide marine research and monitoring projects
SLO	EA	Marine Image Library edition 1.0	All	3,000	• Keyword-searchable database of images relevant to marine science in WA, on CD	• SDCA, Regions/specialist branches	• Many images already in use on DEC websites etc
SLO	NA	Seed-Funding	All	90,000	Funding provided to CSIRO, MU; Outputs due in 2007/08.		
SLO	NA	Seed-Funding	Proposed MPAs	21,000	Funding provided to MU; Outputs due in 2007/08.		
MSP		Advice (EIA, Marine Planning etc)	All	63,000	MSP provided technical advice on marine EIA, fisheries, MPA planning and regional marine planning		
MSP		Committee representation	All	56,000	MSP is currently representing DEC on over 20 marine science related committees		
MSP		Administration	All	147,000	• Draft TOR for Marine Science Coordination Committee • Draft process for Marine Science Concept Plan • Draft process for Marine Science Project Proposal • MSP Equipment Inventory		
MSP		Equipment	All	60,000	Purchase of computers, software, field equipment etc		
ROWLEY SHOALS MARINE PARK							
SLO		Collation and databasing of existing unpublished data	RSMP	75,000	Funding provided to WAM ($60K) and AIMS; Outputs due in 2007/08.		
SLO		Comparative marine biodiversity survey of the Rowley Shoals	RSMP	5,000	• Prospectus (Concept Plan) • Draft SPP	• Media release announcing that survey will take place, timed to coincide with gazetting of zones in RSMP	• Nigel Higgs is writing media release based on prospectus
AED	KBA	Rowley Shoals Marine Park Marine Research and Monitoring Projects Database	RSMP	18,000	• Report (Bibliography of historical R&M) • Report (Current and proposed marine R&M projects)	• Regions/Specialist Branches	• Provides an improved basis for the design of the 2007 RSMP biodivesitysurvey.

PI[1]	Co- I[2]	PROJECT TITLE	MPA	MSP Budget[3]	OUTPUTS		
					Science *What did we learn?*	**Communication** *Who did we tell?*	**Knowledge transfer** *What difference did it make?*
MONTEBELLO/BARROW ISLANDS MPAs							
KBA	CSI, SAR, SLO	Establishing a long-term benthic community monitoring program in the Montebello/Barrow Islands marine protected areas	MBBI	88,000	• Field Program Report (August 06 field trip) • Data report (August 06) • Field Program Report (December 06 field trip) • Data Report (December 06) • Scientific note submitted to "*Coral Reefs*" re: coral reef complex (SLO, CSI, KBA, AKE)	• Media statement (August survey) • Media statement (December survey) • Media quality DVD provided to SDCA for Communication & education usage (SAR)	• Video clip of coral reef footage provided to EPA re: Gorgon assessment • Advice provided to MPRA re: humpback whale entrapment in pearling lease in Montebello Is. • Draft Operational Guideline: Recommendations for the conservation of *Scylla* spp. in the Montebello/Barrow Islands Marine Protected Areas (PVA,SLO)
NINGALOO MARINE PARK							
SLO	CSI	Coral Bay Coral Communities Recovery Survey 2006	NMP	26,000	• Field Program Report • Data Report • Scientific paper submitted to "*Coral Reefs*" re: methods • Scientific paper in draft for "*Coral Reefs*" re: recovery of reef communities	• Radio interview	• Improved understanding of potential climate change impacts on NMP • Improved understanding of validity of comparisons between historical and recent data.
SLO		Coral Spawning Observations: Coral Bay April 2007	NMP	6,000		• Television interview • Scientific advice provide to DEC and DPI staff and contractors re: construction of small boat facility at Moncks Head • Public presentation at community workshop	• Sediment curtain to confine suspended sediment plume was fixed
PVA	SLO	Disturbance history of coral reef communities in Bill's Bay, Ningaloo Marine Park, 1975-2007	NMP	3,000	• Data Report collating unpublished data		• Ensures valuable unpublished historical data is preserved and available

PI[1]	Co- I[2]	PROJECT TITLE	MPA	MSP Budget[3]	OUTPUTS		
					Science *What did we learn?*	**Communication** *Who did we tell?*	**Knowledge transfer** *What difference did it make?*
SAR		Survey of *Drupella* at Ningaloo Marine Park and Muiron Islands Marine Management Area	NMP	31,000	• Field Program Report • Data Report • Scientific paper (draft completed)	• LANDSCOPE article (December edition 07) • Article in Conservation News (May edition 07) • Radio Interview ABC North West (13/6/07) • AMSA student presentation July 06 • DEC Park Note (Exmouth District) • News paper article: Exmouth Expression (1st August 2007)	• Improved community understanding of this issue
SAR		Winter coral bleaching survey at Ningaloo Marine Park	NMP	7,000	• Data Report	• Article in Northern Guardian (25/4/07) • Article in Conservation News (June edition 07)	• Improved understanding by managers and community of a poorly understood process
SAR	KBA, JDA	WAMSI Node 3: Ningaloo Marine Park: Research and Monitoring Projects Database	NMP	3,000	• Report (Bibliography of historical R&M) • Report (Current and proposed marine R&M projects) • Bibliographic paper in "Conservation Science" journal	• AMSA student presentation July 06 • Provided to: DEC Marine Policy and Planning Branch; DEC District and Regional Managers; Ningaloo Research Program project leaders (WAMSI Node 3).	• Improved knowledge of what information is/ will be available • Better integration of research effort in WAMSI Node 3
ND/KWA	CSI	WAMSI Node 3 Science Plan	NMP	16,000	• Science Plan	• Presentation to Ningaloo Cluster workshop • Presentation to Ningaloo Tourism workshop • Point source article • Distributed to WAMSI Node and Project Leaders	
ND/KWA	CSI	WAMSI Node 3 Project plans and Project agreements	NMP	20,000	• Project Plans • Project Agreements	• WAMSI website	
KWA		Database of current research in Ningaloo Marine Park and their relevance to management objectives	NMP	7,000	• Excel database on MSP T-drive (continuously updated)	• Provided to DEC district staff, and external collaborating institutions and departments.	
KWA		Data and Information Management Plan, WAMSI Node 3	NMP	1,000	• Interim plan for the storage and management of marine data gathered through WAMSI research projects	• Provided to WAMSI project leaders	
SLO	NA	Seed-Funding	NMP	9,000	• Funding provided to MU; Outputs due in 2007/08.		
SHARK BAY MPAs							
SLO	NA	Seed-Funding	SBMP	3,000			
JURIEN BAY MARINE PARK							
KBA	CSI	Water Quality of Jurien Bay Marine Park	JBMP	14,000	• Draft paper		
SLO	NA	Seed-Funding	JBMP	75,000	•Funding provided to MU; Outputs due in 2007/08.		

PI[1]	Co- I[2]	PROJECT TITLE	MPA	MSP Budget[3]	OUTPUTS		
					Science *What did we learn?*	**Communication** *Who did we tell?*	**Knowledge transfer** *What difference did it make?*
METROPOLITAN MARINE PARKS							
DLI (SCD)	KBA, KFI	Metro Marine Parks Marine Research and Monitoring Projects Database	Metro	5,000	• Report (Bibliography of historical R&M) Report (Current and proposed marine R&M projects)	Regions/Specialist Branches	
SLO	NA	Seed-Funding	Metro	28,000	•Funding provided to MU; Outputs due in 2007/08.		

Key: CSI= Chris Simpson; SLO= Suzanne Long; KBA= Kavin Bancroft; KWA= Kelly Waples; AKE= Alan Kendrick; SAR= Shannon Armstrong; AED= Alicia Edwards; JDA= Judy Davidson; PVA= Peter Van Schoubroeck; DLI= David Lierich (Swan Coastal District); KFI= Kate Fitzgerald

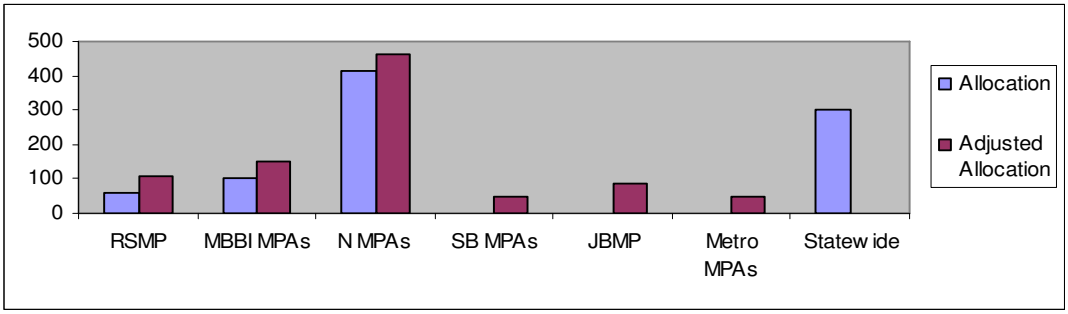
TABLE 2: MARINE SCIENCE PROGRAM: SUMMARY OF BUDGET ALLOCATION AND EXPENDITURE FOR 2006/07

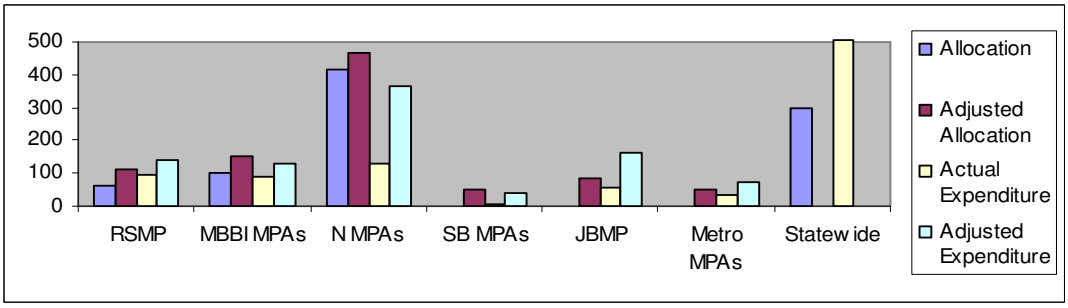
MPA	Allocation	Adjusted Allocation[4]	Expenditure	Adjusted Expenditure[5]	Comments
Rowley Shoals Marine Park	60	110	98	138	
Montebello/Barrow Is MPAs	100	150	88	128	
Ningaloo MPAs	415	465	129	366	
Shark Bay MPAs	0	50	3	42	
Jurien Bay Marine Park	0	85[6]	54	164	Includes $35K (i.e. 50% of $70K) for sealion research
Metro MPAs	0	50	33	72	
Statewide	300	0	505	0	
Total	**875**	**910**	**910**	**910**	

[4] includes even split of statewide allocation across all MPAs
[5] includes uneven split of statewide expenditure across all MPAs
[6] Includes $35K (i.e. 50% of $70K) for sealion research from Director of Nature Conservation and Director of Science Division

TABLE 3: MSP EXPENDITURE FOR 2006/07 ($1000S)

MPA	Allocation	Adjusted Allocation	Actual Expenditure	Adjusted Expenditure
RSMP	60	110	98	138
MBBI MPAs	100	150	88	128
N MPAs	415	465	129	366
SB MPAs	0	50	3	42
JBMP	0	85	54	164
Metro MPAs	0	50	33	72
Statewide	300	0	505	0
Total	**875**	**910**	**910**	**910**





APPENDIX 1: MARINE SCIENCE PROGRAM STRATEGIC DIRECTIONS

This section outlines the strategic marine research priorities of DEC over the next five years. These directions will be addressed via internal marine science programs, collaborations and through influencing the strategic priorities of external research organisations.

Better co-ordination of marine science within DEC
A preliminary assessment of marine science projects supported by regional offices and branches within DEC but external to the Science Division, found there were over 60 projects being wholly/partly funded by the Department. This is likely to be a significant underestimate but nonetheless represents a significant investment of public money in marine science by DEC. At present there is no co-ordination of this activity across the Department. A high priority is to develop an integrated meta database of all recent past and current marine science projects being wholly/partly funded by the Department.

A Marine Science Co-ordination Committee (MSCC) will be established with representation from the MSP, Regions and key specialist branches. DoF marine science programs in CALM Act MPAs will also be included in this co-ordination process. The MSCC will ensure that all ecological and social marine science projects within DEC 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. 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 promote potential synergies, minimise duplication and ensure compliance with DEC Science Division quality control processes (e.g. Science Project Plans). 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.

Building strategic alliances with external research providers
A priority for the MSP will be to continue to build strategic alliances with organisations that have marine science interests in common with DEC. Mechanisms to promote enhanced collaborative arrangements will be developed with State Government agencies (e.g. particularly WA Museum and the Department of Fisheries), regional NRM groups, local and some interstate universities and Commonwealth research agencies (e.g. AIMS, CSIRO, Geoscience Australia, Bureau of Meteorology). Alliances with key WA industry groups (e.g. oil and gas) will also be developed as appropriate as many of these industries have had a significant role in marine research and environmental management in WA for decades. Alliances will also be developed with State conservation/NRM agencies in other States and the Northern Territory. The MSP will also maintain links with international programs through the Inter-governmental Oceanographic Commission/UNESCO (Perth office) and with national initiatives such as the Integrated Marine Observing System.

Promoting better integration and knowledge transfer of research outputs
A priority for the MSP over the next few years will be to promote better integration of research programs of interest to DEC. These include major research programs within WAMSI, core research programs of AIMS, CSIRO and local and interstate universities and numerous Natural Heritage Trust projects (e.g. WA Marine Futures, Capes MPA Zone Study). This integration will maximise the benefits of available funding and provide a better basis to identify gaps to assist with marine science planning within DEC.

The transfer of scientific outputs to support departmental programs will also be a priority for the MSP. In particular, assisting the development of the Marine Strategy Evaluation (MSE) tool, as a key mechanism to integrate much of the Ningaloo research effort and transfer this knowledge into operational management will be a major priority. Facilitating the development of other Decision Support Systems for conservation planning and management is also a priority.

The transfer of scientific knowledge will be promoted via the development of formal guidelines to inform marine policy development, marine protected area planning, regional marine strategy

planning, marine fauna conservation planning and operational MPA management. These guidelines will be developed in collaboration with the recipient groups in DEC.

Future marine research priorities
Much of 2007/08 will be focused on completing an audit of recent historical, current and proposed marine research in WA that is relevant to DEC objectives. Once this is completed it will be possible to assess these activities against the research priorities outlined in the MPA and marine fauna management plans to identify critical gaps. These gaps and other emerging priorities will be then used to develop, in early 2008, the longer-term research priorities of the MSP beyond 2007/08.

Current research priorities are outlined below.

Ecosystem Research
A long-standing priority is to better document the distribution and patterns of marine biodiversity in Western Australian marine ecosystems and how and why these systems change over time. As well as evaluating the results and outcomes of the ecosystem process studies being undertaken within WAMSI over the next five years, the following specific priorities will be pursued:

- The development of a dedicated cost-effective state capability to systematically survey WA's marine biodiversity (akin to the existing terrestrial biodiversity survey capability) to provide the information needed for MPA planning, regional marine planning and marine environmental protection.
- A high resolution seabed topography map of the entire State waters to support the above program;
- Marine biodiversity surveys in both existing and proposed MPAs and areas of the Pilbara and Kimberley under increasing pressure from industrial development. Initially, the focus will be on mapping the major marine habitats and marine fauna distributions followed by detailed species level biodiversity surveys;
- Geographical priorities include the Montebello/Barrow islands MPAs, the proposed MPAs in the Dampier/Archipelago/Cape Preston, 'SW Capes' region, the Shark Bay and Marmion marine parks, the proposed MPAs in the west Kimberley/Pilbara and state waters off the Kimberley coastline; and
- The development of key surrogate indicators for monitoring change in marine biodiversity patterns and distribution.

Marine Protected Areas
Implementation of the marine science strategies in MPA management plans is a major priority for the MSP. The initial focus will be understanding the distribution and patterns of marine biodiversity in WA MPAs, how and why these systems change over time (see above) and the development of indicators of resource condition, threats and the management response.

Before major DEC programs of MPA research and monitoring can be developed, an assessment of historical, current and proposed research in WA MPAs by external providers (e.g. WAMSI etc) is required to identify gaps. This is necessary because of the extensive existing marine science programs currently being undertaken /proposed in WA MPAs over the next few years. Once completed, research and monitoring programs will be implemented to address these gaps.

Marine Fauna
Key priorities will be drawn from marine fauna management/recovery plans. Initial priorities for marine fauna research, including assessing existing data, are quantifying the status, dynamics and forcing factors (bio-physical influences and human threats) of the population structure, distribution and abundance of:

- Turtles (green, leatherback, flatback, loggerhead, hawksbill) off the Gascoyne, Pilbara and Kimberley coastlines;
- Dugong off the Pilbara and Kimberley coastlines;
- Australian sea-lions off the central west coast of WA;
- Seabirds in the Ningaloo MP and the Pilbara MPAs;

- New Zealand Fur Seals off the south coast of WA;
- Migratory birds in Roebuck Bay and the Swan Estuary; and
- Little Penguin populations off the metropolitan coastline.

A key focus for the above research is the development of cost-effective protocols for monitoring the condition of the above marine fauna populations.

Another important marine fauna research priority is the development of generic conservation management tools, such as Population Viability Analysis (PVA) models, to assist in the conservation and management of a range of marine fauna. The Murdoch University research program on the ecology of the dolphins of Koombana Bay is such an example.

Climate Change
Knowledge about the potential impacts of climate change on WA marine ecosystems is a major current gap and research is needed to address this deficiency. Initial priorities include the establishment of long-term monitoring programs including a state-wide network of temperature recorders and quantitative descriptions of the marine biodiversity and key ecological processes (e.g. acidification, carbon flux, recruitment, herbivory etc) through time in representative ecosystems in the major zone of biogeographic overlap in WA (i.e. between North West Cape and Cape Leeuwin). Changes are likely to be more obvious in this overlap zone and these studies will provide a better basis to understand the potential impacts of climate change on WA's marine biodiversity. Baseline studies of coral disease on WA coral reefs, the on-going study of the recovery of the coral reef communities at Coral Bay (Ningaloo Marine Park) and retrospective studies examining changes in coral growth over the past 100 years (e.g. in *Porites*) are also priority research areas in regard to the potential impacts of climate change on WA coral reefs.

Social Science
Social research priorities include developing a framework to provide operational expressions for 'wilderness' and 'seascape' values, particularly in the Jurien Bay, Ningaloo and Rowley Shoals marine parks; identifying indicators for social and economic benefits of marine conservation programs and using oral and recorded histories, including indigenous knowledge, to reconstruct marine environment resource condition trends in WA.

Performance Assessment
The establishment of a state-wide system of marine protected areas has accelerated over the past few years and this impetus will continue. The planning for WA's first regional marine strategy has also begun on the south coast. There is a need for on-going development of the existing performance assessment systems that measure the effectiveness of these management measures, at system (e.g. CAR), MPA (e.g. KPI) and 'asset' (e.g. condition, pressure, response) level, in mitigating threats to conservation values and in measuring the social and economic benefits to the community. A similar need exists to measure the performance of threatened marine fauna recovery/management prescriptions. Two parallel research priorities in this regard are: the identification of appropriate ecological (e.g. resource condition) and social indicators, and the development of cost-effective methodologies to monitor these indicators. The development of remote sensing techniques will be a priority in a state as large as WA, as well as maintaining links with the recently established Integrated Marine Observation System.

The development and implementation of state-wide MPA and marine fauna monitoring programs to support departmental performance assessment and MPRA audit processes are a major priority for the MSP over the next three years. Links will be established with regional NRM groups, particularly NHT monitoring and evaluation programs.

The format and content of this first report, including better links with the financial reporting system, will be further developed in 2007/08 following comments from the MPRA and regional and specialist branches.

Developing and implementing marine science communication programs state-wide
Science communication is about transferring scientific knowledge into improved policy, planning and operational management, positively influencing community attitudes and behaviour towards conservation and sustainable use of the environment and influencing the attitudes of politicians, stakeholders, media and industry groups with an aim of building confidence about governance, regulation and the use of science and technology.

The development of a comprehensive state-wide marine science communication plan will be a priority.

APPENDIX 2: CURRENT DEC MARINE SCIENCE SEED-FUNDING PROJECTS.

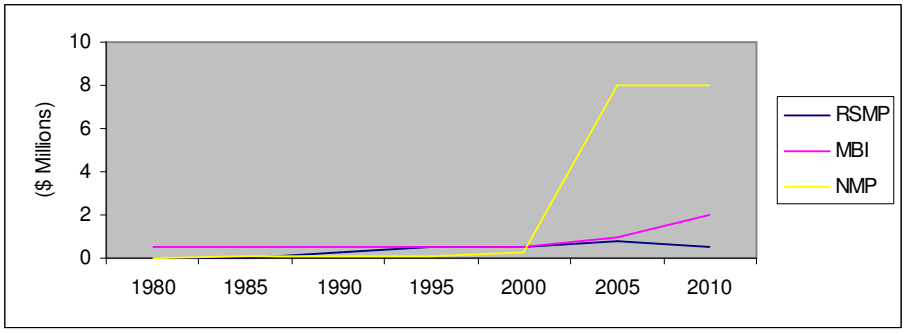
Project	Institution	Principal Investigator	DEC Region	DEC Funding Commitment	Budget ($'000s)				Duration	Comments
					MSP	Regions/ Branches	External	Total		
Little Penguin Study	MU	Dr Belinda Cannel	Swan	$27,500	8	TBD			2006/07-2009/10	Cost-effective monitoring protocol to measure LP population abundance and reproductive output.
Broke Inlet Fish Study	MU	Dr Fiona Valesini	Warren	$18,227	10	8			2006/07	Assist with resource assessment for MPA planning; MPPB also providing $8K.
Beach use patterns at three high use areas in NMP	MU	A/Prof Lynnath Beckley	Pilbara	$1870	2	TBD			2007/08	Assist in developing visitor risk assessment profile.
Australian Sea-lion Study	ECU	Dr Richard Campbell	Mid-West	$50,000 (Director of NC) $20,000 (one-off: Director of SD) $20,000 (in-kind: Moora District)	3	90			2007/08 2007 2006/07	Contribute to ASL research; development of a Pinniped Wildlife Management Plan; development of cost-effective monitoring protocols.
Pilbara Dugong Study	ECU	David Holley	Pilbara	$8000 from SCB	3	8			2007/08	Distribution, abundance and critical habitats of dugong along Pilbara/Kimberley coast; will assist with MPA resource assessment.
Monkey Mia Dolphin Study	MU	Dr Lars Bejder	Mid-West	$15,000 up to $25,000 pa for six years	3	15			2006/07-2012/2013	Will assess effectiveness of management intervention by DEC (will measure dolphin abundance and reproductive output).
JBMP Zone Effectiveness Study	UTas	Dr Graeme Edgar	Mid-west	$48,000 pa	5	43			On-going	Effectiveness of zoning scheme; part of larger study of temperate MPAs in Australia; progress to be reviewed in 2007/08.
Bunbury dolphin Study	MU	Dr Lars Bejder	Southwest	$10,000 pa	10	0			2007/09	Will help develop generic population viability analysis models for use on other marine fauna in WA.
History of fish populations (Ningaloo MP)	UWA	Dr Angela Gaynor	Pilbara	$5,000	5	0			2006/07	Will retrospectively construct time-series data on changes in abundance/size of targeted fish.
Condition of the coastal area at Coral Bay, WA	MU	Dr Halina Kobryn; Luisa D'Andrea	Pilbara	$1,985	2	0			2007	Will assist assessment of impacts of ROVs on coastal vegetation of NMP etc.
Capes MPA Zone Effectiveness Study	UWA	Dr Mark Westera	Southwest	$5,000	5	0			2006/07	Effectiveness of proposed zoning scheme; NHT-funded project.

Capes Abalone Study	MU	Dr Neil Loneragan	Southwest	$75,000	3	75			2007	Funded from DEC HQ. via MPPB
NW Research Inventory (Kalbarri to NT border)	TBD	TBD	Mid-west, Pilbara, Kimberleys	$15,000	15	0			2007/08	Funding from NOO, DEC, DoF, WATC?, DOIR?, DPI? Bibliography of Marine R&M.
Collation and summary of unpublished WAM research of the Rowley Shoals	WAM	Dr Di Jones	Kimberleys	$60,000	60	0			2007/08	Will assist major planned collaborative survey by DEC/DEW/AIMS in November 2007.
Ecological interaction in coastal marine communities: fish communities in the JBMP	MU	Dr David Fairclough	Mid-west	$20,000 one-off	1	20				Top up existing SRFME project in JBMP.
Ecophysiology of benthic primary producers in the JBMP	ECU	Dr Paul Lavery	Mid-west	$8000 one-off	1	8				Top-up of existing SRFME project in JBMP.
Taxonomy of marine algae in WA	WAH/MU	Dr Kevin Theile	All	$50,000 pa for three years	15	0			07/08 to 09/10	0.5fte contribution to Dr John Huisman's salary at WAH; additional $35K pa from SD.
SUB-TOTAL 10					**152**	**259**				

MSP Seed-Funding Co-ordinator: Dr Suzanne Long

APPENDIX 3: HISTORICAL AND PROJECTED TRENDS OF TOTAL MARINE SCIENCE FUNDING RELEVANT TO WA MPAs ($Millions pa)

Year	RSMP	MBI	NMP	SBMP	JBMP	METRO
1980	0.01	0.5	0.01	1	0.01	2
1985	0.01	0.5	0.1	1	0.01	0.2
1990	0.3	0.5	0.1	0.4	0.01	4
1995	0.5	0.5	0.1	0.4	0.2	0.5
2000	0.5	0.5	0.3	0.1	0.2	0.5
2005	0.8	1	8	0.2	2	0.7
2010	0.5	2	8	0.2	0.5	0.7



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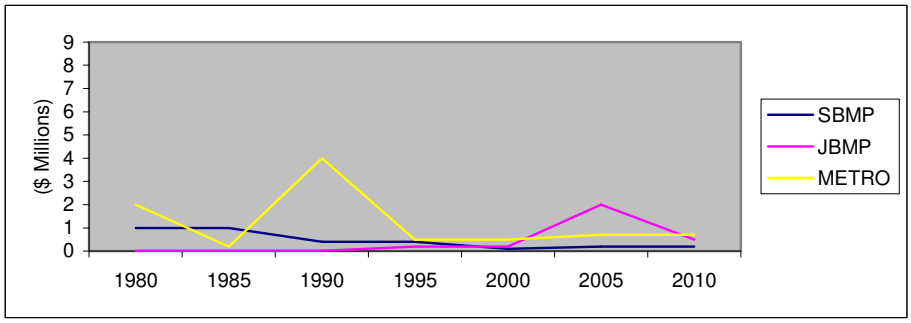


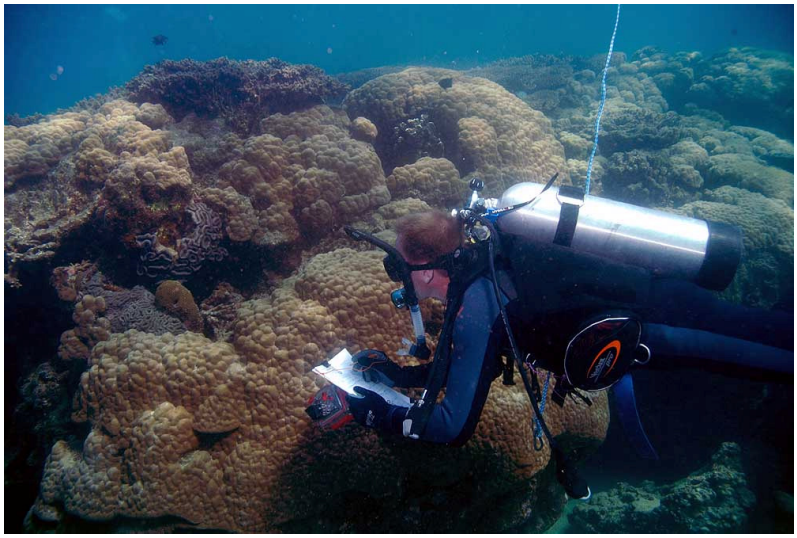
[8]

[7] **RSMP**: WAM in early 1990s; AIMS from mid-1990s to present; WAM 2006 survey; DEC/AIMS 2007 survey.
MBBI MPAs: Oil&Gas industry environmental studies from 1980s; Gorgon development from 2006 onwards.
NMP: Ningaloo Research Program 2006-2011.

[8] **SB MPAs**: UWA Shark Bay Study from early/mid 1980s; SB World Heritage funding during1990s;
JBMP: SRFME, NHT, Utas, FRDC studies 2003-2007;
Metro MPAs: CSIRO Coastal Research from late 1970s to mid 1980s; PCWS/SMCWS studies early to mid 1990s; WAMSI/NHT from 2006 to present.

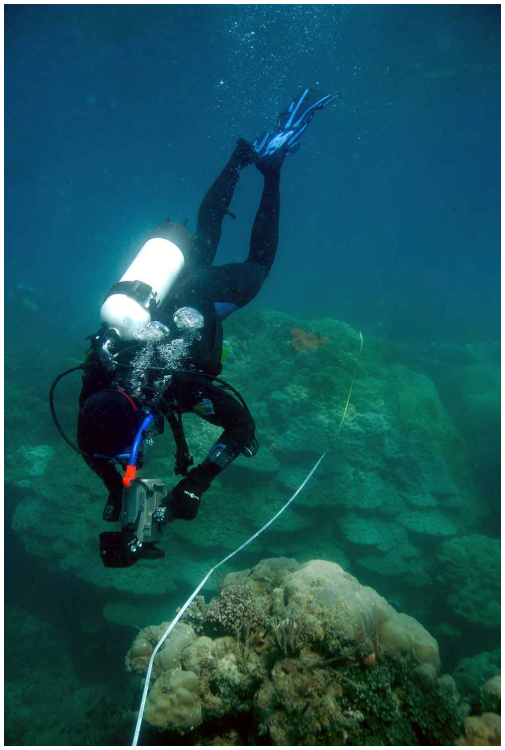
Marine Science Program in action during 2006/07

Jurien Bay Marine Park: Sea lions in the shallows of Fishermans Island

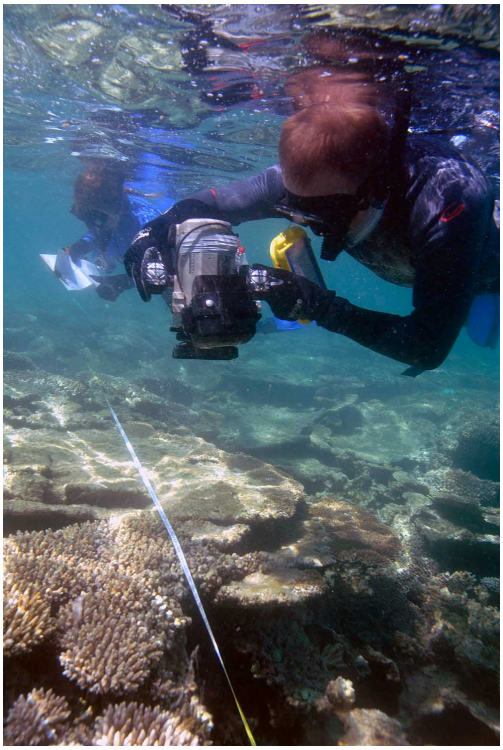


Montebello and Barrow Islands MPAs: Surveying Dugong Reef

Malus Island: proposed Dampier Archipelago Marine Park



Montebello and Barrow Islands MPAs: *Porites* bommie habitat



Montebello and Barrow Islands MPAs: Surveying coral communities at Wonnich Reef

Ningaloo Marine Park: Intertidal coral communities showing winter bleaching (lighter shade)

Ningaloo Marine Park: Coral communities in Bills Bay showing the effects of repeated disturbance

Department of
Environment and Conservation
Marine Science Program

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MSP videos publicly available on the internet