Annual Work Plan

National Environmental Research Program (NERP)

MARINE BIODIVERSITY HUB

January 2013 – December 2013

(revised July 2013)





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Introduction

The National Environmental Research Program (NERP) is an Australian Government program that provides funding for applied public good research. It builds on the Commonwealth Environment Research Facilities (CERF) program with a specific focus on biodiversity.

The program’s objective is:To improve our capacity to understand, manage and conserve Australia's unique biodiversity and ecosystems through the generation of world-class research and its delivery to Australian environmental decision makers and other stakeholders.

As the NERP research activities span several years, the Annual Work Plan (AWP) is the key document for defining, justifying, budgeting for and scheduling activities on an annual basis. It relates directly to the Hub Multi-Year Research Plan (MYRP) which broadly describes the scope of the research work program over four years (July 2011- December 2014).

The Annual Work Plan is an annual planning tool for research administrators, researchers, communications staff and Australian Government staff. Other interested stakeholders may be non-hub researchers (seeking collaborations), industry and other end users, government and non-government organisations and the general public (seeking information on the Hubs).

For the Hub, the Annual Work Plan:

provides a management tool for the Leader and teams including outlining the projects and activities planned and their timing

links outputs and outcomes with monitoring and evaluation

links to Australian Government Environment Portfolio policies and programs and end users

provides the basis for reporting progress of Hub activities, for example when the current status of a project is compared to what had been foreseen in the work plan and

provides for opportunities to present a visual outline or illustration of the sequence of projects. This can facilitate presentations and negotiations concerning the projects.

The primary audience for the AWP is the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) and the Hub with its researchers.

Each Annual Work Plan provides an implementation plan for the coming year and provides:

justification, if required, for the proposed program of work,

a detailed work plan, describing and scheduling activities, links to end users and expected outputs, outcomes and benefits,

a budget that sets out the costs of implementing the work,

a check-point to ensure the monitoring and evaluation plan is current, or updated as appropriate,

a check-point to ensure the communication plan is current, or updated as appropriate, and

a review and update of the risk in relation to functions and activities (see Attachment A – Risk).

This Annual Work Plan will cover the period between January 2013 to December 2013. It should be read in conjunction with the Multi-Year Research Plan.

This template comprises of:

This covering document,

Part A – Hub Administration Activities,

Part B – Hub Knowledge Brokering and Communication Activities,

Part C – Hub Projects, and

Part D – Staff, Income, Expenditure Finance Tables and

* 1. Attachment 1 – Risk
  2. Attachment 2 – Monitoring and Evaluation Plan (where necessary)
  3. Attachment 3 – Communication Plan (where necessary)

Endorsement and Approval of the Annual Work Plan

Each year the Hub prepares the first draft of the annual work plan, based on the Multi Year Research Plan, and finalises this plan after endorsement by the Hub Steering Committee. The endorsed AWP should then provided by the Hub Leader to the DSEWPaC for approval.

If the AWP involves significant changes to the scope of the Hub and planned projects as outlined in the Multi Year Research Plan, then Ministerial approval will be required to modify the Multi-Year Research Plan.

DSEWPaC must give final approval of the AWP to the Hub Leader, authorising the Hub Leader to implement the AWP.

### Overview of 2013 Annual Work Plan

Results of the earlier preparatory work start to show in this 2013 Annual Work Plan. The 2011-12 AWP had a large component of preparation and developing the agreed projects with SEWPaC to ensure they matched the Department’s needs. Scientific results will start to show in 2013. This will increase in 2014 when it will be particularly important to match the presentation of scientific results to Departmental programs and priorities. Important components of the 2103 AWP include:

* Identify science products especially those that will benefit or require collaboration between projects, themes, Hubs and agencies;
* Focus science outputs and products on the questions that are most relevant to the Department and other partner agencies;
* Identify opportunities for high profile scientific papers and communication opportunities, especially those that match the partners’ strategic research interests;
* Continue to build engagement with the Department and between the Department and other partners to increase understanding of individual capabilities and potential in supporting Departmental priorities;
* Continue to build the nodes of the collaborator’s network so that scientific outputs increase in their relevance to the broader marine science and management communities;
* Start to identify and build support for further scientific research that would support Departmental decision making in the NERP program.

Theme-specific highlights of the 2013 AWP follow:

Theme 1: National Monitoring, Evaluation and Reporting

*Project .1.1: Collation and analysis of existing data sets*

The project will: a) perform an analysis of available data sets to identify gaps for meeting the data requirements of a national-scale ecosystem health (KEF indicators) reporting framework for input to the 2016 SOE Report, and for managing the Southeast Commonwealth Marine Reserve Network; b) catalogue existing, and develop new, techniques to analyse spatio-temporal data for seasonality, change point and trend detection, and c) develop a long-term plan to mobilize national capacity to provide the required data (especially through IMOS and NPEI).

In 2013, this project will have identified the main datasets available, identified the gaps and gained a clear understanding of the information content of existing datasets for statistically-informed decision making. A presentation to SEWPaC will be used to sharpen the final year’s analysis and reporting. The key risk to this project is the unavailability of national datasets – we are minimizing this risk by trialling new and existing methods on datasets that are currently held by NERP research team.

*Project 1.2: Analysis of approaches for monitoring biodiversity in Commonwealth waters*

The project will design, implement and test ways to integrate new and existing survey and monitoring methods at three locations: the Flinders CMR, the coral/kelp KEF to the east of the Houtman-Abrolhos islands and the shelf KEF and Commonwealth Reserve south of the Solitary Islands. It will also access existing CMR monitoring datasets from the South-East CMR. The project will examine: a) statistical and logistical issues of survey methods in regular and event-initiated surveys; and, b) survey design issues, such as the choice of biodiversity metric and seasonal/spatial variation in species group indicators of ecological health, and their impact of these issues on the variance and bias of survey data.

In 2013, this project will have completed the Flinders CMR and Solitary Islands CMR field research. The Solitary Islands field research will be completed in 2013. An analysis of alternative approaches for monitoring biodiversity in the CMR will be complete, as well as a gap analysis for national ecosystem health and CMR monitoring in the South-east CMR.

Theme 2: Supporting Management of Marine Biodiversity

*Project 2.1: Integrating social, economic and environmental values*

This project will provide knowledge and advice regarding the economic and social dimensions of marine conservation in complex multi-jurisdictional and multi-sectoral environments. This will be achieved through three related activities:

* Supporting the development of a monitoring strategy for the Commonwealth South-east marine reserve network
* Valuing marine biodiversity
* Understanding the role of incentives including offsets in marine conservation and management

In 2013 this project will have worked with SEWPaC to develop a framework and set of guiding principles for identifying performance indicators and allocating monitoring resources in the SE CMR. It will have reviewed the set of incentives created under existing conservation legislation for extractive industries and identified those with potential to foster marine stewardship by these industries. This will include a case study on offsets including social license to operate and a national workshop on best practice in offsets design. Finally it will have completed a series of non-market valuation studies based on ecologically relevant scenarios that will be meaningful for policy development and/or implementation. The major risk to this project is an inability to engage in a timely fashion with DSEWPaC staff. The Hub Director and Deputy Director have agreed with the Marine Division SES to meet three times a year to help keep projects and their inputs timely and relevant to alleviate this risk. We have also linked project deliverables to alternate external agencies and events to ensure their relevance.

*Project 2.2: Integrating threats, values and assets for management*

This project will bring together existing data and information on key threats to marine biodiversity, building on work from the current Marine Biodiversity Hub, previous work on fisheries risk assessment, NPEI, IMOS and NOIS, to provide a prioritised threat assessment. The link between threats and biodiversity values will be identified for simple one to one relationships and then expanded to consider multiple threats on biodiversity values. Several approaches will be taken to link threats and values and tested against data. Finally, cumulative threats will be mapped. The project has also taken on shared responsibility for developing the data management plan for the Hub.

In 2013, data management workflow and metadata tools will be supplied to all Hub researchers providing researchers and SEWPaC improved access to the data. Maps of the national distribution known threats will have been updated and initial cumulative threat models will have been completed including their links to management. Major risks to this project are the lack of sufficient data to identify cumulative impacts and the complexity of specifying the values that would underpin cumulative impacts. The Hub Director and Deputy Director have agreed with the Marine Division SES to meet three times a year to help keep projects and their inputs timely and relevant to alleviate this risk.

*Project 2.3: Task 1 - Landscape approaches to managing high conservation priority species*

A significant fraction of Australia's chondrichthyan fauna is at risk from a variety of human uses, particularly fishing. The group contains many slow-growing vulnerable species, including some of high concern to the Marine Division, so this group provides a good test case for developing integrated approaches. Landscape approaches to management have been identified as a primary tool for protection, but chondrichthyans are widely distributed and cannot be fully protected in all parts of their range. This task will identify and test strategies for supporting management of chondrichthyans both on and off reserve. What combination of spatial and other management strategies can best protect this group, including more mobile species, while maintaining access for ocean users? This issue will be addressed at national and regional scales.

In 2013, this task will produce refined species distribution maps for sharks and rays in South-east Australia, including hotspots, and areas important for particular life history events. It will have explored options for the on- and off- reserve management of sharks and rays in this area. The major risks to this task are the lack of suitable data and predictive methods. The project team will consult as necessary with Australian chondrichthyan researchers to obtain the best available data, and with experts who developed and tested some of the most recent predictive tools (many through the CERF Marine Biodiversity Hub).

*Project 2.3: Task 2 - Landscape approaches to managing high priority conservation values*

This task will acquire, collate and analyse benthic information to develop a spatial dynamic model of industry, trawl (and bottom set long-line) effort & impacts and benthic recovery in the SEMR, to evaluate alternative management options across sectors. The model will be based on a model originally developed in 1999 for evaluating management of the effects of trawling in the GBR, and subsequently applied successfully in the GBR, the Torres Strait and in the NPF. It will be used to evaluate outcomes for benthos of recent management interventions in the SEMR (e.g. SE RMP; SESSF structural adjustment and fishery spatial closures; possibly petroleum leases if information becomes readily available).

In 2013, this task will produce the relevant datasets and maps and develop a model capable of assessing risk and evaluating alternative management options in the SEMR. Major risks to this project are the lack or relevant data or lack of access to those data and complications in transferring the model from previous studies. The project team will consult as necessary with Hub and external researchers who have collected much of the relevant primary data and have existing agreements with industry for their use. External funding will be sought if additional programming is required.

*Project 2.4: Supporting management of listed and rare species*

This project will develop innovative methods to assess the population status of data-poor, low abundance, rarely-encountered, threatened euryhaline and estuarine elasmobranchs in order to inform conservation and management of these species. The initial focus is the freshwater sawfish in the NT with key river systems being the Daly, East Alligator, South Alligator and Victoria Rivers. Acoustic telemetry (including updated methods for determining range and habitat use) and close-kin genetics will be the major methods applied.

In 2013, the major tasks will be to progress development of the close-kin tools and progress the field sampling to improve knowledge of seasonal occurrence, habitat utilization, abundance and connectivity. An additional task requested by EACD is to develop a manual that can be used to review or specify monitoring protocols for use when assessing referred actions. The major risk to this project is the lack of sufficient sawfish to complete the close-kin work, in which case a transfer to the speartooth shark, *Glyphis glyphis,* will be discussed with partners and SEWPaC.

*Project 2.5: White shark population and abundance trends*

In mid 2013, the Hub was granted $500,000 under the Emerging Priorities funding for a new project to develop estimates of the abundance and population trends of white sharks in Australian waters initially focussing on the eastern Australian population during 2013 and 2014.

Work in 2013 will concentrate on consolidating existing information on demographic parameters of white sharks relevant to Australian populations, develop analytical routines to integrate abundance estimates based on aerial surveys and acoustic detection data, develop close-kin tools and progress field sampling including acoustic tagging and acoustic receiver deployments in east coast nursery areas as well as commencing aerial surveys. The major risk to this project is lack of access to sharks in nursery areas as a result of bad weather and thus limiting the samples available for close-kin analyses. Fieldwork will be scheduled to coincide with favourable weather windows where possible to minimise this risk.

Theme 3: National Ecosystems Knowledge

*Project 3.1: Shelf and canyon ecosystems – functions and processes*

### Physical features on the continental shelf and in submarine canyons were identified as important areas for biodiversity in marine regional plans. However, we lack a detailed understanding of the influence of physical features and associated oceanographic processes on patterns of biodiversity across the shelf and in the vicinity of canyons. This project will provide a better understanding of these linkages for targeted areas in Northern Australia through integrated analysis and modelling of available physical and biological datasets and nationally for canyons using available data.

In 2013, this project will have published the metadata report for available data, developed maps and models depicting shelf/canyon processes (including maps of canyon morphotypes with connectivity) and initiated a series of research publications. Major risks to this project are lack of timely communication with SEWPaC leading to a failure to follow an approach which would lead to most information on Biologically Important Areas. Regular updates are planned to ameliorate this risk.

*Project 3.2: National maps of connectivity and biodiversity*

There are few national maps of biodiversity for the Australian marine environment. Consequently, biological assessments of MPAs, KEFS and areas of economic interest have to be conducted without comparable data from other regions. This project will take advantage of recently developed and upgraded biodiversity databases, supplemented with new genetic information, to map hotspots of biological and genetic diversity, explore potential changes to faunal compositions under climate change and assign relative values to marine assets. The research products will inform conservation management at medium to large scales.

In 2013, this project will complete compiling the distributional datasets for the two invertebrate groups and Australian sharks and rays and will have mapped species richness and species turnover across the Australian marine environment. It will have developed an internationally agreed approach to mapping benthic faunal biodiversity and acquired the molecular data for determining phylogenetic endemism. The major risk to this project is an inability to extract suitable DNA from museum specimens. Project researchers are in contact with international teams working on DNA extraction so will be able to access the latest techniques.

Theme 4: Regional Biodiversity Discovery to Support Marine Bioregional Plans

*Project 4.1: Twenty-one day RV Solander survey*

Marine habitats in Northern Australia host globally significant biodiversity. This biodiversity faces rapidly increasing pressures from human activities, while extensive regional-scale knowledge gaps threaten to compromise efforts to conserve and manage it. This project will begin to fill these knowledge gaps in one of the most poorly known regions, the Oceanic Shoals Marine Reserve, by mounting a voyage-of-discovery to this region where extensive sampling of both the physical environments and biological communities will be done. The information from this cruise will support the research goals of the other three themes in the Marine Biodiversity Hub.

The survey will have been completed in the 2011-2012 AWP, and 2013 will be spent analysing and reporting on the data collected and extending the value of the information obtained by accessing data from similar surveys in the two bioregions. The metadata and/or data will be uploaded to the Hub website and AODN. A mid-year meeting will help identify opportunities arising from the analyses of these data.

### Monitoring and Evaluation Plan

Minor changes to the Monitoring and Evaluation Plan, as endorsed by the Steering Committee March 27, 2012 and attached as Attachment 2.

### Communication Plan

No changes to the Communication Plan, as endorsed as a living document by the Steering Committee March 27, 2012 and attached as Attachment 3. Outcomes from the branding report prepared for the Hub by Corporate Communications August 2012 may have future implications for the Communication Plan.

### NERP Emerging Priorities or other Australian Government Funding

In late June 2012, additional funding was granted through the NERP for the Hub to partner with the Tropical Hub, Environmental Decisions Hub and GBRMPA, to develop an integrated monitoring framework for the GBRWHA. The Hub sees this as a good opportunity to demonstrate how NERP can be used by the DSEWPaC (i.e. getting multiple Hub’s working together to meet DSEWPaC’s requirements). It also provides the opportunity to apply some of the knowledge obtained in developing national marine ecosystem health monitoring with SEWPaC and supports our drive for nationally consistent approaches to marine monitoring.

The Hub is also assisting [DSEWPaC](http://www.environment.gov.au/) in developing a joint Australian/France workshop to develop collaborative research of the Coral Sea and a workshop to support the South Pacific application of the UN Regular Process. The latter is a part of a global process to monitor the environmental, economic and social attributes of the marine environment. These small contracts are part of a larger engagement that is applying expertise developed through the CERF Marine Biodiversity Hub to support Australia’s regional interests.

The Hub is partnering on a proposal to undertake an *Interdisciplinary investigation of Coral Sea Deepwater Shipwrecks and their Environment* aboard the Marine National Facility in 2013/2014. The proposal was submitted jointly with CSIRO, NOAA Marine Sanctuaries Program, DSEWPaC Heritage and Wildlife Division (Heritage Reform and Shipwrecks), WHOI, the National Parks Service, JCU, University of Sydney and AIMS. The SEWPaC Marine Division has been invited to join the proposal and NERP funding will be sought if the proposal is successful.

Part A: Marine Biodiversity Hub Administration Activities

**Annual Work Plan 2013**

Administration Activities Leader: Vicki Randell

Organisation: UTAS

Total NERP Budget (ex GST): No NERP funds are used for administration activities

Total 2013 Non-NERP Cash/In-Kind Budget (ex GST): $448,261

UTas 2013 Scholarships Budget (ex GST): $298,915

### Activities and Milestones in 2013

Milestone 7 (Due 1 April 2013):

* The following are provided to and accepted by the Department:
* Progress Report 4 and associated financial report (period covered: 1 July – 31 Dec 2012)
* Annual financial report for 2012 calendar year

Milestone 8 (Due 1 October 2013):

* The following are provided to and accepted by the Department:
* Progress Report 5 and associated financial report (period covered 1 Jan – 30 June 2013)
* The following are provided to and approved by the Department:
* Annual workplan for 2014
* Updates (if required) to Hub Plans

**Reporting**

* Preparation and submission of Progress Reports – 4-5
* Preparation and submission of Workplan for 2014

**Finance**

* Overview and management of annual budgets – cash and inkind contributions
* Payments to Research Organisations and payment of Research Organisation invoices
* Organisation of 2012 annual audit report.

**Legal**

* Liaise with DSEWPaC, partner organisations and UTas legal office as required, eg for contract variation approvals.

### Governance

See [Governance](http://www.nerpmarine.edu.au/governance) on website for current listing of Steering Committee and Research Leadership Team.

Roles and responsibilities of all committees, executive and management roles in the Hub have been defined in the Roles and Responsibilities document that has been endorsed by the Steering Committee and is available on the website.

Paul Hedge has joined the Hub on secondment from the Marine Division (SEWPaC) as Deputy Director with communications, knowledge broking, and data management as his primary duties.

Outside Collaborator Network

Executive Team

Executive Officer

Knowledge Broker

Communicator

Hub Director

Host

IMAS/UTAS

Contracts and Legal

Theme 1

National

Monitoring

Theme 2

Management Support

Theme 4

Biodiversity Discovery

Theme 3

Ecosystems Knowledge

Theme 5

GBRWHA Integrated Monitoring

**Steering Committee**

The **Steering Committee** consists of major stakeholders (DSEWPaC, AFMA, APPEA, IMOS, a member of the NERP Secretariat, an independent chairman elected by the committee, and senior representatives of major partners.

The Hub Director reports to this committee, which meets twice a year to oversee Hub progress and reporting, and hold an annual strategic review of the Hub.

The Steering Committee approves reports to be provided to the NERP Secretariat.

**Research Leadership Team**

The **Research Leadership Team** consists of Theme Leaders, Project Leaders, partners (optional), the Director, Deputy Director/Knowledge Broker, and Communication Support Officer.

The Leadership Team meets monthly via teleconferences for administrative matters and progress updates, and twice a year for review, reporting and planning.

The Research Leadership Team prepares reports for Steering Committee approval.

### Key Risks in 2013 and Risk Management Strategy

Loss of key staff - Larger organisations have capabilities to fill key gaps. Regular meetings and reporting means that key information will not be lost.

Reporting timetable not met - any administrative or governance issues to be raised and discussed in weekly meetings held between Director, Deputy Director and Executive Officer.

Financial probity not met - Annual accounts audited

Part B: Marine Biodiversity Hub Knowledge Brokering and Communications Activities

Annual Work Plan - 2013

Knowledge Brokering and Communication Leader: Paul Hedge

Organisation: University of Tasmania

Total 2013 NERP Budget (ex GST): $384,531

Total 2013 Non-NERP Cash/In-Kind Budget (ex GST): $470,100

### Hub Knowledge Brokering and Communication

Activities undertaken in 2011/12 have provided a firm base to develop the Hub’s approach to knowledge brokering and communication activities in 2013. Activities will continue to be guided by the Science Communication Plan (attached) and Monitoring and Evaluation Plan (attached). The following are primary work areas for 2013:

* Shaping, delivering and communicating the Hub’s research outputs to meet the needs of DSWEPaC and other primary stakeholders;
* Continuing to improve engagement between the Hub and DSEWPaC, particularly at SES and cross divisional levels, to ensure priorities and needs are met;
* Enhancing the profile of the Hub and the importance of its research outputs to inform the Minister, DSEWPaC, other primary stakeholders, research community and the public;
* Providing public access to Hub data and leadership for public access to marine biological data via the AODN; and
* Refining the Hubs systems for reporting on KPIs for both output delivery and project impact.

Knowledge brokering will build capacity in the science policy interface by ensuring data and information is shaped and delivered for a shared understanding between the Hub and DSEWPaC. Established communication mechanisms (e.g. Hub Research Leadership Team meetings, NERP Communicators meetings, fortnightly Hub/DSEWPaC meetings and regular communications between the Hub and DSEWPaC) will continue to be important means for effective knowledge brokering. An output delivery schedule and DSEWPaC engagement schedule will be develop to increase certainty about development, delivery and communication of research outputs.

The Hub will build on work undertaken in 2012 on its branding position and key messages to refine its approach to communications to enhance its profile and the importance of its research. Use of media releases, newsletters, the website, publications and attendance at workshops and conferences will continue to be important to enhance the profile of the Hub.

The Hub will continue to work with its partners and the AODN in 2013 to establish the necessary processes and tools to ensure the Hub’s data is made available to the public. The Data Management Plan for the Hub will be finalised and implemented in 2013.

Work will be undertaken to refine the Hub’s systems for reporting on KPI’s identified in the Monitoring and Evaluation Plan. A significant challenge will be identifying KPI’s of project impact that are meaningful to DSEWPaC, other primary stakeholders and the Hub. The Hub will need to work closely with DSEWPaC to identify meaningful KPI’s that are relevant to the reporting periods (i.e. identifying meaningful project impact indicators for the 2013-14 period).

### Key Outcomes in 2013

* Enhanced profile for NERP Marine Biodiversity Hub with the Minister, DSEWPaC, research community and public
* Increased capacity to understand and meet DSEWPaC and other primary stakeholder needs
* Shared understanding about project outputs and delivery times with DSEWPaC and other primary stakeholders
* Improved public access to biological data for marine environment through AODN
* Shared understanding between Hub and DSEWPaC about how project impact will be measured/determined

### Key Outputs in 2013

* Updated Science Communications Plan
* Updated Monitoring and Evaluation Plan
* Data Management Plan
* Stakeholder and cross disciplinary workshops
* Metadata and data records available through AODN
* Output Delivery Schedule

### Activities and Milestones in 2013

* Engage DSEWPaC to develop and use the Output Delivery Schedule
* Revise Science Communication Plan to incorporate refinements to brand position, key messages and other developments
* Engage with Hub scientists and DSEWPaC to revise Monitoring and Evaluation Plan, particularly KPIs for project impact
* Engage with Hub partners and scientists, AODN and DSEWPaC to finalise and implement the Hub’s Data Management Plan
* Convene triennial meetings with DSEWPaC SES and project contacts
* Engage in fortnightly meetings with Hub/DSEWPaC coordination contacts
* Engage in monthly meetings with NERP Communicator Group
* Provide NERP progress reports to DSEWPaC – as required under contract

### Key Risks in 2013 and Risk Management Strategy

* Loss/replacement of key staff - the Deputy Director provides leadership for knowledge brokering and communication. The Deputy Director is seconded from DSEWPaC to the Hub. The secondment agreement extends to the end of Jan 2013. Management strategy - the Director and Deputy Director will meet with DSEWPaC in the last quarter of 2012 to consider options and agree on a succession plan before the end of 2012.

### Links and Dependencies to other Hubs and projects

* Monthly meetings with NERP Communicators

Part C: Marine Biodiversity Hub Projects and Themes

Annual Work Plan 2013

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| --- |
| Theme 1: National Monitoring, Evaluation and Reporting  This theme will contribute towards two blue-prints: first, for a sustained national environmental monitoring strategy designed to evaluate marine ecosystem health, and; second, for a sustained monitoring strategy to help manage the Commonwealth Marine Reserve Network (focussing on the Southeast Marine Region). This research aligns broad strategies in the Marine Bioregional Plans and with a number of research priorities identified by the Marine Division of DSEWPaC. It will facilitate closer liaison between federal agencies such as DSEWPAC, BOM, and DIISR, and state agencies responsible for the management of Marine Protected Areas (MPAs), to identify the data infrastructure requirements and logistical/statistical constraints of a sustained national marine monitoring strategy.  Outputs from this theme depend critically on and are contingent upon, results from existing research in the Southeast Marine region, and results from new research in Theme 2 (project 1) to assist definition of operational objectives for the Commonwealth Southeast Marine Reserve Network.  There are two projects in this Theme:   1. Collation and analysis of existing data sets 2. Analysis of approaches for monitoring biodiversity in Commonwealth waters   Theme 1 projects are managed by the Theme leader with the assistance of senior project research staff. The theme has monthly (Project 1) and fortnightly (Project 2) phone meetings to exchange information and review progress. These meetings are augmented by additional half-yearly whole of project and/or whole of Theme meetings.  Theme Leader: Keith Hayes  Organisation: CSIRO  Total NERP Budget (ex GST): $ 2,938,408 2013 NERP Budget (ex GST): $824,519  Total Non-NERP Cash/In-Kind Budget (ex GST): $3,928,887 2013 Non-NERP Cash/In-Kind Budget (ex GST): $1,177,119  (noting that this does not include additional in-kind support from Hub collaborators e.g. NSW DECC and OEH, WA Fisheries and IMOS) |

Project 1.1: Collation and analysis of existing data sets

Continuing project

Project Leader: Keith Hayes

Organisation: CSIRO

Total NERP Budget (ex GST): $1,194,184

2013 NERP Budget (ex-GST): $427,427

Total Non-NERP Cash/In-Kind Budget (ex GST): $1,582,952

2013 -NERP Cash/In-Kind Budget (ex GST):$649,531

Project Description

Project 1 will:

1. Source and analyse available relevant data sources to validate predictions associated with KEF indicators for national-scale marine ecosystem health;
2. Develop new techniques to analyse time series data for seasonality, change point and trend detection;
3. Source available data relevant to the operational objectives for the Southeast Marine Reserve Network (ie. in collaboration with Theme 2 Project 1), a process that will be relevant to Marine Reserve Networks in all bioregions; and,
4. Include an analysis of available data to identify gaps and propose a way forward for meeting the data requirements for reporting on national-scale ecosystem health and managing the Southeast Commonwealth Marine Reserve Network.

Key Researchers

The key researchers in Project 1, together with their institution and roles, are:

1. Keith Hayes, CSIRO - Project leader, data analysis
2. Jeffrey Dambacher, CSIRO - Qualitative modelling, data collation and analysis
3. Geoffrey Hosack, CSIRO - Statistician, data analysis and methods development
4. Emma Lawrence, CSIRO - Statistician, data analysis and methods development
5. Julian Caley, AIMS - Senior biologist, data analysis and methods development
6. Hugh Sweatman, AIMS - Biologist, data collation and analysis
7. Camille Mellin, AIMS Postdoc - data analysis and methods development
8. Neville Barrett, UTAS - Senior biologist, data collation and analysis
9. Rick Stewart-Smith, UTAS - Biologist, data collation and analysis
10. Gary Kendrick, UWA - Senior biologist, data collation and analysis

Problem Statement

The Australian Government is unlikely to be able to support sustained ecological monitoring, at a scale necessary to monitor the health of Australia’s EEZ and manage the Commonwealth Marine Reserve Estate, without integrating, and leveraging off, the monitoring and survey resources of different departments and institutions. Project 1 will catalogue and collate existing data sets, and evaluate their suitability as the basis for a sustained national marine monitoring system that is capable of collecting indicator data to evaluate marine ecosystem health and manage the CMR estate in the south east marine planning region. The project will attempt to source and analyse relevant data sources to (in)validate predictions associated with KEF and/or CMR indicators in a fashion that is consistent with SEWPAC objectives for ecosystem health monitoring, management of the CMR estate and the Marine Environment Reporting Framework (MERF). The project will also develop new multivariate State Space Modelling techniques (that allow for the confounding effects of observation error) to complement analysis with traditional time series methods for seasonality, change point and trend detection.

Outcomes

The expected outcomes of Theme 1 are:

1. Improved reporting on national-scale marine ecosystem health for input to the 2016 SoE report, based on access to the relevant data analyses (within limits of existing data);
2. Improved choice of marine ecosystem health indicators through a review of existing indicator analysis methods, together with their strengths and weaknesses, and the application and development of new methods; and,
3. Development of a long-term plan to improve national marine ecosystem health through identifying the need and opportunities to mobilise national capacity to provide the required data (especially IMOS and NPEI).

Outputs (products and services) in 2013

Whole of project and specific 2013 outputs are:

1. Identify the evidence-base/data requirements for managing the Southeast network of Commonwealth Marine Reserves and by extension networks in other bioregions. Specific 2013 output:
   1. complete SE CMR network catalogue of existing data sources listing the metric, observation platform, location, start and end of time series and frequency of observations
2. Identify the evidence-base/data requirements to evaluate and report on national marine ecosystem health. Specific 2013 output:
   1. complete at least one KEF catalogue of existing data sources listing the metric, observation platform, location, start and end of time series and frequency of observations
3. Data analysis (within limits of existing data) to inform national-scale marine ecosystem health input to the 2016 SoE report. Specific 2013 output:
   1. continue to progress a national analysis of existing data sources listing the metric, observation platform, location, start and end of time series and frequency of observations (in conjunction with AODN and IMOS)
4. Develop and where possible apply new and existing statistical models for multivariate trend and change point detection with and without observation error: Potential outputs in 2013 (completion of some outputs may be deferred until 2014 depending on the degree of technical challenges to be overcome):
   1. Existing models: Application of GLM and GLMM methods to the Reef Life Survey, Long Term Reef Monitoring Programme (LTRMP) and/or Temperate Reef Monitoring Data (TRMD) set.
   2. New models: development and application of compound processes for discrete and continuous variables.
   3. Empirical indicators, new models: possible application of new compound process models for modelling size spectra.
   4. Existing models: application of state space models (incorporating detection probability) to LTRMP data sets.
   5. Methods review: what are the data requirements for more complex hierarchical models and/or state space models?
   6. New models: consider the application of Markov Decision Processes to statistical process control analysis.
   7. New models: consider the application of parametric and non-parametric points over threshold (exceedance) models for Statistical Process Control
   8. New models: development and application of regime switching and change point models.

Activities and Milestones in 2013

Project milestones in 2013:

1. Ongoing milestone: Catalogue of existing data sources and their relevance to KEFs and/or CMRs in the south east marine planning region;
2. Ongoing milestone: Identification and prioritisation of key data gaps for a sustained national marine environmental monitoring;
3. Ongoing milestone: Development and where possible application of new and existing statistical models for multivariate trend and change point detection with and without observation error;
4. New milestone: Progress report on results to date including a presentation to SEWPaC to provide opportunity for feedback and input to final year’s research (for projects 1 and 2); and
5. New milestone: Report list of proposed publications and authors (June 2013).

Expected Benefits

The short, medium and long term benefits of Project 1 (in conjunction with Project 2) are as follows:

Short term: Greater understanding and alignment between institutional and government department environmental information needs and priorities

Medium term: Greater understanding of the logistical and statistical resources required to monitor the effectiveness of individual CMRs and a network of CMRs.

Medium term: Prioritisation of future infrastructure needs to meet the objectives of a sustained national environmental monitoring strategy for the South East Commonwealth Marine Reserve network and ecosystem health assessment of Australia’s EEZ.

Long term: Statistical and logistical foundation for the first assessment of marine ecosystem health of Australia’s EEZ.

Long term: Status and trend reporting for SoE 2016 from relevant extant datasets.

Key Risks in 2013 and Risk Management Strategy

1. Unavailability of national data sets: managed by trialling new and existing methods on datasets that are currently held by NERP research team
2. Not meeting milestones: managed by regular project progress meetings

Research Questions (Environment Portfolio)

Project 1 contributes to the following NERP research questions

2.1 How can we improve our capacity to understand, monitor and evaluate ecosystem function/health, including by using predictive models/tools, to ensure:

* key ecosystem functions can be understood and maintained through effective management
* threats to values, such as biodiversity or important ecosystem functions, can be detected
* trends can be monitored and tipping points/thresholds, that indicate species, population or ecosystem collapse, can be predicted, and
* which management actions are effective and timely, can their success be measured over time, and how can their relevance/effectiveness be evaluated as the environment changes (i.e. use of adaptive management systems)?

2.2 What are practical models for incorporating complex ecosystem science into management, e.g. through managing key drivers such as keystone species, core processes and human activities?

* What are the minimum data needed to determine the health of an ecosystem?

4.2 As land and marine use intensifies, how can we improve approaches to strategic environmental assessments of nationally important areas and regions?

4.4 How can Australia’s marine environment be best managed to maximise ecosystem health, ecosystem resilience, and ecosystem goods and services?

Policies and Programs

1A Biodiversity Conservation;

1E Maintaining/building a Marine reserve systems and protected areas;

B1 Environmental Regulation;

B3 Protection and Management of Heritage Values;

C1 Antarctic Science and Environmental Management.

6A Environmental Reporting – SOE reporting, Marine Environmental Reporting Framework

Key Events and Dates in 2013

Whole of project progress meeting in April/March 2013

Whole of NERP hub meeting in late 2013.

Presentation of progress for discussion with SEWPaC late 2013

End Users

Marine Division – contacts including Ilse Kiessling, Barbara Musso, Belinda Jago

SOE Reporting – Kathleen Coulson

Australian Antarctic Division - Martin Riddle & Andrew Constable

NPEI – TBD

Links and Dependencies to other Hubs and projects

Collation of available data relevant to the operational objectives of the Southeast Marine Reserve Network is contingent on these objectives being identified by SEWPaC as part of Theme 2 Project 1.

Start Date and Duration (in months)

July 2011, 42 months

Project 1.2: Analysis of approaches for monitoring biodiversity in Commonwealth waters

Continuing project

Project Leader: Keith Hayes

Organisation: CSIRO

Total NERP Budget (ex GST): $1,744,224

2013 NERP Budget (ex GST): $397,092

Total Non-NERP Cash/In-Kind Budget (ex GST): $2,345,935

2013 Non-NERP Cash/In-Kind Budget (ex GST): $527,588

Project Description

Project 2 will:

1. Design, implement and test ways to integrate new and existing survey and monitoring methods at three locations: the shelf of the Flinders CMR in the Southeast IMCRA transition bioregion, the coral/kelp KEF to the east of the Houtman-Abrolhos islands and the east-coast shelf KEF adjacent to the Solitary Islands marine reserve,
2. Access existing CMR (and other MPA) monitoring datasets from the partners for the Southeast Marine Bioregion (i.e. Freycinet, Huon, Tasman Fracture and Zeehan CMRs and Maria Island MPA) and thereby attempt to extend the spatial coverage of survey and monitoring methods to include all depths and habitat-types contained in the Commonwealth Southeast Marine Reserve Network (excepting the abyssal plain),
3. Use these new and existing datasets to examine: a) economic and logistical issues, such as the costs and benefits (developed by Theme 2 project 1) of the survey methods, and the use of regular versus event-initiated surveys; and, b) scientific and statistical survey design issues, such as the choice of biodiversity metric and seasonal variation in species group indicators of ecological health, and their impact on the variance and bias of survey data and hence our ability to reliably detect change with these data.

Key Researchers

The key researchers in Project 2, together with their institution and roles, are:

1. Keith Hayes, CSIRO - Project leader, data analysis
2. Jeffrey Dambacher, CSIRO - Qualitative modelling
3. Emma Lawrence, CSIRO, Statistician, survey design
4. Russ Babcock, CSIRO - Senior Biologist, survey methods and design
5. Rhys Leeming, CSIRO - Senior Chemist, isotope survey methods
6. Alan Williams, CSIRO - Senior Biologist, deep water survey methods and design
7. Neville Barrett, UTAS - Senior biologist, survey methods
8. Nicole Hill, UTAS, Postdoc - Survey methods and design
9. Vanessa Lucieer, UTAS - Acoustic swath mapping
10. Gary Kendrick, UWA - Senior biologist, survey methods
11. Euan Harvey, UWA - Senior biologist, survey methods
12. Scott Nichol, GA - Senior research scientist, acoustic swath mapping

Problem Statement

The commonwealth government needs to develop the capacity to undertake targeted and cost-effective data collection on a sustained basis in order to inform evaluations of marine ecosystem health and to measure the performance of the Commonwealth Marine Reserve Estate against stated objectives. Project 2 will examine the logistical and statistical issues associated with some non-extractive survey and monitoring methods that are likely to form key components of any sustained environmental monitoring strategy. The project will design, implement and test ways to integrate new and existing survey and monitoring methods at three locations: the shelf of the Flinders CMR in the South East IMCRA transition bioregion, the coral/kelp KEF to the east of the Houtman-Abrolhos islands and the east-coast shelf KEF adjacent to the Solitary Islands marine reserve. The project will also examine: a) logistical issues, such as the costs and benefits of the survey methods and the use of regular- versus event-initiated surveys; and, b) statistical issues such as the use of General Random Tessellated Stratified (GRTS) designs in relation to the determinants of a method’s power to detect change, particularly the variance and bias associated with the survey methods. Non-extractive survey and monitoring methods have recently been developed for deployment at depths that preclude divers, and for ecosystem attributes that cannot be monitored via satellite. These methods include single- and dual-head multi-beam sonar, single- and stereo-underwater video (towed behind vessels or deployed via remote or autonomous underwater vehicles) and deep, baited remote underwater video systems. Project 1 will examine the extent to which these methods, alongside other new (Nitrogen isotope assay) and existing methods, provide a suitable platform for initial survey and sustained ecological monitoring of Key Ecological Features (KEFs) and Commonwealth Marine Reserves (CMRs) in Australia’s Exclusive Economic Zone.

Outcomes

The expected outcomes of Project 2 are:

1. A considered understanding of the data requirements for managing a network of Commonwealth Marine Reserves including how to mobilise national capacity to provide the required data
2. A considered understanding of the data requirements to evaluate and report on national marine ecosystem health including how to mobilise national capacity to provide the required data (especially IMOS and NPEI)

Outputs (products and services) in 2013

Whole of project and specific 2013 outputs are:

1. An analysis of alternative approaches for monitoring biodiversity in the Commonwealth Marine Reserve network, based on scientific, economic, and logistical considerations
2. In conjunction with Project 1, a gap analysis for national ecosystem health and Southeast marine reserve network monitoring in the Commonwealth Waters, including recommendations for how to mobilise national capacity to provide the required evidence/data

Activities and Milestones in 2013

Project milestones in 2013:

1. On-going milestone: Successful implementation of Houtman-Abrolhos KEF survey
2. Ongoing milestone: Analysis of data from Phase I and II of the Flinders CMR survey, including
   1. power analysis for specific objectives (shelf Baited Remote Underwater Videos – BRUVs – and Stereo Towed Video – STV – on the slope)
   2. analysis of Generalised Random Tessellated Squares(GRTS) based methodology for STV transects, and shelf-wide inventory, and a comparison of the inference that can be drawn both between continuous swath-mapping inventory and GRTS-based inventory
   3. continued inventory of shelf and slope habitats in the Flinders CMR, include additional swath mapping of new areas.
3. Ongoing milestone: Analysis of data from Solitary Islands survey, including
   1. autocorrelation and power analysis for specific objectives (BRUVs)
   2. analysis of GRTS based methodology for AUV and STV transect (broad grids), and a comparison of the inference that can be drawn both between these two pieces of equipment, and between the use of GRTS versus ad-hoc survey designs;
   3. comparison of video monitoring techniques, specifically the use of oblique forward looking mono/stereo videos on STV and AUVs;
   4. Continued inventory of shelf habitats in the Solitary islands KEF, include additional swath mapping of new areas
4. New milestone: Progress report on results to date including a presentation to SEWPaC to provide opportunity for feedback and input to final year’s research (for projects 1 and 2); and
5. New milestone: Report list of proposed publications and authors (June 2013).

Expected Benefits

The short, medium and long term benefits of Project 2 (in conjunction with Project 1) are as follows:

Short term: Greater understanding and alignment between institutional and government department environmental information needs and priorities

Medium term: Greater understanding of the logistical and statistical resources required to monitor the effectiveness of individual CMRs and a network of CMRs.

Medium term: Prioritisation of future infrastructure needs to meet the objectives of a sustained national environmental monitoring strategy for the South East Commonwealth Marine Reserve network and ecosystem health assessment of Australia’s EEZ.

Long term: Statistical and logistical foundation for the first assessment of marine ecosystem health of Australia’s EEZ.

Long term: Status and trend reporting for SoE 2016 for relevant extant datasets.

Key Risks in 2013 and Risk Management Strategy

1. Weather prevents successful completion of field work: Managed by providing contingency funds to allow vessels to stay on station during periods of bad weather
2. Not meeting milestones: managed by regular project progress meetings

Research Questions (Environment Portfolio)

Project 1 contributes to the following NERP research questions

2.1 How can we improve our capacity to understand, monitor and evaluate ecosystem function/health, including by using predictive models/tools, to ensure:

* key ecosystem functions can be understood and maintained through effective management
* threats to values, such as biodiversity or important ecosystem functions, can be detected
* trends can be monitored and tipping points/thresholds, that indicate species, population or ecosystem collapse, can be predicted, and
* which management actions are effective and timely, can their success be measured over time, and how can their relevance/effectiveness be evaluated as the environment changes (i.e. use of adaptive management systems)?

2.2 What are practical models for incorporating complex ecosystem science into management, e.g. through managing key drivers such as keystone species, core processes and human activities?

* What are the minimum data needed to determine the health of an ecosystem?

4.2 As land and marine use intensifies, how can we improve approaches to strategic environmental assessments of nationally important areas and regions?

4.4 How can Australia’s marine environment be best managed to maximise ecosystem health, ecosystem resilience, and ecosystem goods and services?

Policies and Programs

Commonwealth Marine Reserve Network Management Plans

Monitoring for Marine Bioregional Plans

SOE 2016

Key Events and Dates in 2013

Whole of project progress meeting in April/March 2013

Whole of NERP hub meeting in late 2013.

Presentation of progress for discussion with SEWPaC late 2013

End Users

Marine Division – contacts including Ilse Kiessling, Barbara Musso, Belinda Jago

SOE Reporting – Kathleen Coulson

Australian Antarctic Division - Martin Riddle & Andrew Constable

Links and Dependencies to other Hubs and projects

Monitoring benefits will be addressed in Theme 2 Project 1.

Start Date and Duration (in months)

July 2011, 42 months

|  |
| --- |
| Theme 2: Supporting Management of Marine Biodiversity  This theme will provide methods and tools to value marine biodiversity, identify threats and cumulative impacts, and evaluate and provide guidance on the effectiveness of management tools to meet conservation objectives in a multi-jurisdictional and multi-sectoral environment. Tools and options will be designed to add value to existing management processes; including implementing marine bioregional plans, monitoring the Southeast Marine Reserve Network, and assessing and managing listed species under the EPBC Act. Our goal is to provide scientific advice that can be used by conservation and resource management agencies, thus supporting a shared understanding of the environmental and economic values, and options for monitoring and management.  Theme Leader: Tony Smith  Organisation: CSIRO  Total NERP Budget (ex GST): $2,499,212  2013 NERP Budget (ex GST $1,037,931  Total Non-NERP Cash/In-Kind Budget (ex GST): $4,209,393  2013 Non-NERP Cash/In-Kind Budget (ex GST): $1,212,578 |

Project 2.1 – Integrating social, economic and environmental values

Continuing project

*Project Leader:* Sarah Jennings

*Organisation:* University of Tasmania

*Total NERP Budget (ex GST): $814,506  
2013 NERP Budget (ex GST): $243,912*

*Total Non-NERP Cash/In-Kind Budget (ex GST): $1,177,693  
2013 Non-NERP Cash/In-Kind Budget (ex GST): $370,443*

Project Description

This project will develop socio-economic approaches to valuing biodiversity to support implementation of management objectives in the CMR network management plan, and approval and permitting of new infrastructure developments. The project will have three main components: 1) to assist development of performance indicators in the Commonwealth Southeast Marine Reserve Network; 2) to develop options for using incentives to increase stewardship of CMRs, especially in support of monitoring and compliance in multiple-use zones; and 3) provide biodiversity valuations to support decisions on new approvals (in areas to be determined in consultation with the Department).

An early emphasis will be on working with the Marine Division to understand management objectives for the Southeast CMR network management plan, with the aim of providing quantifiable measures that can be used to compare the efficacy and cost of different options to monitor and manage marine biodiversity, including assessing the data needs. The initial task will use a variety of approaches in working with the Marine Division to develop quantitative performance indicators for managing the Southeast CMR network. This is an essential component of developing a sustained monitoring blue-print for this network, and this project will developed jointly with the Marine Division and Theme 1 Project 1.

The second component will be to work with the Marine Division to identify management options and incentives that would support a sharing of responsibility and stewardship of the CMR network, with an initial focus on the Southeast. The goal of this work will be to assess how best to involve marine users in the monitoring and performance assessment of CMRs, especially multiple-use zones, and how alternative approaches to involving marine users affects their support, stewardship and compliance. This research has the potential to be extended to also inform how existing users of the marine environment would respond to management options likely to be considered in implementing marine bioregional plans more generally. A focus for this extension will be determined in consultation with the Department.

The third component will be to derive and compare economic values for marine biodiversity and habitats, at different scales (eg. local and regional) and to different stakeholders. This will support development of monitoring plans, the comparison of alternative management options, and decisions associated with the approval and permitting of new marine developments, particularly in the oil and gas industry. Early discussions will be held with the Department to provide a geographic focus for this research.

Key Researchers

1. Sean Pascoe (CSIRO) – social and economics
2. Olivier Thebaud (CSIRO) – social and economics
3. Michael Burton (UWA) – social and economics
4. Dave Pannell (UWA) – socio-economics
5. Abbie Rogers (UWA) - Post doctoral researcher – socio-economics
6. Satoshi Yamazaki (UTAS) - social and economics
7. Sarah Jennings (UTAS) - - social and economics
8. Samantha Parades (CSIRO – volunteer fellow) and Jean-Baptiste Marre (PhD student - QUT) are also contributing to project outputs.

Problem Statement

The key research questions to be addressed are how to value and monitor biodiversity in a quantitative fashion that will support managers in including implementing marine bioregional plans and permitting new developments.

Outcomes

This project will develop socio-economic approaches to valuing biodiversity to support implementation of management objectives in the CMR network management plan, and approval and permitting of new infrastructure developments. The project will have three main components: 1) to assist development of performance indicators in the Commonwealth Southeast Marine Reserve Network; 2) to develop options for using incentives to increase stewardship of CMRs, especially in support of monitoring and compliance in multiple-use zones; and 3) provide biodiversity valuations to support decisions on new approvals (in areas to be determined in consultation with the Department).

Additional specification of outcomes based on subsequent discussions with SEWPaC:

The consistent and effective monitoring of CMR networks in Australia leading to improved allocation of monitoring effort spatially and temporally (Component 1).

Improved resource allocation and management due to a more comprehensive knowledge of how incentives can be used to promote the achievement of marine conservation goals (Component 2a).

A set of guidelines for applying offsets in the marine environment, particularly where broad environmental and ecosystem effects are anticipated, which reflects current best practice national and international evidence/experience, is based on sound economic principles and has social license (Component 2b)

Improved resource allocation and management due to a more comprehensive knowledge of individual and social values at a variety of scales for marine biodiversity and other conservation outcomes, and better understanding of how these values are formed and of how information is used by decision makers (Component 3).

Outputs (products and services) in 2013

Activity 1: project team members will work with SEWPaC and Theme 1 to develop and apply a framework and set of guiding principles for identifying pressures, objectives and performance indicators in marine reserve networks, and for allocating monitoring resources and for triggering appropriate management responses:

* Paper mapping possible social, economic and ecological indicators to offshore marine reserve objectives, and developing a methodology for prioritising these in a cost-effective manner.

Activity 2a: Identification of the current set of incentives created under existing conservation legislation relating to the extractive industries; identification of possible incentive based mechanisms that may foster marine stewardship by these industries and the broader community:

Overview paper on use of market-based instruments to promote sustainability and stewardship both on and off reserve, and across a range of activities.

Paper detailing the potential for market-based incentives to improve environmental performance in the marine mining and dredging sector.

Activity 2b: a case study illustrating the application of the marine offset framework and a non-market valuation study to explore a range of potential issues associated with social licence in the use of offsets, including where the offset occurs (local, national, international) and whether the offset is associated with, for example, a purposeful change caused by industry development or as a contingency to the possibility of accidental damage:

Conference paper on the economics of offsets.

Report synthesising outcomes of workshop on best practice in offsets design and valuation (run in association with AARES 2013).

Activity 3: a series of non-market valuation studies, each of which will describe scenarios in ecologically relevant ways and which will provide information that is meaningful for policy development and/or implementation. The suite of projects will be designed to allow comparison of values for marine biodiversity and habitats, at different scales (e.g. local and regional) and to different stakeholders. One of the non-market valuation studies will support Activity 2 by exploring issues related to social licence and marine offsets. Another component will explore the way in which decision-makers use various types of information about marine and coastal values:

Draft report describing the results of the pilot study investigating public values associated with alternative marine offset mechanisms.

Draft report on primary offset social licence case studies.

Draft report on the use and influence of economic valuation applied to coastal and marine ecosystems in decision-making

Activities and Milestones in 2013

| Date | Activity | Milestone | Department contact | Project contact |
| --- | --- | --- | --- | --- |
| December 2012 | Identification of case studies focus and scope/ working group members/ and of key meeting dates for 2013 |  |  | Sarah Jennings |
| January | Preparation for offsets workshop |  |  | Sean Pascoe |
| January - June | Case studies as per agreed activities and milestones |  |  |  |
| February 5th |  | Joint hosting of offsets workshop  Conference paper on economics of offsets |  | Sean Pascoe |
| January - March | Analysis of pilot offset valuation survey data |  |  | Michael Burton/ Abbie Rogers |
| April 30th |  | Report based on offsets workshop and other desktop work to date |  | Sean Pascoe/ Satoshi Yamazaki |
| June 30th |  | Report on outcomes of case studies, including recommendations for further case studies and/or project work  Submit paper on market-based instruments overview  Draft report for use of valuation information case study |  | Case study leaders/ Sarah Jennings  Sean Pascoe  Olivier Thebaud |
| April-August | Design and implementation of primary offset valuation surveys |  |  | Michael Burton/ Abbie Rogers |
| 30 June 2013 |  | Draft report for pilot offset valuation case study |  | Michael Burton/ Abbie Rogers |
| September | Synthesis of learnings to date to inform EOP & Guidelines review |  |  | Sarah Jennings/ Olivier Thebaud |
| October |  | Submission to EOP & Guidelines review |  |  |
| Sep-December | Analysis of primary offset valuation survey data |  |  | Michael Burton/ Abbie Rogers |
| 31 December |  | Draft report for primary offset valuation case study |  | Michael Burton/ Dave Pannell/ Abbie Rogers |

Expected Benefits

The key benefits produced in this period will be a strengthened knowledge set upon which to base the implementation of marine offsets, particularly where activities involve complex ecosystem and environmental effects on market and non-market marine values; general and activity specific information and guidance about the use of incentives in achieving marine resource stewardship and sustainability; identification of objectives and priorities related to offshore marine reserves, and clear guidance as to the selection of social, economic and ecosystem indicators. Scoping of further activity in all areas, including additional non-market valuations and economic experiments, will strengthen engagement during the 2013 period but the benefits from these components will be derived in the following time period (2014).

Key Risks in 2013 and Risk Management Strategy

The key risk to the project is failure of SEWPaC staff to engage meaningfully with the research, and as a consequence delay the research itself, and possibly reduce the uptake of the research when completed. We are attempting to mitigate this risk by furthering engagement wherever possible, and in addition, to ensure that core research can be started independent of engagement. This has included strategies for ensuring the initial offset pilot study has a WA focus, that the offsets workshop is linked to an external organisation, and a refocusing of the monitoring work, so that it has greater links within the Hub.

A series of feedback actions was agreed with the Department at the August 22nd 2012 workshop to further engagement. Specifically:

Feedback to Hub on the draft Offsets Research Proposal within a week

Underlying principles and relevant components of DSEWPaC’s developing offsets policy provided to Hub as soon as practical. Update Hub proposal in response to this.

Face to face discussions to scope project (e.g. ½ day workshop with at least Sarah Jennings, Ilse Kiessling, James Tresize and Felicity McClean within a month)

Research Questions (Environment Portfolio)

The project specifically addresses Question 1. Values: understanding the major drivers for maintaining biodiversity and Question 5. Biodiversity markets and the role of conservation incentives.

Policies and Programs

1A Biodiversity Conservation – Environmental Stewardship Program – development of a metric for conservation value

1E Maintaining/building a Marine reserve systems and protected areas – Understand the values, perception and attitudes of the community and stakeholders to the establishment and management of the Commonwealth marine reserve estate to determine appropriate levels of resource allocation/engagement regarding compliance, enforcement and education;

B1 Environmental Regulation – promote a cooperative approach to protect and manage the environment; EPBC statutory and regulatory decision making in marine areas; Use of Environmental Offsets under the EPBC Act

Key Events and Dates in 2013

Offsets workshop held in conjunction with AARES annual conference, Sydney (February 2013)

Project meeting to further research progress and collaboration (mid 2013), including to consider broader focus on offsets across this project and others in the Hub providing input from social, economic and ecological components

Hub workshop (late 2013)

End Users

Activity 1: Ilse Kiessling, Barbara Musso, Belinda Jago

Activity 2: Ilse Kiessling, James Tresize, Felicity McLean

Links and Dependencies to other Hubs and projects

This project is developing links with projects 2 and 3 within the Theme. These are bilateral: advice is being drawn on attribute definition for the valuation exercises, and values derived from these projects may be integrated with the outcomes of those projects.

The monitoring component will also link with Theme 1, to include additional ecological scope. There are no anticipated limiting dependencies.

Start Date and Duration (in months)

July 2011, 42 months

Project 2.2 - Integrating threats, values and assets for management

Continuing project

Project Leader: Piers Dunstan

Organisation: CSIRO

Total NERP Budget (ex GST): $411,957

2013 NERP Budget (ex GST): $132,447

Total Non-NERP Cash/In-Kind Budget (ex GST): $411,960

2013 Non-NERP Cash/In-Kind Budget (ex GST): $132,477

Project Description

The first component of this project is to identify the relevant risks and impacts from human activities and map their spatial distribution at the national scale. A significant amount of work has already been done to identify individual threats. The project will bring together existing data and information on key threats to marine biodiversity –CERF Marine Biodiversity Hub, DSEWPaC Marine Bioregional Planning, DSEWPaC/CSIRO Marine Indicators Threat Mapping Project, fisheries risk assessment, NPEI, IMOS and NOIS – to provide a threat assessment that can be prioritised to meet the Department’s needs in implementing marine bioregional plans. Additional important threats including SST anomalies, marine debris and invasive species need quantification. There is no agreed method to quantify cumulative threats and impacts and this project will explore several methods, testing them against independent data to support the Department’s management of cumulative threats to marine biodiversity. Improved methods for mapping cumulative threats will be used to provide threat and impact layers nationally.

The information from threats and impacts will be integrated with improved knowledge on socio-economic values from Project 1 and improved understanding of biodiversity assets from Theme 3 to support implementation of marine bioregional plans. The project will identify interactions between threats, biodiversity values and biodiversity assets and develop a geographic focus based on the Marine Bioregional Plans and in discussion with the Department. It will result in an improved understanding how information and analyses from a variety of sources (including other projects and themes in this Hub) can be integrated to support their decision making. A key priority for the task is to assemble the expertise in EBM, EBFM and spatial planning within the Hub and CSIRO to formulate options and opportunities that build on existing work.

Additional Information:  
The project is also responsible for developing the Data management plan for the Hub. Data generated by the Hub will be made available through AODN to enable easy use by DSEWPaC and researchers in other Hubs. A workflow will be developed to enable hub researchers to easily make data available on AODN. The project will identify tools for metadata authoring and identify the barriers for data management for researchers.

Key Researchers

1. Piers Dunstan, CSIRO Marine and Atmospheric Research – Mathematical ecologist
2. Scott Foster, CSIRO Mathematic and Information Services - Statistician
3. Michael Fuller, CSIRO Marine and Atmospheric Research - Geographer & Data Management

Problem Statement

The Department needs to be able to manage threats to biodiversity within Australia’s EEZ. To achieve this requires an understanding of specific threats to biodiversity assets and the cumulative impact of those threats on biodiversity. Different social- economic values will influence how those threats are considered.

Outcomes

1. Short term: A clear understanding of DSEWPaC’s needs for cumulative threat analysis and an understanding of how threats, values and assets are linked. DSEWPaC will have enhanced threat maps that will map currently missing threats including climate change, marine debris and invasive species.
2. Medium term: DSEWPaC will be able to better assess the treats to marine biodiversity and the impacts of cumulative activities. The department will have improved information to make decisions on biodiversity management.
3. Long term: DSEWPaC will be better able to assess threats to marine biodiversity. There will be an improved understanding of cumulative impacts across sectors. The department will be able to assess the interaction between threats, biodiversity values and biodiversity assets.

Outputs (products and services) in 2013

1. Tools and approaches to enhance SEWPaCs and Australia’s understanding of the links between threats and biodiversity assets.
2. Improved maps of the distribution of known threats to biodiversity and the overlap between threats and assets. Tools to understand the cumulative impacts of multiple threats to biodiversity.
3. Improved data management allowing DSEWPaC rapid and increased access to Hub data and Research.

Activities and Milestones in 2013

Milestone 1: Initial data management workflow completed, supplied to data contacts for each project for testing (January 2013);

Milestone 2: Data management workflow and metadata tools supplied to all Hub researchers (June 2013);

Milestone 3: Report list of proposed publications and authors (June 2013); and

Milestone 4: Cumulative threat models completed and initial efforts to integrate threats, values and biodiversity assets to address management objectives completed (December 2013).

Expected Benefits

This project will provide:

an improved understanding of the links between threats, values and biodiversity.

improved tools for understanding cumulative threats and how these threats overlap biodiversity assets.

improved tools for assessing multiple use objectives.

improved data management for the Hub

Key Risks in 2013 and Risk Management Strategy

1. Insufficient communication with other themes and DSEWPaC caused by poor links leading to the project goals being inadequately specified or resourced. The Hub Director and Deputy Director have agreed with the Marine Division SES to meet three times a year to help keep projects and their inputs timely and relevant to alleviate this risk.
2. Inability to link threats to biodiversity caused by poor data leading to inability to compile cumulative risk. To alleviate this risk an initial scoping will be used to identify examples with sufficient data.

Research Questions (Environment Portfolio)

1.3 What is the fairest and most cost-effective mix of policy tools to conserve recognised biodiversity values (e.g. land acquisition, covenants, stewardship payments, regulation, education) at both national and regional scales?

2.1 How can we improve our capacity to understand, monitor and evaluate ecosystem function/health, including by using predictive models/tools, to ensure:

* key ecosystem functions can be understood and maintained through effective management
* threats to values, such as biodiversity or important ecosystem functions, can be detected
* trends can be monitored and tipping points/thresholds, that indicate species, population or ecosystem collapse, can be predicted, and
* which management actions are effective and timely, can their success be measured over time, and how can their relevance/effectiveness be evaluated as the environment changes (i.e. use of adaptive management systems)?

2.2 What are practical models for incorporating complex ecosystem science into management, e.g. through managing key drivers such as keystone species, core processes and human activities?

What are the minimum data needed to determine the health of an ecosystem?

2.3 What are the advantages and disadvantages for biodiversity of an ecosystem management approach? How can emerging genetic technologies and analysis of past management practices assist our understanding of ecosystems?

2.4 In environments such as marine areas, where comparatively little is known about biodiversity and ecosystem processes, what can we do to strengthen and validate the use of surrogates for identifying biodiversity for protection?

3.7 How can we best manage those parts of the Commonwealth Marine Area outside Marine Protected Areas (MPAs) to ensure values of MPAs are not compromised by external threats?

3.9 How can the different threats to biodiversity be prioritised for management and investment purposes, and how can cumulative threats be assessed?

4.4 How can Australia’s marine environment be best managed to maximise ecosystem health, ecosystem resilience, and ecosystem goods and services?

Policies and Programs

1A Biodiversity conservation;

1B Protection of threatened species & communities;

1E Maintaining a marine reserve system;

1G Biodiversity research;

B1 Environmental regulation;

B3 Protection and management of heritage values.

Key Events and Dates in 2013

Project meeting with SEWPaC (mid 2013)

Hub Meeting (late 2013)

End Users

Ilse Kiessling, Director Marine Policy (Domestic), Marine Division SEWPaC

Barbara Musso, Director West Management Planning, Marine Division, SEWPaC

Belinda Jago, Director East Management Planning, Marine Division, SEWPaC

Felicity McClean, A/g Director, Offshore Petroleum, EACD, SEWPaC

David Holt, Mike Maslen, ERIN, SEWPaC

Ian Snape, Martin Riddle and Andrew Constable, AAD

Roger Proctor, Director AODN

Links and Dependencies to other Hubs and projects

Collaboration with Theme 3 project 2 on national biodiversity maps & threats

Collaboration with Theme 2 project 1 using identified biodiversity values

Collaboration with Theme 1 project1 developing data management tools, shared datasets and methods of analysis.

Collaboration with Tropical Hub, Theme 2 program 5, Cumulative impacts on benthic biodiversity

Start Date and Duration (in months)

July 2011, 42 months

Project 2.3 – Task 1 - Landscape approaches to managing high conservation priority species

Continuing project

Project Leader: Tony Smith

Organisation: CSIRO

Total NERP Budget (ex GST): $318,350 (Tasks 1 and 2)

2013 NERP Budget (ex GST): $74,612 (Tasks 1 and 2)

Total Non-NERP Cash/In-Kind Budget (ex GST): $446,984 (Tasks 1 and 2)

2013 Non-NERP Cash/In-Kind Budget (ex GST): $119,599 (Tasks 1 and 2)

Project Description

This project focuses on integrated management solutions to key threatened groups and habitats, including on and off reserve management. It comprises 2 tasks focused at a range of landscape scales to deliver improved management arrangements to address high priority conservation values identified under the EPBC Act.

Task 1: Supporting management of high conservation priority species: This task will develop new approaches to manage high conservation priority species at a landscape scale in a multi-jurisdictional and multi-sectoral environment. A significant fraction of Australia's chondrichthyan fauna is at risk from a variety of human uses, particularly fishing. The group contains many slow-growing vulnerable species, including some of high concern to the Marine Division, so this group provides a good test case for developing these methods. Landscape approaches to management have been identified as a primary tool for protection, but chondrichthyans are widely distributed and cannot be fully protected in all parts of their range. The task will identify and test strategies for supporting management of chondrichthyans both on and off reserve. What combination of spatial and other management strategies can best protect this group, including more mobile species, while maintaining access for ocean users? This issue will be addressed at national and regional scales. Delivery outputs will include recommendations for improved guidelines for managing high conservation priority species on and off reserve and will seek to identify complementary arrangements between conservation and resource management agencies, particularly fisheries.

Task 2: see following project report (Roland Pitcher)

Key Researchers

1. Ross Daley, CSIRO – shark and ray expert
2. Penny Johnson, CSIRO – Atlantis ecosystem modelling
3. Tony Smith, CSIRO – project leader
4. Helen Webb, CSIRO – ecological risk assessment

Problem Statement

This task will develop new approaches to manage high conservation priority species at a landscape scale in a multi-jurisdictional and multi-sectoral environment. A significant fraction of Australia's chondrichthyan fauna has been identified as being at risk from a variety of human uses, particularly fishing. Spatial management has been identified as a primary tool for protection, but sharks and rays are widely distributed and cannot be fully protected in all parts of their range. What combination of spatial and other management strategies can best protect this group while maintaining access for ocean users?

Additional information:   
The premise underlying this project is that conservation values are not distributed uniformly across the EEZ, but that high conservation value species and habitats tend to be aggregated in “hot spots”. This project aims to develop improved understanding of the location of such areas and the conservation values they contain.

Outcomes

1. New Short term: improved understanding of the location of high conservation value areas and the conservation values they contain – for this project, focusing on the shark and ray fauna of SE Australia.
2. New Short term: improved information to assist Marine Division work on Biologically Important Areas for listed species (as defined in Marine Bioregional Plans)
3. New Medium term: identification and analysis of management options to improve conservation outcomes for sharks and rays in SE Australia – both on reserve and off reserve
4. New Medium term: improved information to assist EACD for assessing risk and evaluating potential offsets
5. New Long term: improved protection for the chondrichthyan fauna in SE Australia
6. Existing Long term: A more efficient regulatory environment for ocean users and better protection for key species. Better links with key management agencies such as AFMA.

Outputs (products and services) in 2013

1. Refined species distribution maps for sharks and rays in SE Australia
2. Locations of biodiversity hot spots for sharks and rays in SE Australia
3. Nursery, foraging and corridor areas for selected key species
4. Preliminary exploration of options for on and off reserve management of sharks and rays in SE Australia

Activities and Milestones in 2013

Milestone 1: Summary of species distributions completed including incorporation of new data (June 2013);

Milestone 2: Report list of proposed publications and authors (June 2013).

Milestone 2: Report on preliminary investigation of on and off reserve management options using Atlantis (October 2013)

Milestone 3: Methods for mapping nursery, foraging and corridor locations completed; example plots of species-specific maps of key areas (December 2013)

Expected Benefits

Benefits will include easier access to existing information to help make decisions about protecting sharks and rays that take into account existing and new management arrangements.

Additional information: Activities and outputs in 2013 should lay the foundation for the more specific advice on management options to be delivered in June 2014.

Key Risks in 2013 and Risk Management Strategy

This project aims to improve understanding of the distribution of the temperate chondrichthyan fauna of SE Australia, and to provide more precise information on area and habitat use for selected species. Analyses will be based on existing biological and environmental data.

Risk 1: existing data are inadequate to improve the predictions of species distributions. This data risk can be managed by supplementing existing data with expert knowledge from chondrichthyan experts. (The project has already identified a range of such experts and held a first workshop with them to identify sources of knowledge).

Risk 2: methods to improve predictions of area use by selected species have not yet been developed. This methodological risk can be managed by involving additional experts in statistical and modelling methods to advise on the methods needed. (Project team member Ross Daley has already demonstrated the application of similar methods to analysis of gulper shark movement and area use).

Research Questions (Environment Portfolio)

1.1 Are all threatened species equally valuable in a genetic and ecological context?

1.2 When is it too late to recover a species?

1.4 What are the best mechanisms for sharing the costs of management between the various beneficiaries?

2.1 How can we improve our capacity to understand, monitor and evaluate ecosystem function/health, including by using predictive models/tools, to ensure:

* key ecosystem functions can be understood and maintained through effective management
* threats to values, such as biodiversity or important ecosystem functions, can be detected
* trends can be monitored and tipping points/thresholds, that indicate species, population or ecosystem collapse, can be predicted, and
* which management actions are effective and timely, can their success be measured over time, and how can their relevance/effectiveness be evaluated as the environment changes (i.e. use of adaptive management systems)?

2.2 What are practical models for incorporating complex ecosystem science into management, e.g. through managing key drivers such as keystone species, core processes and human activities?

* What are the minimum data needed to determine the health of an ecosystem?

2.3 What are the advantages and disadvantages for biodiversity of an ecosystem management approach? How can emerging genetic technologies and analysis of past management practices assist our understanding of ecosystems?

3.1 How do we manage ecosystems and regions for ecological resilience:

how is resilience maintained, restored and monitored?

3.4 How can the biodiversity value of protected areas be improved through a system of establishing adjacent buffering areas?

3.7 How can we best manage those parts of the Commonwealth Marine Area outside Marine Protected Areas (MPAs) to ensure values of MPAs are not compromised by external threats?

3.9 How can the different threats to biodiversity be prioritised for management and investment purposes, and how can cumulative threats be assessed?

4.2 As land and marine use intensifies, how can we improve approaches to strategic environmental assessments of nationally important areas and regions?

4.4 How can Australia’s marine environment be best managed to maximise ecosystem health, ecosystem resilience, and ecosystem goods and services?

Policies and Programs

Q2.1.2: Threats to biodiversity values can be detected

Q2.1.3: Trends can be modelled and predicted

Q2.1.4: Which management actions are effective and can be evaluated

Q3.7: How can off-reserve areas be managed to ensure values of biodiversity, and MPAs, are not compromised by regional & external threats?""

Q3.9 How can the different threats to biodiversity be prioritised for management and investment purposes, and how can cumulative threats be assessed?

Q4: Inform decisions related to sustainable use by managers having access to integrated assessments of cumulative effects of uses

Q4.1 How do productive marine uses impact on biodiversity?

Q4.4 How can Australia’s marine environment be best managed to maximise ecosystem health, ecosystem resilience, and ecosystem goods and services?"

Key Events and Dates in 2013

Joint Project Meeting with SEWPaC and AFMA (mid 2013)

Hub Meeting (late 2013)

End Users

Ilse Kiessling, Director Marine Policy (Domestic), Marine Division SEWPaC

Nathan Hanna, Director Sustainable Fisheries, Marine Division SEWPaC

Felicity McLean, A/g Director, Offshore Petroleum Section, EACD, SEWPaC

Shaneen Coulson, Director Species Listing Section, Wildlife Branch, Heritage and Wildlife Division, SEWPaC

Beth Gibson, AFMA

Nick Rayns, AFMA

Links and Dependencies to other Hubs and projects

There will be important links between this Project and Project 2.3.2 that is focusing on benthic biodiversity in the same region (SEMR). Potentially the improved understanding of benthic habitats from the latter project can help inform species distribution and habitat use for sharks and rays. There will be links to Project 2.2 for data provision (human use) and also data management (storage of and access to map products). Outputs from Project 2.3.1 can also inform monitoring strategies for the SE MRN (Project 2.1).

Start Date and Duration (in months)

July 2011, 42 months

Project 2.3 - Task 2 - Landscape approaches to managing high priority conservation values: supporting management of marine benthic biodiversity

Continuing project

Project Leader: Roland Pitcher

Organisation: CSIRO

Total NERP Budget (ex GST): $318,350 (Tasks 1 and 2)

2013 NERP Budget (ex GST): $74,612 (Tasks 1 and 2)

Total Non-NERP Cash/In-Kind Budget (ex GST): $446,984 (Tasks 1 and 2)

2013 Non-NERP Cash/In-Kind Budget (ex GST): $119,599 (Tasks 1 and 2)

Project Description

This project focuses on integrated management solutions to key threatened groups and habitats, including on and off reserve management. It comprises 2 tasks focused at a range of landscape scales to deliver improved management arrangements to address high priority conservation values identified under the EPBC Act. *(See Task 1 project report in previous section – Tony Smith.)*

Task 2: Supporting management of marine benthic biodiversity: Considerable information has now accumulated on benthic biodiversity and human uses that interact with the seabed, including detailed maps in some regions. It is known that some uses are a potential threat to benthic biodiversity, but it is not known how these threats may interact. What combination of spatial and other management strategies can protect benthic biodiversity while maintaining access for ocean users now and in the future? This task has strong links to biodiversity valuation in Project 1 of this theme, and monitoring in Theme 1. The landscape approach being taken will also lead to complementary and competing management options with Task 1 that will need to be resolved as part of these tasks.

Additional Information:  
Given the resources available, this task will focus in the SEMR. To progress meaningfully beyond existing benthic assessments in the SEMR, the approach must collate all relevant existing data, be quantitative and at finer spatial resolution, as well as be relevant to stakeholders and publishable in peer reviewed literature. The proposed scope is to acquire, collate and analyse underpinning benthic information and data to provide integrated input into a spatial dynamic model of trawl effort & impacts and benthic recovery, to evaluate alternative management options (MSE) across sectors. The model will be based on a trawl MSE model originally developed in 1999 for evaluating management of the effects of trawling in the GBR, and subsequently applied successfully in the GBR, the Torres Strait and in the NPF. The model will be re-configured for application in the SEMR, to model cumulative effects (if possible, including bottom set long-line) of direct impacts (in future projects, developments may include indirect effects) and will be used to evaluate outcomes for benthos of recent management interventions in the SEMR (e.g. SE RMP; SESSF structural adjustment and fishery spatial closures; possibly petroleum leases if information becomes readily available). These outcomes will be cross-referenced with fishing industry bio-economic outcomes under the same management interventions, if and as available from the existing fishery assessments for the SESF. This integrated approach will demonstrate potential utility for application to future on- and off-reserve management options that may be suggested by stakeholders.

Key Researchers

1. Roland Pitcher, project leader, CSIRO - impact & recovery data, analysis & prediction, reporting
2. Alan Williams, co-project leader, CSIRO - SEMR benthic biological and fishery information, reporting
3. Nick Ellis, CSIRO - trawl modelling and scenario evaluation, reporting
4. Franzis Althaus, CSIRO - SEMR benthic biological data management, fishery data, reporting
5. Additional supporting staff include: Bruce Barker, CSIRO (benthic video data) and Ian Mcleod, CSIRO (regional environmental datasets).

Problem Statement

Considerable information has now accumulated on benthic biodiversity and human uses that interact with the seabed, including detailed maps in some regions. It is known that some uses are a potential threat to benthic biodiversity, but it is not known how these threats may interact, or what combination of spatial and other management strategies can protect benthic biodiversity while maintaining access for ocean users.

Additional Information:   
In order to understand the potential cumulative threats of human uses to benthic biodiversity, and which spatial and other management strategies provide the best outcomes for benthic biodiversity and for ocean users, the approach will be evidence-based and will require new integration of disparate datasets. The required data to be acquired and analysed include: maps of benthic biodiversity characterisation; distributions of sessile epibenthos morphotypes and other species from surveys in the SEMR; impact and recovery rates of sessile morphotypes and species; recent management interventions and spatial planning; spatial and temporal fishing effort; historical fishing intensity and distribution; and bio-economic information for industry indicators.

Outcomes

1. integration and understanding of sessile benthos distribution and vulnerability in the SEMR;
2. integration and understanding of the benthic biodiversity benefits of recent management interventions in the SEMR;
3. integrated approach to the protection of benthic biodiversity and management of human uses that interact with the seabed;
4. an evidence-based regulatory environment for ocean users;
5. effective off-reserve management and accounting of reserve and off-reserve management in assessing overall sustainability risk.

Outputs (products and services) in 2013

1. catalogue of relevant datasets and sources for benthos biodiversity, human use (with priority on fishing), and management regimes, for the SEMR
2. maps of human uses and intensity that interact with the seabed in the SEMR, where data available;
3. refined empirical maps of hard ground habitats in the SEMR;
4. map of predicted distribution of benthic biodiversity composition for the SEMR;
5. a model capable of assessing risk and evaluating alternative management in the SEMR

Activities and Milestones in 2013

Milestone 1: relevant datasets and sources for benthos biodiversity, human use (with priority on fishing), and management regimes, identified for the SEMR (September, 2012);

Milestone 2: acquisition & collation of information & data completed (February, 2013):

benthic habitat, biodiversity characterisation & distribution

occurrence of epibenthos morphotypes from surveys in SEMR

occurrence of other key benthic species, if possible

impact and recovery rates of vulnerable benthic fauna

fishing effort data (particularly trawling) spatial by year; recent and historical

past management interventions and spatial planning in the SEMR

bio-economic information for essential industry indicators

Milestone 3: maps of distributions of fishing activities that interact with the seabed completed (June, 2013);

Milestone 4: refined empirical maps of hard ground habitats in the SEMR completed (June, 2013);

Milestone 5: map of benthic biodiversity characterisation acquired  
 - additionally, cross-tabulate exposure of biodiversity distributions to fishing footprints and protection in fishery closures and CMRs (February, 2013);

Milestone 6: re-configuration of trawl MSE model to SEMR completed (June, 2013); and

Milestone 7: report list of proposed publications and authors (June 2013).

Expected Benefits

More effective conservation of benthic biodiversity, with management arrangements able to provide downstream benefits for ecosystem processes.

Additional information:  
Improved understanding of sessile biodiversity distribution and vulnerability in the SEMR, and of the benefits of recent management interventions in the SEMR; and ability to evaluate future alternative strategies for on and off reserve management with respect to sustainability risk and industry performance — leading to an effective integrated evidence-based approach to planning, management and regulation for conservation and sustainable multiple use of the seabed environment.

Key Risks in 2013 and Risk Management Strategy

1. Data acquisition:

* impact and recovery rates of vulnerable benthic fauna:
* little empirical rate data are available for trawling in the SEMR. A range of suitable values will be obtained from other regions including tropical Australia, and temperate northern hemisphere.
* impact for devices other than trawl is largely anecdotal. Some new quantitative data are expected to become available for longline and access will be requested.
* fishery effort data:
* access to State data is uncertain. Commonwealth fisheries data are available and these sectors can be assessed; State fisheries data will be accessed where available.
* historical fishing effort data:
* pre-1985 data are qualitative. Spatial & temporal mapping of effort pre-1985 will be based on interpolation.
* bio-economic indicators for fisheries:
* the management alternatives that have been evaluated for fisheries economics (by other projects) may not be a direct match for those relevant to sustainability assessment of benthos. Relevant benthic evaluations will be made, and where possible, compared with fisheries indicators for the best available matching evaluations.

1. Distributions of fishing activities that interact with the seabed:

* access agreements may not permit ‘publication’ of industry maps. It is expected at least that permissions to use data as inputs to assessments will be available.

1. Refinement of empirical maps of hard ground habitats:

* the level of detail of the update is dependent on industry cooperation. Nevertheless, maps do already exist and some level of refinement will be achievable.

1. Predict and map distributions & abundance of epibenthos morphotypes:

* relatively few benthos types may be predictable with sufficient certainty across the entire SEMR. Responses may involve simplifying to fewer benthos types and/or restricting applications to sub-regions within the SEMR. Further, benthos morphotypes are not true species and the actual species composition of any given type may vary across the SEMR. Results will be presented with appropriate qualifiers and recommendations for gap filling.

1. Re-configure existing trawl MSE model to SEMR:

* potential for incompatibilities with current operating systems. May need to establish a computer with previous operating system and software.
* potential need for programmer support to port existing model to SEMR. May need to request 5%FTE of suitably skilled programmer.

Research Questions (Environment Portfolio)

Q2.1.2: Threats to biodiversity values can be detected

Q2.1.3: Trends can be modelled and predicted

Q2.1.4: Which management actions are effective and can be evaluated?

Q3.7 How can off-reserve areas be managed to ensure values of biodiversity, and MPAs, are not compromised by regional & external threats?

Q3.9 How can the different threats to biodiversity be prioritised for management and investment purposes, and how can cumulative threats be assessed?

Q4 Inform decisions related to sustainable use by managers having access to integrated assessments of cumulative effects of uses

Q4.1 How do productive marine uses impact on biodiversity?

Q4.4 How can Australia’s marine environment be best managed to maximise ecosystem health, ecosystem resilience, and ecosystem goods and services?

Policies and Programs

1.1 Are all threatened species equally valuable in a genetic and ecological context?

1.2 When is it too late to recover a species?

1.4 What are the best mechanisms for sharing the costs of management between the various beneficiaries?

2.1 How can we improve our capacity to understand, monitor and evaluate ecosystem function/health, including by using predictive models/tools, to ensure:

* + key ecosystem functions can be understood and maintained through effective management
  + threats to values, such as biodiversity or important ecosystem functions, can be detected
  + trends can be monitored and tipping points/thresholds, that indicate species, population or ecosystem collapse, can be predicted, and
  + which management actions are effective and timely, can their success be measured over time, and how can their relevance/effectiveness be evaluated as the environment changes (i.e. use of adaptive management systems)?

2.2 What are practical models for incorporating complex ecosystem science into management, e.g. through managing key drivers such as keystone species, core processes and human activities?

* + What are the minimum data needed to determine the health of an ecosystem?

2.3 What are the advantages and disadvantages for biodiversity of an ecosystem management approach? How can emerging genetic technologies and analysis of past management practices assist our understanding of ecosystems?

2.4 In environments such as marine areas, where comparatively little is known about biodiversity and ecosystem processes, what can we do to strengthen and validate the use of surrogates for identifying biodiversity for protection?

3.1 How do we manage ecosystems and regions for ecological resilience: how is resilience maintained, restored and monitored?

3.4 How can the biodiversity value of protected areas be improved through a system of establishing adjacent buffering areas?

3.7 How can we best manage those parts of the Commonwealth Marine Area outside Marine Protected Areas (MPAs) to ensure values of MPAs are not compromised by external threats?

3.9 How can the different threats to biodiversity be prioritised for management and investment purposes, and how can cumulative threats be assessed?

4.2 As land and marine use intensifies, how can we improve approaches to strategic environmental assessments of nationally important areas and regions?

4.4 How can Australia’s marine environment be best managed to maximise ecosystem health, ecosystem resilience, and ecosystem goods and services?

Key Events and Dates in 2013

Joint Project Meeting with SEWPaC and AFMA (mid 2013)

Project and/or theme meeting (mid 2013)

Hub Meeting (late 2013)

End Users

Ilse Kiessling, Director Marine Policy (Domestic), Marine Division SEWPaC

Nathan Hanna, Director Sustainable Fisheries, Marine Division SEWPaC

Felicity McLean, A/g Director, Offshore Petroleum Section, EACD, SEWPaC

Shaneen Coulson, Director Species Listing Section, Wildlife Branch, Heritage and Wildlife Division, SEWPaC

Beth Gibson, AFMA

Nick Raynes, AFMA

Links and Dependencies to other Hubs and projects

This project links to other projects in Theme 2 (Projects 2.2 and 2.3.1) due to shared concepts and contribution of ideas and skills. Nevertheless, there is no duplication and no dependencies. Similarly, there are links with Themes 1 and 3. CMR monitoring fieldwork conducted early in Theme 1 may be able to contribute data to this project if video analyses are completed within the current year. Dependencies are to projects outside the Marine Hub as outlined in the risk assessment section.

Start Date and Duration (in months)

July 2011, 42 months

Project 2.4 - Supporting management of listed and rare species

Continuing project

*Project Leader:* Peter Kyne

*Organisation:* Charles Darwin University

*Total NERP Budget (ex GST):* $954,399;

*Total Non-NERP Cash/In-Kind Budget (ex GST):* $1,331,878

Project Description (reorganised)

Reliable and cost-effective assessment and monitoring tools are urgently required for the conservation and management of data-poor, low abundance, rarely-encountered threatened species in Australia, including euryhaline and estuarine elasmobranchs of northern Australia. Management of globally-significant populations of priority species, particularly sawfishes (Pristis species) and river sharks (Glyphis species), is currently compromised by an acute lack of data and knowledge, including in the river and estuarine waters of the Northern Territory (NT). Essential baseline data and an understanding of distribution, abundance, biology, patterns of connectivity, critical habitat requirements and population genetic structure are needed. While Pristis and Glyphis species are protected under the EPBC Act as well as Commonwealth and State/Territory fisheries regulations, current reporting from fisheries is inadequate to quantitatively determine population status. Subsequently, this limits the assessment of the effectiveness of current management initiatives (such as retention bans, fishing effort reduction, gear regulations, seasonal closures, spatial closures etc.). Population monitoring methods, population modelling and integrated assessment strategies are urgently needed to estimate population status, undertake population assessments, and predict population trajectories, as well as to assess management effectiveness. Research tools encompassing field surveys, tagging and acoustic telemetry, and novel genetic techniques can be integrated in order to meet these needs, resulting in the assessment of the status of rare and threatened species more effectively and at a radically reduced cost. Integrated assessment strategies developed for euryhaline and estuarine elasmobranchs are potentially transferable to other data-poor, low abundance, rarely-encountered and/or threatened marine and aquatic species across a variety of taxa (fishes, reptiles, mammals). This project will be undertaken in several key river systems of the NT, including the Daly, East Alligator, South Alligator and Victoria Rivers.

Key Researchers

1. Peter Kyne (CDU; Project Leader/Field Research Team);
2. Richard Pillans (CSIRO; Project Co-leader/Field Research Team);
3. Thor Saunders (NT Fisheries; Project Co-leader);
4. Grant Johnson (NT Fisheries; Field Research Team);
5. Pierre Feutry (CDU; Genetics Research Team/Population Assessment and Modelling Team);
6. Mark Bravington (CSIRO; Genetics Research Team/Population Assessment and Modelling Team);
7. Peter Grewe (CSIRO; Genetics Research Team/Population Assessment and Modelling Team).

Problem Statement (reorganised)

This project will develop innovative methods to assess the population status of data-poor, low abundance, rarely-encountered, threatened euryhaline and estuarine elasmobranchs in order to inform conservation and management of these species.

Outcomes (reorganised)

1. Quantitative estimates of population trend and/or population size for at least one threatened euryhaline or estuarine elasmobranch species which will act as a baseline level to assess the population status and effectiveness of current management measures;
2. Improved ecological understanding of habitat utilization and requirements, short and long-term movements, connectivity and spatial dynamics of priority species;
3. Improved understanding of the seasonal occurrence, species richness and abundance of priority species; and,
4. Improved management of priority species in northern Australia;
5. Improved public awareness and understanding of the threats facing threatened euryhaline and coastal elasmobranchs in northern Australia;
6. Improved engagement with Indigenous communities to further understanding and management of threatened sawfishes and priority elasmobranchs in the NT.

Additional Outcome requested by SEWPaC

1. Improved monitoring of potential impacts on Freshwater Sawfish and other threatened euryhaline and estuarine elasmobranch species for referred actions or fisheries assessments.

Outputs (products and services) in 2013

1. Manuscript on estimating genetic marker sample size for the inference of parentage relationship levels;
2. Development of genetic markers for Freshwater Sawfish and/or Speartooth Shark;
3. Manuscript on the status of the Freshwater Whipray, a data-poor priority species;
4. Project website including species accounts for each priority species; and,
5. A manual providing protocols for monitoring Freshwater Sawfish for use by EACD when addressing referred actions and assessment of fisheries.

Activities and Milestones in 2013

1. Progress the development of close-kin tools through ongoing molecular and statistical research (including the discovery of genetic markers) (ongoing);
2. Undertake ongoing field sampling for Freshwater Sawfish and river sharks in key NT river systems;
3. Initiate small-scale movement studies to determine habitat utilisation and movement patterns of selected euryhaline species (ongoing);
4. Develop and implement a monitoring and tagging program for river sharks in selected key NT river systems (ongoing);
5. Plan an expert workshop on the development of management options for data-poor, low abundance, rarely-encountered threatened species (to be held early 2014) (ongoing);
6. Explore options for the calculation of natural mortality from telemetry data (natural mortality estimates required for close-kin modelling approach) (June 2013);
7. Engage Indigenous communities in research activities, including in the Daly and Alligator Rivers regions (ongoing);
8. Examine importance of relevant commercial and recreational fisheries regarding interactions with priority species (ongoing); and,
9. Maintain project website (conservation and management of data-poor, low abundance, rarely-encountered threatened species) (ongoing).

Expected Benefits (updated)

SEWPaC will have improved information upon which to base management decisions for data-poor, low abundance, rarely-encountered threatened species in Australia, which a focus on northern Australian threatened euryhaline elasmobranchs (benefits also potentially transferable to other data-poor, low abundance, rarely-encountered and/or threatened marine and aquatic species across a variety of taxa i.e. fishes, reptiles, mammals).

Key Risks in 2013 and Risk Management Strategy

1. Lack of baseline knowledge of distribution and abundance for many species of data-poor, low abundance, rarely-encountered threatenedelasmobranchs in the NT (risk), due to their rarity and/or largely inaccessible habitat (source), may compromise population modelling and assessment (consequence). Current program will develop an information base for 3-5 key riverine systems.
2. Small population size of adult Freshwater Sawfish (risk), due to reductions in population, subsequent rarity, large adult size (up to 7 m long, making sampling difficult), and occurrence in expansive marine environments (source), which limits a population assessment of mature animals (consequence). Juvenile Freshwater Sawfish will instead be the focus as these occur in riverine environments and are therefore more accessible than adults. The close-kin method enables the estimation of adult population size through an examination of the relatedness of juveniles within and between rivers, therefore not relying on obtaining adult samples.
3. Small population size of juvenile Freshwater Sawfish (risk), due to rarity, inaccessibility of some freshwater habitat, or possibly due to poor recruitment years during the course of the project (source), which results in insufficient samples for the close-kin genetic approach (consequence), and insufficient fish available to be acoustically tagged in order to monitor movement and derive estimates of mortality required for population estimates. Field Research Team will intensively sample the Daly, Victoria, South Alligator and East Alligator Rivers; a student will sample the Adelaide River; potential samples may be contributed by external projects from the MacArthur, Keep and Roper Rivers. *Glyphis glyphis*, another listed euryhaline species with known populations in the Adelaide, South Alligator and East Alligator Rivers, is considered an appropriate back-up species, should insufficient Freshwater Sawfish samples be obtained.
4. Some acoustic receivers positioned in river systems may be lost (risk), due to the large discharge in the wet season (source), reducing data available for movement studies and mortality estimates (consequence).
5. A limited number of independent mitochondrial or nuclear loci may be found (risk), due to recent bottle-neck events or small effective population size (the less unrelated the individuals are, the less recombination events have happened) (source), limiting our capacity to infer relationships between individuals, population structure and sex-biased dispersal (consequence).

Research Questions (Environment Portfolio) (reduced to key questions addressed)

1.1 Are all threatened species equally valuable in a genetic and ecological context?

1.2 When is it too late to recover a species?

1.3 What is the fairest and most cost‐effective mix of policy tools to conserve recognised biodiversity values?

1.4 What are the best mechanisms for sharing the costs of management between the various beneficiaries?

Policies and Programs

1A Biodiversity Conservation;

1B Protection of Threatened Species and Communities;

B2 Sustainable Management of Natural Resources and the Environment.

Key Events and Dates in 2013

June to November: key field season.

End Users

Lesley Gidding, Director, Species Conservation Section, Marine Division, DSEWPaC;

Nathan Hanna, Director Sustainable Fisheries Section, Marine Division, DSEWPaC;

Shaneen Coulson, Director Species Listing Section, Wildlife Branch, DSEWPaC

Director of National Parks (Kakadu National Park)

Links and Dependencies to other Hubs and projects

This project inks to the NERP Northern Australia Hub. That Hub will be examining the interdependencies between riverine and coastal systems, including a focus on biodiversity and connectivity. With the Marine Hub examining inshore‐offshore marine environments, a linkage between the two will provide a more complete picture of cross‐system use, resulting in filling critical knowledge gaps regarding connectivity between systems. Sawfish (and other euryhaline elasmobranchs), are reliant on environments spanning the interests of both Hubs, moving across the catchment‐coastal‐offshore interface, and therefore representing a cross‐system linkage. The Northern Australia Hub has co‐invested, providing 50% of a postdoctoral salary and contributing to operating costs. This will result in significant value adding, and complimentary expertise and leadership from the riverine‐estuarine perspective. Links to Project 2.3 (task 1) ‐ Landscape approaches to managing high priority conservation values.

Start Date and Duration (in months)

Start date: October 2011; Duration: 39 months.

Project 2.5 – White shark population and abundance trends

*Project Leader:* Barry Bruce

*Organisation:* CSIRO

*Total NERP Budget (ex GST):* $500,000

*Total Non-NERP Cash/In-Kind Budget (ex GST):* $840,881

Project Description

This project develops techniques to undertake a population assessment for white sharks in Australian waters. An assessment is necessary to understand whether the species is recovering and hence whether conservation actions under the National Recovery Plan for the species are producing tangible benefit. This project will combine novel genetic and electronic tagging techniques to develop initial estimates of the abundance and population trends of white sharks in eastern Australian waters. It will also establish protocols for developing national estimates of abundance and an on-going monitoring strategy for the species. The tools developed will provide a framework for similarly assessing the population status of other EPBC Act listed marine species, such as grey nurse shark, sawfish and spear-tooth shark species. The overall program comprises seven sub-projects staged through the 2013 and 2014. The project will consolidate existing information on the demographic parameters, develop novel methods for determining juvenile and adult survival and provide initial estimates of abundance based on nursery area surveys. These data will be used to develop strategies for long-term population monitoring and for assessing population trends. Research will initially focus in eastern Australia while building further knowledge and reviewing on data available for white sharks west of Bass Strait. Once the techniques have been developed on the east coast, they will be transferrable to white sharks on the west coast, as the movement patterns, spatial footprint and key habitats of the western population are identified.

Key Researchers

1. Barry Bruce (CMAR Project Leader)

2. Toby Patterson (CMAR Project Co-leader - Estimating juvenile abundance)

3. Peter Grewe (CMAR Project Co-leader - Estimating adult survival)

4. Mark Bravington (CMIS Project Co-leader - Estimating adult abundance)

5. Rich Hillary (CMAR Project Co-leader - Data integration and modeling)

6. Russ Bradford (CMAR Project Co-leader – Western white shark population)

Problem Statement

The white shark is currently listed as ‘Vulnerable’ under the EPBC Act. A National Recovery Plan for the white shark was initiated in 2002 and a review of the recovery plan, undertaken in 2008, supported the current listing. The review, however, concluded that although progress has been made on a number of listed actions, there was still no effective way to estimate population size or population trends in Australian waters and thus no effective way of determining if current Recovery Plan actions (including the initial instigation of protective legislation) were having any tangible beneficial effect. Thus it was not possible to assess progress against the primary goal of the Recovery Plan.

Recent public and political debate, particularly in Western Australia, due to a series of fatal shark attacks, has highlighted an urgent need to assess population status and trends in white sharks in order to establish the efficacy of combined recovery actions, use such data to design effective and defendable recovery and population rebuilding strategies and provide a scientifically sound and rational basis from which to develop policies that balance conservation objectives and public safety. Establishing current status and trends in populations generally requires long-term historical data sets of catch or other suitable indices of abundance, analytical tools to interpret and standardise these data and protocols for implementing a cost effective way of on-going monitoring. These are not always available or well defined for marine TEP species, like the white shark, and are thus not trivial tasks to achieve.

Outcomes

The project will advance efforts to halt the decline of marine biodiversity through: supporting the recovery of a threatened species, the white shark (*Carcharodon carcharias*) by meeting the requirements of the primary goal of the National Recovery Plan. The project will provide information that will assist in the implementation of marine bioregional plans; development and implementation of policies to support the ecologically sustainable management of the marine environment; and advising on the status of and threats to marine matters of national environmental significance and fulfil obligations under the National Plan of Action (Sharks).

The project will contribute to:

Priorities identified in the department’s Annual Operational Plan 2012-2013 and Strategic Plan 2012-2016 by advancing efforts to halt the decline of marine biodiversity;

Response to a recent emerging issue of public interest but furthering a national research strategy agreed to by WA, Commonwealth and other leading Australian shark experts;

A research need identified in SOE2011, specifically the uncertainty around the reported continuing decline in east coast white shark populations;

Inform efficient and effective biodiversity data, information and knowledge systems, through its collaborative approach and integrating existing expertise and data; and uses innovative technology to establish well-informed conservation management through recovery planning, using a mix of acoustic tagging, aerial surveys and close-kin genetics;

Outputs (products and services) in 2013

1. Manuscript reviewing the use of fin identification as a mark-recapture tool for estimating population size in white sharks
2. Manuscript on quantifying the uncertainty in the Eastern Australian white shark population
3. Review document consolidating information on demographic parameters in white sharks
4. Public extension display featuring project activities at the Melbourne aquarium

Activities and Milestones in 2013

1. Consolidate existing information on demographic parameters of white sharks relevant to Australian populations (Dec 2013)
2. Complete preliminary assessment of genetic markers and analyses of archived samples including those from the western population (Dec 2013)
3. Commence tagging program (Port Stephens) (Dec 2013)
4. Commence aerial survey program (Port Stephens) (Dec 2013)
5. Establish public extension displays (Melbourne Aquarium and partner oceanariums) (Dec 2013)
6. Provision of Progress Report Dec 2013

Expected Benefits

The project will advance efforts to halt the decline of marine biodiversity through: supporting the recovery of a threatened species, the white shark (*Carcharodon carcharias*) by meeting the requirements of the primary goal of the National Recovery Plan. The project will provide information that will assist in the implementation of marine bioregional plans; development and implementation of policies to support the ecologically sustainable management of the marine environment; and advising on the status of and threats to marine matters of national environmental significance and fulfil obligations under the National Plan of Action (Sharks).

Key Risks in 2013 and Risk Management Strategy

|  |  |  |  |
| --- | --- | --- | --- |
| Risk | Analysis – Likelihood and consequence | Rating – see table below | Treatment |
| Availability of experts | Possible; Major | High | Project team is well established and allocated to the project. Sub-project leaders have been allocated tasks and meeting schedules determined |
| Reluctance of some parties to cooperate and share information | Possible; Moderate | low | Involve all stakeholders in process to incorporate their views and get them on board with the benefits of the project. |
| Timelines not aligned to DSEWPaC needs | Unlikely; Major | High | Key dates and deliverables have been discussed and agreed with SEWPaC listed species section. |
| Linkages and synergies with other NERP projects not fully explored/implemented | Unlikely; Moderate | Moderate | Internal meetings with linked projects regularly held and representatives from projects consulted prior to or participate in meetings. Shared project staff between this project and other projects. |
| Unusual weather prevents field work | Possible, Moderate | Moderate | Close liaison with State colleagues will identify suitable windows and improve equipment availability. |
| White shark population much larger than expected | Rare, Catastrophic | Moderate | Moderate risk to project, but overall a good outcome for the department and the conservation of this species. Statistical analyses will help resolve this question. |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Likelihood | | | | | |
| Consequence |  | Rare | Unlikely | Possible | Likely | Almost certain |
| Insignificant | Low | Low | Low | Low | Low |
| Minor | Low | Low | Moderate | Moderate | Moderate |
| Moderate | Low | Moderate | Moderate | High | High |
| Major | Moderate | High | High | Very high | Very High |
| Catastrophic | Moderate | High | Very High | Very High | Very High |

Research Questions (Environment Portfolio) (reduced to key questions addressed)

What is the current population status of white sharks in Australian waters?

How can populations of such non-commercial threatened marine species be adequately assessed and monitored to provide robust policy advice?

Policies and Programs

1A Biodiversity Conservation;

1B Protection of Threatened Species and Communities;

B2 Sustainable Management of Natural Resources and the Environment.

Key Events and Dates in 2013

August to December – key fieldwork period

End Users

Lesley Gidding, Director, Species Conservation Section, Marine Division, DSEWPaC;

Nathan Hanna, Director Sustainable Fisheries Section, Marine Division, DSEWPaC;

Shaneen Coulson, Director Species Listing Section, Wildlife Branch, DSEWPaC

Additional key stakeholders are SEWPaC, the National Shark Recovery Team, the engaged group of experts, Fisheries and Environment Departments of the States of WA, NSW, Victoria, SA, and TAS, IMOS.

Links and Dependencies to other Hubs and projects

This project builds on techniques developed in the FRDC/CSIRO southern bluefin tuna population estimation project – a multi-year, multi-million dollar project. This project will use and further refine the statistical and genetic approaches developed in that project.

This project extends the NERP Marine Biodiversity Hub Euryhaline Elasmobranch project led by CDU with input from CSIRO and NT Fisheries. There will be exchange between the projects to improve the technical expertise available to both, including in genetics, close-kin analysis and the analysis and interpretation of acoustic data.

Start Date and Duration (in months)

June 2013 18 months:,(Final report due June 2015)

|  |
| --- |
| Theme 3: National Ecosystems Knowledge  This theme will provide a better understanding of linkages between seabed physical features and ecological processes that sustain important areas for marine biodiversity including Key Ecological Features (KEFs), estimate and test connectivity between these important areas and those areas being actively managed for biodiversity conservation (eg. CMRs), and provide the long-term perspective on biodiversity dynamics to inform future management under climate change.  Additional information: The research will support implementation of Marine Bioregional Plans by providing new data, maps and interpretations (e.g. inputs to Marine Conservation Atlas) to inform assessments under the EPBC Act, such as those for commercial fisheries or assessment of activities associated with oil and gas exploration and production. This theme will also contribute to the strategic longer-term need to progressively develop our capacity to understand and communicate national patterns of marine biodiversity (e.g. through future iterations of the Integrated Marine and Coastal Regionalisation of Australia that may be required in the longer-term).  Theme Leader: Dr Scott Nichol  Organisation: Geoscience Australia  Total NERP Budget (ex GST): $2,712,636 2013 NERP Budget (ex GST): $897,323  Total Non-NERP Cash/In-Kind Budget (ex GST): $4,823,632 2013 Non-NERP Cash/In-Kind Budget (ex GST): $1,594,612 |

Project 3.1 – Shelf and canyon ecosystems – functions and processes

Continuing project

Project Leader: Dr Scott Nichol

Organisation: Geoscience Australia

Total NERP Budget (ex GST): $1,508,743

2013 NERP Budget (ex GST): $509,271

Total Non-NERP Cash/In-Kind Budget (ex GST): $2,734,824

2013 Non-NERP Cash/In-Kind Budget (ex GST): $929,943

Project Description

This project will provide a better understanding of the spatial linkages between seabed physical features and patterns of biodiversity for targeted areas in Northern Australia through integrated analysis and modelling of available physical and biological datasets.

Project 1 focuses on shelf and canyon features as these were identified as important areas for biodiversity in marine bioregional plans. Improved information on the importance of individual features to biodiversity values and the relative biodiversity value of nearby features will assist assessments of the impacts of marine use and inform subsequent management decisions. Ecologically important physical processes that operate within and between shelf and canyon ecosystems determine their value as biodiversity hotspots, eg. for locally rich benthic biodiversity, high productivity, or local abundances of listed species. This project will improve knowledge of the importance of large-scale shelf features that support biodiversity values for areas of management interest in Northern Australia, selected in consultation with DSEWPaC. The project will harvest the best available existing data (bathymetry, oceanography, sediments, habitats, species), incorporate new data from strategically selected sites (in collaboration with Themes 1 and 4) and employ advanced spatial analysis methods (in collaboration with Project 2 and Theme 1). Importantly, this project will develop an analytical template for characterising and assessing the significance for biodiversity of key physical and ecological features throughout the Australian Marine Estate. This will assist managers evaluating options for biodiversity management of the many canyons and outer shelf features (especially outside the Commonwealth Marine Reserve Network) where no biological surveys have occurred. The project comprises two tasks:

Task 1: Data Discovery for Areas of Management Interest. Data that describe physical features, processes and patterns of biodiversity on the continental shelf in areas of management interest of Northern Australia will be identified, harvested and formatted for analysis. The key outputs will be GIS products and supporting documentation that describe and integrate these datasets for these areas, as well as the provision of sustainable management and online discoverability of the data.

Task 2: Data Analysis & Synthesis for Areas of Management Interest. The role of large-scale physical features on the shelf (banks, canyons, reefs) in influencing patterns of marine biodiversity will be analysed for these identified areas. Key objectives of the analysis are: (i) Providing quantitative descriptions of the morphology of large-scale physical features that can be used to predict their likely influence on key ecological processes (exposed substrate and increased productivity); (ii) Characterising physical and biological oceanography both on and off these large-scale physical features (e.g. upwelling zones); (iii) Mapping the distribution, abundance and behaviour of selected taxa (e.g. large sharks and fishes); (iv) Assessing the role of physical processes and ecology in the distribution of biodiversity. The key outputs will be new models (conceptual, qualitative & quantitative) that describe how the morphology and local oceanography of large-scale physical features influences their value to biodiversity. These models can then be used to predict the biodiversity value of other large-scale physical features that have not been sampled for their biodiversity. This information will assist assessing and managing impacts of marine industries including fisheries and oil and gas development.

Key Researchers

1. Julian Caley, AIMS - Ecologist
2. Camille Mellin, AIMS - Benthic ecologist
3. Brendan Brooke, GA - Geomorphologist
4. Peter Harris, GA - Sedimentologist
5. Zhi Huang, GA - Spatial analyst
6. Johnathan Kool, GA - Marine ecologist
7. Jin Li, GA - Ecological modeller
8. Scott Nichol, GA - Geomorphologist
9. Kim Picard, GA - Geoscientist
10. Rachel Przeslawski, GA - Marine ecologist
11. Lynda Radke, GA - Geochemist
12. Justy Siwabessy, GA - Acoustician
13. Gordon Keith, CSIRO - Seabed acoustician
14. Rudy Kloser, CSIRO - Seabed acoustician
15. Alan Williams, CSIRO - Marine ecologist
16. Phillipe Bouchet, UWA - Ecologist
17. Tom Letessier, UWA - Ecologist
18. Jessica Meeuwig, UWA - Quantitative ecologist
19. Anya Waite, UWA - Biological oceanographer

Problem Statement

Physical features on the shelf and in canyons were identified as important areas for biodiversity in marine regional plans. However, we lack a detailed understanding of the influence of physical features and processes on patterns of biodiversity across the continental shelf and upper slope. This project will improve our knowledge of the importance of large-scale shelf features (e.g. reefs, canyons) that support biodiversity values for areas of management interest in Northern Australia.

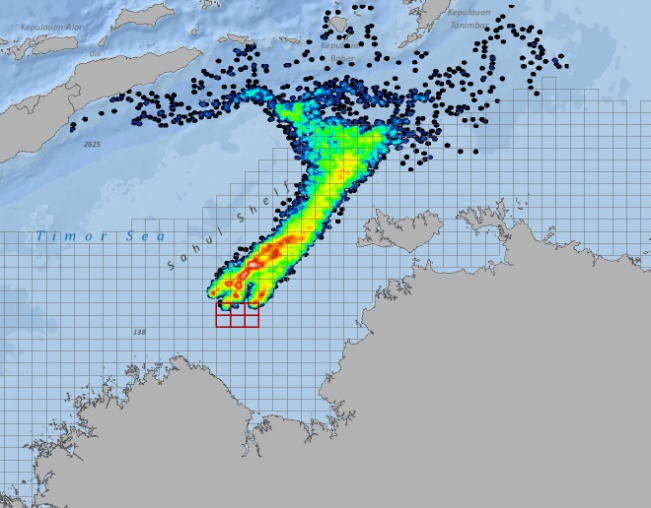
Additional material – examples of hypotheses to be tested:   
 “*Assemblages of benthic community x vary in distribution across space as a function of the distribution of seabed features 1, 2, 3”* and; “*Key ecological processes vary across the continental shelf in association with the distribution of large scale geomorphic features (e.g. banks, shoals, valleys)”*

Outcomes

Short term outcomes include a considered understanding of the importance of the physical environment associated with seafloor features for biodiversity value, including connectivity between management areas (CMRs, KEFS). This will lead to the medium to long term outcome of an improved capacity for understanding and monitoring patterns of biodiversity at inter-annual to decadal time scales and for managing off-reserve activities at spatial scales that represent biodiversity patterns.

Outputs (products and services) in 2013

1. Metadata Report – First quarter 2013. This will be led by GA (with input from UWA) and include metadata for all new datasets derived for the shelf/canyon analysis. Draft will be available by end 2012 with revisions and publication scheduled for early 2013.
2. Maps and Models Depicting Shelf/Canyon Processes – Draft products available late 2013. These will include maps depicting canyon morphotypes (and associated metrics e.g. aspect, rugosity), maps showing overlay of larval dispersal patterns on canyon morphotypes and shelf features (down to 9 km2 scale) – essentially maps of spatial connectivity for species within a region. An example of the model output is shown below.



*Connectivity model output for larval dispersal tracks –   
warmer colours denote higher density of particles*.

Models will also include bi-variate and multivariate graphs and plots of key datasets to represent spatial associations that support (or otherwise) hypotheses regarding biodiversity patterns.

1. A series of five papers has been proposed:

|  |  |  |
| --- | --- | --- |
| **1.** | **Working title:** | ***Physical characteristics and classification of submarine canyons on the Australian continental margin*** |
|  | Authors: | Huang, Nichol, Kloser, Harris and others |
|  | Synopsis: | Physical taxonomy and classification of Australian submarine canyons, reporting on a range of metrics derived from the 250m bathymetry grid and classified on the basis of those metrics. Likely to be a hierarchical classification scheme that makes use of finer scale bathymetry where available. |
|  | Draft due: | July 2013 |
| **2.** | **Working title:** | ***A continental-scale ocean connectivity model for marine ecosystems in Australia*** |
|  | Authors: | Kool and others |
|  | Synopsis: | A paper describing the connectivity model product. |
|  | Draft due: | July 2013 |
| **3.** | **Working title:** | ***Relationship between seabed structure and pelagic marine biodiversity at a continental scale*** |
|  | Authors: | Bouchet, Letessier, Huang and others |
|  | Synopsis: | Analysis of relationships between pelagic diversity / distributions against a range of environmental variables (seabed geomorphology and satellite derived ocean properties). |
|  | Draft due: | December 2013 |
| **4.** | **Working title:** | ***The WA Marine Futures Dataset paper (aka the MIG paper)*** |
|  | Authors: | Caley, Mellin, Meeuwig, Huang and others |
|  | Synopsis: | Analysis of Mean Information Gain (MIG) and other techniques from holistic analysis of the WA Marine Futures data - covering nine study regions from Abrolhos to Esperance and comprising high resolution swath bathymetry, tow-video, fish data (sp. richness) from BRUVs and sampling. Paper will develop/apply methods for predicting outside the sample grids across the regional extent of the full dataset. |
|  | Draft due: | December 2013 |
| **5.** | **Working title:** | ***Using new knowledge of marine ecosystems processes to support management and monitoring of marine reserves*** |
|  | Authors: | Nichol, Meeuwig, Caley and others |
|  | Synopsis: | Demonstration of how new knowledge of the spatial relationships between seabed features and biodiversity patterns can be used to guide marine reserve management (Case studies of KEF’s to be included). |
|  | Draft due: | July 2013 |

Activities and Milestones in 2013

Activity 1: Consultation with Marine Division on progress with project research, with a focus on tailoring outputs to SEWPaC strategic needs

New milestone: Presentation of initial results to SEWPaC and project update February 2013)

Activity 2: Data Analysis and Synthesis, comprising the following:

New Milestone 1: July 2013. National Canyon Classification – physical metrics assembled and analysis of relationships with biodiversity patterns in canyons underway, with an initial focus on canyons in the North and Northwest marine regions (e.g. Cape Range, Cloates canyons).

New Milestone 2: July 2013. Shelf Physical Feature & Biodiversity Analysis - physical metrics assembled and analysis of relationships with biodiversity patterns underway, with a focus on the North and Northwest marine regions. To include data from Theme 4 Oceanic Shoals Voyage of Discovery and outputs from larval dispersal modelling.

New Milestone 3: December 2013. Publications in advanced stage as per list and timetable in Outputs.

Expected Benefits

* Activity 1: Consultation with SEWPaC will contribute to the shared understanding of the research objectives and ensure outputs can be taken up by the Department to support management of the North and Northwest marine regions.
* Activity 2: This work will identify the relative importance for biodiversity of physical features/KEFs, as identified in Bioregional Summaries.

Key Risks in 2013 and Risk Management Strategy

1. SEWPaC not fully informed of project progress. Management strategy – maintain monthly reporting through the Marine Hub Research Leaders meeting.
2. Progress with analysis of project data delayed. Management strategy – regular (fortnightly to monthly) communications between project partners on progress with data assembly and on start-up of analysis. Communications via phone hook-ups and a workshop planned for mid-year.

Research Questions (Environment Portfolio)

Q2. Ecosystems: understanding ecosystem function/monitoring ecosystem health.

Q2.1 How can we improve our capacity to understand, monitor and evaluate ecosystem function/health?

Q2.3 What are the advantages and disadvantages for biodiversity of an ecosystem management approach?

Q2.4. In environments such as marine areas, where comparatively little is known about biodiversity and ecosystem processes, what can we do to strengthen and validate the use of surrogates for identifying biodiversity for protection?

Policies and Programs

1A Biodiversity conservation;

1B Protection of threatened species & communities;

1E Maintaining a marine reserve system;

1G Biodiversity research;

B1 Environmental regulation;

B3 Protection and management of heritage values.

Key Events and Dates in 2013

* Project workshop planned for mid 2013 to bring researchers together and discuss results of data analysis to date.

End Users

1. Ilse Kiessling, Director Marine Policy (Domestic), Marine Division SEWPaC
2. Barbara Musso, Director West Management Planning, Marine Division, SEWPaC
3. Belinda Jago, Director East Management Planning, Marine Division, SEWPaC
4. Felicity McClean, A/g Director, Offshore Petroleum, EACD, SEWPaC
5. Ian Snape, Martin Riddle and Andrew Constable, AAD

Links and Dependencies to other Hubs and projects

This project links to Theme 1 Project 2 – Analysis and approaches for monitoring biodiversity - as a source of expertise and information on shelf physical features, processes and biodiversity. Several researchers from Geoscience Australia (Nichol, Kool, Huang) and CSIRO (Williams) are involved in both projects.

The project also links to and is partly dependent on Theme 4 – Regional Biodiversity Discovery to Support Marine Bioregional Plans, as a source of new data for the Northern Marine Region. However, this project is not fully dependent on Theme 4 and has commenced ahead of the marine survey.

Start Date and Duration (in months)

Activity 1: SEWPaC Consultation – Commenced Nov 2011, Ongoing

Activity 2: Data Discovery – Commenced July 2011, 24 months

Activity 3: Data Analysis & Synthesis – Commencing October 2012, 15 months

Project 3.2 – National maps of connectivity and biodiversity

Continuing project

*Project Leader: Dr Tim O’Hara*

*Organisation: Museum Victoria*

*Total NERP Budget (ex GST):* *$1,203,893*

*2013 NERP Budget (ex GST):* *$388,052*

*Total Non-NERP Cash/In-Kind Budget (ex GST):* *$2,088,808  
2013 Non-NERP Cash/In-Kind Budget (ex GST):* *$664,669*

Project Description

This project will take advantage of recently developed and upgraded biodiversity databases, supplemented with new genetic information, to compare and contrast alternative attributes of Australian marine biodiversity. It will compare the distribution of species richness of local endemics with those for all species, or with areas identified to be important in speciation or climate refuge. It will use a process-based approach to identify common biodiversity patterns that will inform conservation management at medium to large scales.

Task 1 (2012-2014): National maps of biodiversity and connectivity. There are few national maps of biodiversity and connectivity for the Australian marine environment. The aim of this task is to begin accumulating comprehensive datasets for selected biota across the entire Australian EEZ, including Antarctica (from 0-2000 m), map hotspots of biological and genetic diversity, and explore potential changes to faunal composition under various climate-change scenarios. This task will employ an innovative combination of phylogenetics and modelling to map patterns of connectivity of data-rich biota at national and regional scales. Outputs will be national maps of species and genetic biodiversity supported by datasets at sub-regional scale to assist decision makers. At present we have little data for many places identified as being of interest to Marine Heritage (eg Coral Sea, Cape York, Kimberley). An atlas will summarise and interpolate existing knowledge for two large faunal groups nationally. National maps of biodiversity will assist understanding of the role of networks of CMRs and other management measures in achieving the objectives of marine bioregional plans. Output from this task will be used in Theme 2 Project 1 to value marine biodiversity and may influence monitoring decisions in Theme 1.

Task 2 (2013-2014): National biodiversity datasets for squat lobsters, sharks, rays and selected teleosts. This task will utilise the key conservation values, vulnerability and extensive data holdings for Australian sharks, rays and selected teleosts to identify areas of key importance to threatened species, endemics, and both ancient and recently evolved elements of the fauna within marine provinces and their bathomes. Outputs will combine existing datasets and maps summarising distributions with conservation values of sharks, rays and selected teleosts, incorporating hotspots of distribution and endemicity. This project will provide data products and maps that will improve DSEWPaC capacity to recognise, interpret and identify options to manage potential intersections between users of the marine environment and biodiversity values in identified hotspots, and provide improved information on which to base recovery plans if required.

Key Researchers

1. Tim O’Hara, Museum Victoria - Biogeographer & invertebrate taxonomist
2. Adnan Moussalli, Museum Victoria - Molecular analyst
3. Andrew Hugall, Museum Victoria - Post-doc
4. Skipton Woolley, Museum Victoria - PhD Student
5. Julian Caley, AIMS - Ecologist
6. Nikos Andreakis, AIMS - molecular phylogeneticist
7. Peter Last, CSIRO - Fish biogeographer & taxonomist
8. Daniel Gledhill, CSIRO - Fish biogeographer
9. William White, CSIRO - Fish biogeographer & taxonomist

Problem Statement

There are few national maps of biodiversity and connectivity for the Australian marine environment. Consequently, biological assessments of MPAs, KEFS and areas of economic interest have to be conducted without comparable data from other regions. This project will accumulate comprehensive datasets for the Australian EEZ that can be used to map hotspots of biological and genetic diversity, explore potential changes to faunal compositions under climate change and assign relative values to marine assets.

Outcomes

Increased capacity for understanding patterns of biodiversity and connectivity between management areas (CMRs, KEFS) through further building the national evidence database. Improved capacity for understanding patterns of biodiversity and for managing off-reserve activities at spatial scales that represent biodiversity patterns.

Outputs (products and services) in 2013

1. Biodiversity distributional datasets of the two invertebrate groups completed by July 2013. This will incorporate all known data from museums, historical records and the northern 2012 survey planned as the Marine Biodiversity Hub theme 4.
2. Mapping methodologies for seafloor fauna finalised after technical workshop in December 2012.
3. Molecular data required for the mapping of seafloor phylogenetic endemism accumulated by December 2013.
4. Mapping of seafloor species richness and beta diversity (species turnover) across Australia’s marine domain for the two invertebrate groups by December 2013.
5. Database consisting of datasets and maps summarising the distributions and key conservation values of Australian sharks, rays and selected teleosts within each demersal bathome. These will depict hotspots of distribution and endemicity and will provide insight into the origin and derivation of these species.
6. A series of scientific papers is expected, including:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **1.** | **Working title:** | | | ***Environmental drivers of the bathyal faunal tropical-temperate transition*** | |
|  | Authors: | | | O’Hara, Dunstan and others | |
|  | Synopsis: | | | There is a marked change in deep-sea faunal assemblages between northern and southern Australian waters despite the relatively homogeneous temperature and salinity profiles. This paper uses population genetics and high resolution oceanographic data to discover the likely environmental or other drivers of species turnover throughout the region. | |
|  | Draft due: | | | January 2013 | |
| **2.** | **Working title:** | | | ***How to map seafloor biodiversity at large scales*** | |
|  | Authors: | | | O’Hara and others | |
|  | Synopsis: | | | A paper evaluating statistical methodologies for mapping biodiversity metrics across marine domains | |
|  | Draft due: | | | July 2013 | |
| **3.** | **Working title:** | | | ***Patterns of beta diversity in marine assemblages.*** | |
|  | Authors: | | | Woolley, O’Hara and others | |
|  | Synopsis: | | | Analysis of relationships between pelagic diversity / distributions against a range of environmental variables (seabed geomorphology and satellite derived ocean properties). | |
|  | Draft due: | | | December 2013 | |
| **4.** | **Working title:** | | | ***Historical relationships within the Ophiuroidea inferred from RNA transcriptomes*** | |
|  | Authors: | | | Hugall, O’Hara, Mousalli and others | |
|  | Synopsis: | | | Scientific working paper outlining the methodology and interim results that will be used to map phylogenetic endemism for one group of seafloor fauna. | |
|  | Draft due: | | | December 2013 | |
| **5.** | **Working title:** | | | ***Molecular phylogeography and synchronic speciation in Australian wrasses, leatherjackets and stingarees (Labridae, Monacanthidae, Urolophidae)*** | |
|  | Authors: | | | N Andreakis, D Gledhill, DL Rowe, M Puckridge, B Holmes, W White, A Butler, N Bax, M van Oppen & P Last. | |
|  | Synopsis: | | | Molecular clock and diversification analysis of fish and shark species that will be used to elucidate the origins of Australian endemisms. | |
|  | Draft due: | | | June 2013 | |
| **6.** | | | **Working title:** | ***Inferring phylogeographic patterns of* Allogalathea elegans *in the Indo-Pacific and the influence of biogeographical barriers in population connectivity*** | |
|  | | | Authors: | P Cabezas-Padilla, N Andreakis A Machordom, G Poore & E Macpherson. | |
|  | | | Synopsis: | Identify phylogeographic breaks between Indian and Pacific Ocean populations to test the connectivity with the SW Pacific, Philippines, and Vietnam, and test the role of different barriers among the Indian Ocean, the SW Pacific, and the Malaysian Triangle associated with population differentiation. A CERF outcome. | |
|  | | | Draft due: | June 2013 | |
| **7.** | | | **Working title:** | ***Disentangling the Agononida incerta species complex reveals areas of high diversification in the Indo-Pacific*.** | |
|  | | | Authors: | N Andreakis, G Poore. | |
|  | | | Synopsis: | Use of species complexes (i.e. Agononida) to reveal the influence of Indo-pacific biogeographical barriers and climate changes on diversification rates at the species level . A CERF outcome | |
|  | | | Draft due: | June 2013 | |

|  |  |  |  |
| --- | --- | --- | --- |
| **8.** | **Working title:** | ***DNA extraction, PCR Amplification and sequencing of mitochondrial markers from skate specimens (Rajidae) for species delineation and phylogeographic inference.*** | |
|  | Authors: | N Andreakis and others | |
|  | Synopsis: | Scientific working paper outlining the methods and preliminary mitochondrial phylogenies necessary for the delineation of species and identification of phylogenetic endemisms. | |
|  | Draft due: | December 2013 | |
| **9.** | **Working Title** | | ***Historical biogeography of Australasian skates: interpreting present day patterns*** |
|  | Authors | | Last P, White W, Gledhill D, Andreakis, N, others |
|  | Synopsis | | A temporal context will be provided through an Australian perspective on history and connectivity of the provinces and bathomes interpreted through the historical biogeography of skates. |
|  | Draft due | | July 2014 |
| **10.** | **Working title:** | | ***Fathom out: Assessing biogeographic subdivision across the Western Australian continental margin – A multispecies modelling approach.*** |
|  | Authors: | | Woolley S, McCallum A, Wilson R, O’Hara T and Dunstan, P |
|  | Synopsis: | | Biogeographical regions are often used as a basis for management strategies, yet a challenge for biodiversity management across broad scales is establishing regions that are robust across taxonomic groups. Finite mixture models were developed to predict multiple species assemblages termed archetypes. Modelled species archetypes are developed using Decapoda, Ophiuroidea and Polychaeta species, that are grouped based on their similar responses to oceanographic and geographic gradients. A CERF outcome. |
|  | Draft due: | | Jan 2013 |

Activities and Milestones in 2013

Activity 1. Map species richness of benthic fauna (2 typical groups dominant in offshore areas) and sharks/rays across the study area, analysing appropriate methods for mapping and interpolating species distributions from existing records.

New Milestone 1 (Jan 2013): Progress report on the accumulation of data, selection of methodological approach, analysis of resulting data, and interim maps.

Activity 2. Map the distribution of rare and endemic species from the three faunal groups (see activity 1), assessing their relative distribution amongst habitats/bioregions and relative to conservation values.

New Milestone 2 (July 2013): Progress report on the accumulation of data, selection of methodological approach, analysis of resulting data, and interim maps

Activity 3. Map evolutionary diversity, identifying the "wet tropics" of the seas, ie areas that possess clusters (hotspots) of phylogenetically rare species which may be vulnerable to anthropogenic activities.

New Milestone 3 (December 2013): Progress report on the accumulation of data, selection of methodological approach, analysis of resulting data, and interim maps

Expected Benefits

Data discovery and maps of species richness, and the distribution of rare and endemic species of benthic fauna (especially the often vulnerable sharks and rays) will assist the Department in refining values of Biologically Important areas and assessing future activities. Maps of evolutionary diversity will identify hotspots for speciation and evolutionary dead-ends that may influence future management of marine biodiversity.

Key Risks in 2013 and Risk Management Strategy

Activity 1: Inability to extract molecular data from museum specimens. Researchers are keeping up to date with other researchers resolving similar issues for DNA extraction and considerable progress is being made worldwide.

Activity 2: No major risks; data are held in existing records.

Research Questions (Environment Portfolio)

Q1.1 Are all threatened species equally valuable in a genetic and ecological context?

Q2. Ecosystems: understanding ecosystem function/monitoring ecosystem health.

Q2.1 How can we improve our capacity to understand, monitor and evaluate ecosystem function/health?

Q2.3 What are the advantages and disadvantages for biodiversity of an ecosystem management approach?

Q2.4. In environments such as marine areas, where comparatively little is known about biodiversity and ecosystem processes, what can we do to strengthen and validate the use of surrogates for identifying biodiversity for protection?

Q3.1 How do we manage ecosystems and regions for ecological resilience: how is resilience maintained, restored and monitored?

Q3.2 How do we best manage important ecological features, such as climatic refugia, that could prevent decline in ecosystem function or improve species management?

Q3.7 How can we best manage those parts of the Commonwealth Marine Area outside MPAs to ensure values of MPAs are not compromised by external threats?

Policies and Programs

1E Maintaining a marine reserve system;

1G Biodiversity research;

B3 Protection and management of heritage values;

C1 Antarctic science and environmental management.

Key Events and Dates in 2013

* Presentation of initial results to SEWPaC and project update (February 2013)
* Project workshop planned for mid-2013 to bring researchers together and discuss results of data analysis to date.
* Hub workshop (late 2013)

End Users

Ilse Kiessling, Director Marine Policy (Domestic), Marine Division SEWPaC

Barbara Musso, Director West Management Planning, Marine Division, SEWPaC

Belinda Jago, Director East Management Planning, Marine Division, SEWPaC

Felicity McClean, A/g Director, Offshore Petroleum, EACD, SEWPaC

Ian Snape, Martin Riddle and Andrew Constable, AAD

Links and Dependencies to other Hubs and projects

The new data from the biodiversity survey of the Oceanic Shoals in Theme 4 will be incorporated into the national datasets. The data generated by this project has the potential to feed into Theme 2.

This project links to Theme 1 in terms of MPA monitoring designs, to Theme 2 in regard to management of sharks and rays and to Theme 4 as a source of new genetic material for the Northern Marine Region.

Start Date and Duration (in months)

Activity 1: Map species richness – Commenced July 2011, 24 months

Activity 2: Map rare and endemic species – Commenced July 2011, 24 months

Activity 3: Map evolutionary diversity – Commenced July 2011, 36 months

|  |
| --- |
| Theme 4: Regional biodiversity discovery to support marine bioregional plans  Regional knowledge gaps in Northern Australia have been identified as a Departmental priority in recognition of the global marine biodiversity significance of these regions, and the rapidly increasing pressures facing them. A broad suite of physical and biological data will be collected by an interdisciplinary team from AIMS, Geoscience Australia, Museum and Art Gallery of the Northern Territory, and the University of Western Australia using a diverse set of data collecting methods. The two surveys proposed for this theme have now been reduced to one, but opportunities will be sought to mount a second survey through co-investment from other sources including the Marine National Facility.  Theme Leader: *Dr Julian Caley*  Organisation: *Australian Institute of Marine Science*  Total NERP Budget (ex GST): $1,437,606  2013 NERP Budget (ex GST): $153,876  Total Non-NERP Cash/In-Kind Budget (ex GST): $2,099,258  2013 Non-NERP Cash/In-Kind Budget (ex GST): $315,720 |

Project 4.1 – Twenty-one day *RV Solander* survey

Continuing project

Project Leader: Andrew Heyward

Organisation: Australian Institute of Marine Science

Total NERP Budget (ex GST): $1,437,606  
2013 NERP Budget (ex GST): $153,876

Total Non-NERP Cash/In-Kind Budget (ex GST): $2,099,258

2013 Non-NERP Cash/In-Kind Budget (ex GST): $315,720

Project Description

We will use ship-based sampling to “develop a better understanding of the marine biodiversity and major drivers for maintaining biodiversity” (Marine Division) by filling major knowledge gaps for specific data poor KEFs and CMRs in Northern Australia and/or the Coral Sea. The initial cruise will survey key features including shoals and pinnacles that may be areas of high species richness on the continental shelf to the western side of Joseph Bonaparte Gulf. This survey location in the Oceanic Shoals CMR was chosen in consultation with DSEWPaC and aims to directly enhance outputs from other projects in the Hub. The survey will have been completed by the start of the 2013 AWP.

These data will be used to address nationally recognised gaps in biodiversity knowledge and to understand patterns of community assembly, associated physical drivers of marine biodiversity in these poorly studied marine realms, and provide a regional context to these patterns and processes. This sampling will also support further development of a national mapping and survey capacity. This theme will provide key inputs of data and samples to Theme 3. These data will also provide opportunities for testing and extending the work in Themes 1 and 2 particularly the proposed regionally focussed work supporting marine management.

Key Researchers

1. Julian Caley, AIMS - Theme leader
2. Andrew Heyward. AIMS - Project leader
3. Scott Nichol, Geosciences Australia - project leader
4. Jessica Meeuwig. UWA - project leader)

Problem Statement

Difficulties understanding patterns and processes in marine biodiversity stem from significant knowledge gaps particularly for KEFs and MPAs in Northern Australia. This lack of knowledge reduces the capacity of science to support implementation of regional marine plans. This project will provide new biological and physical data to support greater understanding of marine biodiversity and support question driven research in the other themes in the Marine Biodiversity Hub.

Outcomes

Better understanding of patterns and processes structuring Australia's marine biodiversity; improved prediction of biodiversity and connectivity in Northern Australia; increased awareness of the origins and regional significance of Australia’s marine biodiversity; This will support implementation of marine bioregional plans and a more effective management of Australia's marine estate. In addition we will promote development of a national mapping and survey capacity capitalising on recent marine infrastructure investments.

Outputs (products and services) in 2013

New physical and biological descriptions of very poorly known Australian marine ecosystems; supply of key physical and biological samples to support analysis and synthesis for better understanding of the patterns and processes structuring Australian marine biodiversity in linked programs within the NERP MBH; key knowledge gained for particular sites and habitats and the regional context of these sites to provide a more complete understanding of Australia's marine estate; new datasets and improved maps that identify key physical features, biodiversity and connectivity (physical and genetic). Communication products to raise awareness of Australia's marine biodiversity.

Activities and Milestones in 2013

Activity 1: Discovery of additional bioregional shoal datasets and integration into a regional model (ongoing)

Milestone 1: Progress report (June 2013)

New milestone 2: Data processing and primary analyses completed (June 2013)

New milestone 3: Integration of metadata and/or data to Hub website and AODN following Hub protocols and production of summary report of physical and biological data collected for the survey area (December 2013)

New milestone 4: Development of spatial models July onwards and final summary report with models and maps (December 2013)

New milestone 5: Identification of publications and authorship resulting from survey (June 2013)

New milestone 6: Summary report of new information against defined conservation values in NW and N Marine Bioregional Plans (June 2014).

Expected Benefits

The field surveys will provide baseline information of shoal and off shoal environments and biodiversity in the western Joseph Bonaparte Gulf and enable comparison with datasets for other areas.

This work will provide improved characterisation of the bioregion, the first elaboration of variability at the regional scale in the submerged shoals and the probable extent of key habitats associated with high conservation values.

Key Risks in 2013 and Risk Management Strategy

Completion of final report and data transfer delayed by loss or re-allocation of key staff. Identify labour shortages as early as possible.

Unrealistic expectations of what can be achieved by a single survey. Early communication with SEWPaC staff. Integrate with results from existing surveys in similar areas to extend regional coverage.

Research Questions (Environment Portfolio)

2.3 What are the advantages and disadvantages for biodiversity of an ecosystem management approach? How can emerging genetic technologies and analysis of past management practices assist our understanding of ecosystems?

2.4 In environments such as marine areas, where comparatively little is known about biodiversity and ecosystem processes, what can we do to strengthen and validate the use of surrogates for identifying biodiversity for protection?

3.7 How can we best manage those parts of the Commonwealth Marine Area outside Marine Protected Areas (MPAs) to ensure values of MPAs are not compromised by external threats?

4.1 How do productive land and marine uses impact on biodiversity values and ecosystem function in different ecosystems or landscapes, and how might this change with future climate variability?

4.2 As land and marine use intensifies, how can we improve approaches to strategic environmental assessments of nationally important areas and regions?

4.4 How can Australia’s marine environment be best managed to maximise ecosystem health, ecosystem resilience, and ecosystem goods and services?

Policies and Programs

Natural and Indigenous Heritage

Marine research to inform marine conservation management and marine protected area planning in the Indian Ocean Territories (IOT)

Develop a better understanding of the marine biodiversity and major drivers for maintaining biodiversity in the North and North-west Marine Regions and Coral Sea

Understand the ecological features and processes that influence the landscape-scale dispersal and recruitment of marine life that is necessary to maintain the biodiversity and productivity of marine ecosystems

Understand the characteristics of marine ecosystems and biodiversity that help make them resilient to impacts of environmental change and human activities

Key Events and Dates in 2013

Update SEWPaC on survey outcomes (February 2013)

Theme meeting to combine results and progress analyses and publications (mid-2013; milestones 1, 2, 5 & 6)

Hub workshop (late 2013)

End Users

Ilse Kiessling, Director Marine Policy (Domestic), Marine Division SEWPaC

Barbara Musso, Director West Management Planning, Marine Division, SEWPaC

Felicity McClean, A/g Director, Offshore Petroleum, EACD, SEWPaC

David Holt, Mike Maslen, ERIN, SEWPaC

Links and Dependencies to other Hubs and projects

This theme links to Themes 1 and 3 by providing critical new data sets that will facilitate new analyses across local, regional, and national scales

Start Date and Duration (in months)

January 2011, 48 months

|  |
| --- |
| Theme 5: Great Barrier Reef World Heritage Area Integrated Monitoring Program  This project will establish a framework for standardised and integrated ecological, social and economic monitoring in coastal and marine areas. It will focus initially on establishing an integrated monitoring program for the Great Barrier Reef World Heritage Area (GBRWHA), but the aim is to develop a framework that could be adapted and applied to other coastal and marine regions in future.  Theme Leader: Paul Hedge  Organisation: University of Tasmania  Total NERP Budget (ex GST): $500,000  2013 NERP Budget (ex GST): $180,000  Total Non-NERP Cash/In-Kind Budget (ex GST): included in existing executive support |

Project Description

This project will bring together expertise from the Marine Biodiversity Hub, Tropical Ecosystems Hub, Environmental Decisions Hub, and the Great Barrier Reef Marine Park Authority (GBRMPA) to build on existing work relating to marine ecosystem health monitoring. The project will particularly draw on the knowledge and expertise of AIMS and GBRMPA to identify information needs for the GBRWHA and how to link existing monitoring programs through the development of an integrated monitoring framework. The Marine Biodiversity Hub is currently undertaking work on national approaches to monitoring marine ecosystem health and will provide advice on these approaches, as well as identifying how the monitoring framework developed for the GBRWHA could be used for other marine regions. The Environmental Decisions Hub’s expertise will be drawn on to support prioritisation of monitoring activities and how these can be used to address key policy issues and inform adaptive management responses.

Key Researchers

1. Nic Bax, UTAS – steering committee chair
2. Paul Hedge, UTAS – Theme and project leader
3. Peter Doherty, Tropical Ecosystems Hub – steering committee member
4. Hugh Possingham, Environmental Decisions Hub – steering committee member
5. Terry Walshe, Environmental Decisions Hub – EDH project lead
6. Jamie Oliver, AIMS – steering committee member
7. Hugh Sweatman, AIMS – AIMS project lead
8. Peter McGinnity, GBRMPA – steering committee member
9. Fergus Molloy, GBRMPA – GBRMPA project lead
10. Julia Chandler GBRMPA – steering committee and workshop secretariat
11. Mary Colreavy SEWPaC – steering committee member
12. Dave Johnson SEWPaC – steering committee member
13. Ryan Black SEWPaC – SEWPaC project lead

Problem Statement

The GBRWHA is an ideal region in which to initiate this work. There are currently a number of different monitoring programs being undertaken by government, NGOs and industry in the GBRWHA, but there is minimal integration and standardisation of these programs. A methodology is required for integrating these programs and identifying critical information gaps to design an integrated monitoring framework which will inform future adaptive management of the property as a whole. This will also inform the strategic assessment of the GBRWHA.

Outcomes

The following outcomes are within scope for this project:

Identification of options and agreement on a framework that establishes practical and transparent links between values of MNES, critical monitoring and information needs, existing monitoring programs, and adaptive management for the GBRWHA.

Identification of options and agreement on a practical approach to prioritise and target monitoring activities to inform management and strategic assessments of the GBRWHA.

Identification of options and agreement on a meaningful baseline for monitoring condition of values and affects of pressures and impacts to inform adaptive management

Outputs (products and services) in 2012-13

The project will establish a framework for a standardised and integrated, ecological, social and economic monitoring program that:

Addresses critical information needs in the GBRWHA

Builds upon and links existing monitoring programs in the GBRWHA, including broader long-term monitoring programs

Considers how to best prioritise and target monitoring activities

Provides a baseline for monitoring and assessment of condition of values and affects of pressures and impacts

Could be adapted and applied to other marine regions to better understand cumulative impacts of development and inform adaptive management of marine and coastal ecosystems

Supports the development of appropriate monitoring strategies for Commonwealth offshore reserves being developed in a parallel process

Activities and Milestones in 2013

The following series of workshops outlines the logic for achieving the project outcomes. Please note that further detail of the work plan and workshop agendas will be agreed by the project Steering Committee out of session.

1. Steering Committee meeting 1 - teleconference (June 2012)

* Discuss and endorse project plan
* Agree on workshop participation

1. Workshop 1 – 2 days (Aug 2012)

* Proposed integrated monitoring framework based on agreed values underpinning MNES including OUV and the identified pressures affecting those values

1. Steering Committee Meeting 2 (Sept 2012)

* Progress check, consideration of outcomes from first workshop and refinement of project scope/direction as appropriate

1. Workshop 2 – 2 days (Nov 2012)

* Linking existing GBRWHA monitoring programs to the framework
* Priorities and critical information needs for the GBRWHA

1. Steering Committee meeting 3 (Dec 2012)

* Consideration and endorsement of draft Framework

1. Submit draft framework to SEWPAC (Dec 2012)
2. Workshop 3 – 1 day (Feb 2013)

* Data management –principles, standards and accessibility

1. Steering Committee Meeting 4 (March 2013)

* Consider any amendments to the draft framework resulting from public comments on the GBRWHA Strategic Assessment draft impact assessment report and endorsement of the draft Report for submission to SEWPAC

1. Draft Report submitted to SEWPAC (Late March 2013)
2. Steering Committee meeting 5 (May 2013)

* Consideration and endorsement of the final Report for submission to SEWPAC

1. Final Report on integrated monitoring framework (June 2013)

Expected Benefits

This project will inform the strategic assessment of the GBRWHA, future monitoring activities in the GBRWHA and will also provide a monitoring framework that could be used for strategic assessments in other coastal and marine regions in future.

Key Risks in 2013 and Risk Management Strategy

The GBRWHA Integrated Monitoring Project is a joint project funded by the Australian Government Regional Sustainability Plan program. The project team is lead by the NERP Marine Biodiversity Hub and includes the NERP Tropical Ecosystems Hub, NERP Environmental Decisions Hub, and the GBRMPA.

GBRMPA requires specific deliverables within a tight timeframe to directly contribute to the GBRWHA Strategic Assessment. The other project partners are aware of the requirements, but are not responsible for their delivery. The Tropical Ecosystems Hub and GBRMPA are focussed on delivery of the integrated monitoring framework for the GBRWHA and the other two partners have a broader focus on delivery of a more generic national framework for monitoring marine reserves.

| Risk | Analysis – Likelihood and consequence | Rating – see table below | Treatment |
| --- | --- | --- | --- |
| Availability of experts | Possible; Major | High | Steering Committee and workshops dates planned at start of project |
| Reluctance of some parties to cooperate and share information | Possible; Moderate | Moderate | Involve all stakeholders in process, particularly workshops, to incorporate their views and get them on board with the benefits of the project. |
| Timelines not aligned with Strategic Assessment | Possible; Major | High | Key strategic assessment dates considered when setting milestone dates for this project plan |
| Linkages and synergies with other GBRMPA and RSP projects not fully explored/implemented | Possible; moderate | Moderate | Internal meetings with linked projects regularly held and representatives from projects consulted prior to or participate in workshops. |
| Workshop fatigue | Possible, moderate | Moderate | Work with the Project Leads of all linked/related projects to streamline number and content of workshops to avoid repetition and achieve best 'value' from experts time in workshops and out-of-session interactions. |
| GBRWHA Framework is too high level and not practical for implementation in the short term | Possible, major | High | Context and Strategic Assessment requirements communicated and endorsed by the steering committee and workshop participants early in the project. |
| Excessively long and unstructured list of critical information needs | Possible, major | High | Agreement on an effective and achievable approach to prioritising information needs |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Likelihood** | | | | | |
| **Consequence** |  | **Rare** | **Unlikely** | **Possible** | **Likely** | **Almost certain** |
| **Insignificant** | Low | Low | Low | Low | Low |
| **Minor** | Low | Low | Moderate | Moderate | Moderate |
| **Moderate** | Low | Moderate | Moderate | High | High |
| **Major** | Moderate | High | High | Very high | Very High |
| **Catastrophic** | Moderate | High | Very High | Very High | Very High |

Research Questions (Environment Portfolio)

2.1 How can we improve our capacity to understand, monitor and evaluate ecosystem function/health, including by using predictive models/tools, to ensure:

* key ecosystem functions can be understood and maintained through effective management
* threats to values, such as biodiversity or important ecosystem functions, can be detected
* trends can be monitored and tipping points/thresholds, that indicate species, population or ecosystem collapse, can be predicted, and
* which management actions are effective and timely, can their success be measured over time, and how can their relevance/effectiveness be evaluated as the environment changes (i.e. use of adaptive management systems)?

2.2 What are practical models for incorporating complex ecosystem science into management, e.g. through managing key drivers such as keystone species, core processes and human activities?

* What are the minimum data needed to determine the health of an ecosystem?

3.9 How can the different threats to biodiversity be prioritised for management and investment purposes, and how can cumulative threats be assessed?

4.2 As land and marine use intensifies, how can we improve approaches to strategic environmental assessments of nationally important areas and regions?

Policies and Programs

1A Biodiversity Conservation

B1 Environmental Regulation – strategic assessments under the EPBC Act

B3 Protection and management of heritage values – world heritage

B4 Protection of the Great Barrier Reef

6A Environmental Reporting

Key Events and Dates in 2013

See Activities and Milestones

End Users

Mary Colreavy, Assistant Secretary, GBR Taskforce, EACD, SEWPaC

Peer McGinnity, General Manager, GBRMPA

Links and Dependencies to other Hubs and projects

This project will bring together expertise from the Marine Biodiversity Hub, Tropical Ecosystems Hub, Environmental Decisions Hub, and the Great Barrier Reef Marine Park Authority (GBRMPA).

This project will link to Theme 1, applying the approaches for national monitoring to this project to maintain monitoring consistency as far as possible.

Start Date and Duration (in months)

July 2012, 12 months

Part D – Attachments incl Staff, Income and Expenditure Tables

Attachment 1 – Risk

The following describes the DSEWPaC process to identify risk. Additional steps are required to analyse, assess and review risk. This method should be used for risk management across the Hub, themes and project activities. Risk management should be an iterative process throughout the life of the activity and is thus incorporated into the Progress Reports.

DSEWPaC requires all program and projects managers to identify and analyse and assess their project risks and to maintain a Risk Treatment Plan. The Corporate Risk Management Guidelines align with the International Standards Organisation (ISO) Guide 73:2009.

Risk management integrates a systematic and rigorous approach to what most people do on a daily basis. It is not complex, nor does it require specialised skills. It is about creating opportunities, understanding the risks and managing them to achieve desired outcomes. Potential problems are minimised by identifying, analysing, and planning a response to potential threats or uncertainty via Risk Management. Once a risk is realised it becomes an issue to be resolved.

The first step in risk management is to identify the risk. A risk is described by:

Risk + Source + Consequence = Description of Risk

To assist in identifying risks managers need to:

Consult and communicate

When considering a new process or implementing a decision it is important to identify key stakeholders and their needs, to ensure you are well informed about all areas of the activity you are undertaking. This is an important part of the process that should be considered at every step of risk management.

Establish context

Establishing the context is one of the most critical aspects of risk management. As risk is the effect of uncertainty on objectives, a clear understanding of the objectives for which you are assessing the risk, is critical. The context includes the organisation’s internal and external environment and the purpose of the risk management activity. The context defines the scope for the rest of the risk management process. The context of the risk assessment will vary depending on the level within the organisation the risk assessment is being conducted. It may be necessary to re-do the risk assessment at each level (project, program, division, department) as different contexts will impact on the results of the assessment. For example a risk identified as HIGH at a project level (e.g. a consultant failing to meet a milestone), may not equate to a high risk for the division or department.

A poorly defined context can lead to a risk assessment which only focuses on the risk of achieving a process or output but does not consider the impact of this process on the project or organisational objectives.

Identify risks

It is important to identify the possible risks to be managed i.e. what can happen and how it can happen? Identification should also include risks whether or not they are under the control of the organisation.

Step 3 can be enhanced by exposure to an educated group which will result in a more comprehensive set of risks for consideration. The following may assist you with this step:

Brainstorm to identify potential risks to identify issues that could hinder or prevent the achievement of the objective. Some examples of areas of risk that you might like to consider are:

* 1. policy implications
  2. operational requirements
  3. time
  4. budget
  5. climate change and environmental impacts
  6. resources including people management and employee compliance
  7. scoping issues
  8. political impacts

Review the list of identified potential risks and group similar risks; you are likely to find that many are actually sources (how can the risk occur?) of other risks.

Identify the potential source/s or causes of each risk

Identify the potential impacts of the risk if a risk event happens (consequences)

You should also consider the life of the risks. i.e. will the risks outlive the term of the program or project?

Review and finalise risks.

Examples of risk:

That it may rain earlier than expected (**Risk**), caused by unseasonable weather (**Source**) which may delay undertaking the fauna survey (**Consequence**).

The completion of a project might be delayed (**Risk**), caused by the consultant not delivering a report (**Source**) which may mean that we do not expend all of our budget in this financial year (**Consequence**).

Greater than expected visitor numbers (**Risk**), caused by Australia’s weak dollar (**Source**) will cause deterioration of the park’s natural assets (**Consequence**).

A serious accident (**Risk**), caused by unsafe working conditions (Source) will cause the department to face litigation (**Consequence**).

Increasing severity of coral bleaching events (**Risk**), caused by sea surface temperature increases (**Source**), will lead to degraded reef habitat quality and biodiversity loss (**Consequence**).

Attachment 2 – Monitoring and Evaluation Plan

See separate file:

Marine Hub ME Plan Final July 2012.docx

Attachment 3 – Communications Plan

See separate file:

Marine Hub Science Communication Plan Final Dec 11.docx

Attachment 4 – Staff, Income and Expenditure Tables

See separate file:

Marine Hub AWP 2013 Part D – Staff Income Expenditure tables.xlsx