



**National Environmental Science Program
Marine Biodiversity Hub
ANNUAL PROGRESS REPORT 5
1 January 2019 – 31 December 2019**

Hub Name (full activity title): NESP Marine Biodiversity Hub

Host organisation: University of Tasmania

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Other consortium partners/subcontractors/research organisations:

Partners

Commonwealth Scientific and Industrial Research Organisation (CSIRO)

Australian Institute of Marine Science (AIMS)

Geoscience Australia (GA)

University of Western Australia (UWA)

Charles Darwin University (CDU)

New South Wales, Department of Primary Industries (NSWDPI)

New South Wales, Department of Planning, Industry and Environment (NSWDPIE)

Museums Victoria (MV)

Integrated Marine Observing System (IMOS)

Main Subcontractors (2019)

Clean Ocean Foundation

James Cook University

WA Museum

University of Melbourne

Curtin University

Murdoch University

Western Australian Department of Primary Industries and Regional Development (WADPIRD)

North Australian Indigenous Land and Sea Management Alliance (NAILSMA)

Tasmanian Department of Primary Industries, Parks, Water and Environment (DPIPWE)

Sea Mammal Research Unit, University of St Andrews

Claire Charlton Environmental Consulting

Macquarie University

Hub Leader Certification

As Hub Leader, I certify that I have taken adequate steps to reasonably assure myself that:

- each required report component is attached;
- the contents of each component of the report is complete and accurate in all material respects;
- funds have been used for the purpose for which they were provided and all funding conditions have been met, Recipient and Other Contributions have been received, and appropriate oversight has been maintained of Hub projects, their progress, performance and budgets during the reporting period;
- all relevant risks to project delivery have been notified to the Department in this and previous reports and that appropriate steps are being taken to manage those risks;
- the Hub and its sub-contractors have current workers compensation and public liability insurances, as required under the Funding Agreement; and
- any carryover of project funds have been allocated to projects in the next reporting period or financial year in accordance with the approved Research Plan or funds identified for refund to the Department.

Signed: 

Hub Leader Name: Alan Jordan

Date: 11/5/2020

Hub Steering Committee Chair Certification:

As steering committee chair, I certify that any issues of concern or matters raised during steering committee meetings where the draft progress report was discussed have been adequately resolved, amended or incorporated into the final report submitted to the department.

Signed: 

Hub Steering Committee Chair Name: Peter Cochrane

Date: 11/5/2020

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Letter from the Hub Leader (Professor Nic Bax)

We started 2019 well with a publication in the prestigious international journal *Nature* on the origins of deep-sea biodiversity from tropical Australia to Antarctica. The article is the first indication that biodiversity in the deep ocean, where the majority of Australian Marine Parks (AMPs) are located, is evolving from polar latitudes and not tropical latitudes where shallower marine biodiversity originates. Tropical deep-water AMPs harbour a museum of old lineages that warrant special consideration. It is gratifying to see this kind of research coming to fruition as it is the result of the Marine Biodiversity Hub's emphasis on building national information streams and expertise since 2007. Some of the first outputs of the Marine Biodiversity Hub were predictions of national marine biogeography (provincial structure, depth structure and geomorphology) requested by the Environmental Resources Information Network (ERIN). These predictions were based on the restricted information available at the time, including early Russian commercial fish surveys obtained from Vladivostok, but were essential to the design of what has become the AMP network. Twelve years later we have the data that validate those predictions (and AMP design) at the macro level, and which can be used to further improve spatial management of the Australian Exclusive Economic Zone (EEZ).

This is just one example of the national capacity developed by the Marine Biodiversity Hub, as a result of which marine scientists from partner agencies have been able to engage in both significant national programs and international programs and negotiations supporting the Department of Agriculture, Water and Environment (DAWE) and the Department of Foreign Affairs and Trade (DFAT) in areas including the Convention on Biological Diversity (CBD), the Convention on International Trade of Endangered Species, the United Nations (UN) negotiations on Biodiversity Beyond National Jurisdiction, the UN Decade on Ocean Science for Sustainable Development, the Global Ocean Observing System, the Global Climate Observing System, the Global Coral Reef Monitoring Network and the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC-UNESCO) Ocean Best Practices portal to name just some. While the National Environmental Science Program (NESP), and earlier Commonwealth Environment Research Facilities (CERF) and National Environmental Research Program (NERP), have built the capacity for Australia's marine community to engage in these initiatives, international activities are funded externally, increasing the Hub's influence at no cost to the program, showcasing the NESP program to the world, and bringing back additional ideas and perspectives that improve our capability to support Australian researchers and managers. At the end of 2019, Hub researchers supported the Department in accessing regional input to the CBD post-2020 framework that will develop the global biodiversity goals and metrics for the next decade, and attended the post-2020 marine thematic, including facilitating the workshop on marine restoration and its role in climate mitigation and adaptation, an increasingly active area for the Hub.

While the Marine Biodiversity Hub works at the national scale in driving consistency in measurement, such as through a leadership role on the National Marine Science Committee (NMSC), Marine Monitoring and Baselines working group, or through national inventories of opportunities for marine restoration, work is often started on a regional basis, and through its network into the marine community it becomes nationally relevant. The Integrated Monitoring Framework that provides the basis for the Great Barrier Reef (GBR) Reef 2050 Integrated Monitoring and Reporting Program is now being used to inform monitoring program design across the New South Wales (NSW) marine estate and the Parks Australia Monitoring, Evaluation, Reporting and Improvement (MERI) framework. Similarly, the cumulative impacts framework developed for the GBR now informs the Hub's Northern Australia Seascape program, Parks Australia's MERI framework and potentially the cross-Hub Integrated Environmental Assessment. This sequential regional approach used by the Hub, where knowledge gained in one regional implementation is built on in subsequent implementations has proven to be a sound model for Hub research, but it is important to ensure that the national perspective is part of initial planning so that the process developed for each region is relevant nationally. An important synthesis product this year will be applying these regional approaches nationally, to provide an assessment of pressures, assets and the resulting cumulative risk at 1km² resolution all around Australia.

A notable success in 2019 was the Hub working through the Australian Marine Sciences Association (AMSA) to bring together regional Indigenous representatives from the Kimberley to Esperance for the first time in their history to meet with representatives from research agencies operating in Western Australia. This is the culmination of 4 years of learning with Indigenous experts through workshops in New Zealand, Darwin and Adelaide, each building expectations and trust, until finally in Perth last year we were able to understand the breakthroughs in regional collaboration that will be needed to support the expanding engagement in a respectful and sustained manner. A key outcome was to realize that it is not only Indigenous groups that need to coordinate among themselves to develop agreed standards of engagement, but also the research agencies that will need to improve their consistency and standards so that the capacity of Indigenous groups is not swamped by a variety of alternative approaches and protocols. This result was facilitated by the attendance of all major Hub partners who represent the major Western Australian and national research providers. The outcomes of the 2019 Perth meeting will this year be built upon for the eastern seaboard by a different group working with advice from the Hub deputy director.

This sixth and final year of NESP promises to be an exciting and productive year with many projects releasing their results and the Hub engaging in a series of interactions (which will use new engagement tools and products during the period of COVID-19 travel restrictions). One of the Hub's early synthesis products is the Shark Action Plan designed to support a strategic and effective approach to the conservation and management of this vulnerable group of species. While the Policy Report has already been developed with the Protected Species and Community Branch, preparing the large amount of data on listing status of the 328 species of sharks and rays present in Australian waters to International Union for Conservation of Nature (IUCN) standard has taken longer. The complete Shark Action Plan will be delivered this year, together with the first population estimate for the Australian population of Southern Right Whales being developed by an international team, and updated information on the status (including newly found populations) and recovery opportunities for seasnakes, hammerhead sharks, and red and spotted handfish. A second synthesis product is the analysis of coral reef surveys from Reef Life Survey. This program was supported in CERF and has since had continued support by the Marine Biodiversity Hub through NERP and NESP. It has had spectacular National and global success, providing the most important biological dataset in the 2016 State of the Environment (SoE) Report and many high profile papers from their global surveys, resulting in the research leader being made an ARC Future Fellow and becoming a member of the IOC/UNESCO Global Ocean Observing System (GOOS). It is surprising that of all the reef monitoring occurring in Australia, this (and the long-term temperate reef survey program that it grew from) are the only reef surveys which discriminate communities at the species level. The synthesis product will compare reefs across Northern Australia (including Ningaloo, GBR and the Coral Sea) to determine which coral species have been affected by bleaching events and which have survived. This species-level approach will be vital to inform ongoing and substantial government investments in coral reef restoration.

Targeting delivery of our scientific products to meet the Department's needs for effectively administering the Environment Protection and Biodiversity Conservation (EPBC) Act is an important component of the Hub's research design and delivery strategies, especially working with the Protected Species and Communities Branch and Parks Australia, and more generally in particularly challenging areas such as developing a framework to address cumulative impacts for jurisdictions (in 2019 for the Great Barrier Reef Marine Park Authority (GBRMPA) and in 2020 for NSW) that are ready to apply them. The Hub has been steadily developing a focus on marine restoration, recognising it as an important option for climate mitigation and adaptation. Carbon sequestration is much higher for coastal communities like mangroves, saltmarsh, seagrass and kelp than terrestrial communities and there are clear biodiversity benefits. The Hub started its restoration research by developing and supporting a national audit of coastal restoration and is now focussing on developing restoration options with direct benefits to marine biodiversity and communities, including Traditional Owners. Identifying where restoration fits into the Department's legislative requirements under the EPBC Act was the focus of a 2018 research workshop that resulted in a report characterised as "a really good piece of research/writing to inform work in the Department." A follow-up workshop planned for March 2020 has been postponed due to COVID-19.

It is an ongoing focus of Hub research to map how restoration research will support management of Matters of National Environmental Significance (MNES) including AMPs, how we can promote international policy in this area (through the CBD post-2020 agenda), and how we can work with Australian communities (including Indigenous) to make coastal restoration a key Australian deliverable to enhance ecosystem services and mitigate biodiversity losses resulting from human activity and climate change.

Finally, I would like to end on a personal note and thank the Department, research users, partners and researchers for the opportunity to lead the Marine Biodiversity Hub since 2007. It has been a privilege to be given the opportunity to impact the way that marine science can be made most accessible and useful to Australian managers and policy makers, and satisfying to understand and effect (with my most able Deputy Director Paul Hedge), the increased value from joint development of marine science questions by Hub researchers and research users. I look forward to hearing of the Marine Biodiversity Hub's continued successes.

Research

Progress towards outcomes

The NESP Marine Biodiversity Hub continued to build on its program in 2019 resulting in a very productive year. Executive focus areas were managing program level risks, preparing for succession of executive team staff, completing the fourth progress report, implementing Research Plan Version 5 (2019), developing Research Plan Version 6 (2020), including identifying synthesis projects and redesigning the Hub's website.

The Steering Committee met twice in person in order to review the fourth progress report, and review and subsequently endorse the 2020 research plan. The Steering Committee also met by phone to provide early input to the 2020 research plan. The Research Partners Committee, research-users and Research Leadership Team (RLT) met to discuss research progress, identify strategic opportunities and research-user needs which informed the 2020 research plan.

All three research themes made substantial progress on agreed milestones for the reporting period, noting delays with some project milestones that have been discussed with the department (see Attachment A). Implementation of RPV6 is showing the benefits of continued focus and investment of research efforts at a national-scale. Some of these include:

- the progressive expansion of baselines and data to understand management effectiveness of Australian Marine Parks (in 2019 this included application of national standards to new collect and analyse data in the Huon, Tasman Fracture, Ningaloo, Lord Howe, Wessel and Coral Sea marine parks);
- national coordination of efforts to restore marine habitats and advancing techniques for restoration of giant kelp and seagrass and establishing a national database of opportunities for restoration investment;
- promoting partnership for collaborative and respectful Indigenous engagement in marine research and monitoring by convening the fourth regional Indigenous engagement workshop in Western Australia to establish pathways for Indigenous driven standards of engagement; and
- promoting and extending the use of national standards for access to marine data, including access to and visualisation of marine image data. This has resulted in a steadily growing proportion of Australian marine data used to inform decision making about health of the marine environment, with Hub datasets now second only to the Integrated Marine Observing System (IMOS) itself as the largest contributor to the Australian Oceanographic Data Network (AODN).

Research Plan Version 6 (RPV6) was developed and submitted to DAWE (then the Department of Environment and Energy) in November and approved in December 2019. Numerous multi-stakeholder meetings and workshops were used to engage key stakeholders. The workshops were well attended by research partners, research-users including the Department and the Hub's committee members. RPV6 included six new research projects: 1) support for Parks Australia to develop their monitoring, evaluation, reporting and improvement plan; 2) a national analysis of the interaction between park values and pressures; 3) a deep water survey in the Gascoyne Marine Park to improve understanding of conservation values associated with canyons; 4) a governance analysis considering the full range of management levers available to reduce microplastics in the marine environment; 5) a national-scale analysis of the effect of heatwaves on coral species; and 6) a national-scale assessment of the status of tropical inshore dolphins. Five existing projects were refined or extended to enhance research impact.

The NESP Marine Biodiversity Hub website was reviewed and redesigned to make research outputs more accessible to research-users and stakeholders. The new design will go live in April 2020 and include several new landing pages, including those focused on Australian Marine Parks and World Heritage Areas, threatened and migratory marine species, restoring coastal habitat,

Indigenous engagement and science for sustainable use. The website will be an important conduit for delivery of the final Hub report in 2021. The Hub made good use of its primary digital communication channels (i.e. website, social media including videos, and newsletter). The Hub also continues to work closely with the Australian Ocean Data Network to ensure its data are discoverable and accessible.

The Hub has identified six impact stories to highlight research achievements (see section below).

Research projects

Attachment A lists the projects funded under the Marine Biodiversity Hub and provides information on the project status, information on outputs and links to products for all projects (where available). Exceptions to the NESP Data Management and Accessibility Guidelines are also noted here.

There is one instance where research outputs did not meet the guidelines:

1. White shark data has been classified as restricted due to risks of targeting a threatened species listed under the EPBC Act. This has been discussed with relevant Departmental officers (this was noted in the 2017 and 2018 progress reports).

Performance against milestones

Performance against Funding Agreement Milestones

All milestones for the period and to date have been met as per Funding Agreement Milestones 1-24.

Performance against the Research Plan milestones

Information on project progress and performance is provided in Attachment A. We are pleased to be able to provide precise quantitative information for most performance metrics, reflecting our detailed tracking of performance and delivery against what are intentionally ambitious milestones and targets.

Measuring success

The National Environmental Science Program (NESP) is a long-term commitment to support environmental and climate research. The key objective of the NESP is to improve our understanding of Australia's environment through collaborative research that delivers accessible results and informs decision making. The focus of NESP is on practical and applied research that informs on-ground action and that will yield measurable improvements to the environment.

The Program builds on its predecessors - the National Environmental Research Program and the Australian Climate Change Science Program – in securing for decision makers the best available information to support understanding, managing and conserving Australia's environment.

The NESP is delivered through multi-disciplinary research Hubs or consortia, hosted by Australian research institutions.

The NESP seeks to achieve its objective by supporting research that:

- is practical and applied and informs on-ground action
- addresses the needs of the Australian Government and other stakeholders by supporting and informing evidence-based policy and improving management of the Australian environment
- is innovative and internationally recognised
- enhances Australia's environmental research capacity
- is collaborative and builds critical mass by drawing on multiple disciplines, research institutions and organisations to address challenging research questions
- produces meaningful results accessible to government, industry and the community
- includes synthesis and analysis of existing knowledge
- builds relationships between scientists and policymakers to encourage collaborative problem solving on environmental issues.

NESP end-users will be a broad range of stakeholders whose decisions may impact on the environment, and include the Australian Government, state governments, industry, business, community groups and Indigenous land managers (or Indigenous Communities).

The intended outcomes of the NESP are:

- Enhanced understanding of, and capacity to manage and conserve Australia's environment.
- Improved climate and weather information for Australia through a greater understanding of the drivers of Australia's climate.
- Timely research that is used by policy and decision-makers to answer questions and provide solutions to problems.
- Research outcomes that are communicated clearly to end-users and the general public, and stored in a manner that is discoverable and accessible.

Table A: Quantitative performance measures

Key Performance Indicator	Hub Result for 12-month Period (numerical only)	Explanation (if any)
1. Percent of projects (active or completed in the reporting period) for which there is a research-user actively engaged in the project?	100%	
2. Percent of projects approved under RPV6 in which research-users were actively involved in project design?	100%	
3. Number of research outputs provided to end users on time ¹ and as identified in the Research Plan	65	14 manuscripts 19 reports 32 metadata records
4. Proportion of research outputs provided to end users on time and as identified in the Research Plan	75%	Delivery of all milestones (activity and outputs milestones) is at approximately 75%. The Hub's Steering Committee has recognised that, given the complexity and challenges associated with some delivery of some milestones, minor delays in delivery of milestones and outputs are to be expected.
5. Number of instances of where the hub has used NESP-generated information from another NESP hub.	1	The Hub has worked closely with scientists from the NESP Earth Systems and Climate Change Hub to understand climate change effects in the Shark Bay World Heritage Area, this information was used to develop the seagrass restoration (funded in RPV6 as project E6).
6. Number of peer reviewed NESP-funded publications during the reporting period	18 journal articles 25 scientific reports	
7. Number of NESP research citations in other researchers' publications during the reporting period	51 citations	Citations on journal articles published in 2019 only
8. Number of researchers, including PhD and Post-Doc positions engaged as a result of NESP (total, Full-time equivalent) during the reporting period	38	The total NESP funded and in-kind funded FTE reported by other entities, less any FTE attributable to Administration staff, plus the University of Tasmania Research Staff and students paid from the NESP funds.
9. Number of data sets provided to the Hub, or made publicly available, by third parties for the purposes of informing NESP research	31	29 of these are datasets the Hub has liberated from third parties to inform species distribution modelling for prioritised threatened and migratory species
10. Percentage of data sets made publicly available under open licence by the Hub	100%	It This KPI is 99% across the five year funding period 2016-19 as

¹ On time – delivered on the date the outputs were expected to be delivered

Key Performance Indicator	Hub Result for 12-month Period (numerical only)	Explanation (if any)
		white shark data has been classified as restricted due to risks of targeting a threatened species listed under the EPBC Act
11. Percentage of NESP research outputs (including publications, data and metadata) that are discoverable and accessible in accordance with NESP data accessibility requirements and the funding agreement.	100%	This KPI is 99% across the five year funding period 2016-19 as white shark data has been classified as restricted due to risks of exploitation for a threatened species listed under the EPBC Act
12. Number and FTE of Indigenous people employed in a project (separate into full and part time positions).	10 people 0.6 FTE (part-time)	
13. Number of Indigenous researchers/graduates/post-graduate/PhD/Post Doc Positions in projects.	6	The Hub does not ask its researchers to identify as Indigenous. The 6 people identified here were directly involved in project to design and implement the 2019 AMSA Indigenous workshop to promote collaborative research and monitoring on sea county in Western Australia
14. Number of Indigenous people trained in the use of environmental management tools and techniques.	9 people	
15. The number of management tools for Indigenous waters and land that benefitted from NESP research and outcomes (including but not limited to Plans of Management for Indigenous Protected Areas (IPAs), Co/Joint managed parks, Marine Park Plans of Management, Conservation Agreements).	2	
16. Number and type of communication products that have been used to communicate research with Indigenous people.	16	
17. Number of research, knowledge sharing and communication events held with Indigenous communities.	9	This includes a regional workshop bringing together marine scientists and Indigenous people that the Hub has convened and supported for 4 years.
18. Number of public events, conference presentations, jointly authored/published papers with Indigenous participants/contributors.	2	
19. Number of Indigenous communities and organisations engaged to develop, refine or inform NESP research	19+	2019 marked a significant effort investment to engagement with Indigenous communities and organisations in Western Australia. This was spread between targeted investment in collaborative research projects and broader-scale state-wide investments to promote collaborative partnerships for research and monitoring sea

Key Performance Indicator	Hub Result for 12-month Period (numerical only)	Explanation (if any)
		<p>country in WA. (i.e. the 2019 AMSA Indigenous engagement workshop)</p> <p>+ denotes the many Indigenous communities attending and contributing to the 2019 AMSA Indigenous workshop</p>

NESP impact stories

NESP impact stories are provided at Attachment B. These stories showcase the contribution of NESP funded research to the environment, the economy, society, culture, public policy, quality of life, beyond contributions to academia.

Six impact stories are provided for 2019:

1. Uncovering the patchiness of life in Australia's remote deep sea
2. Supporting Australia's commitments to hammerhead shark conservation
3. Advancing Indigenous engagement and participation in sea country research
4. Charting the reach of recreational fishing in Commonwealth marine parks and fisheries
5. What people think about Australian Marine Parks
6. Tracking the recovery of southern right whales

Hub level risk management

All risks identified in the Hub risk management plan are being actively managed.

The following risks have been identified in the Hub risk management plan since the approval of RPV6:

Added/refined risks	Consequence	Likelihood	Rating	Response	Treatments
<u>Refined existing risk</u> 9. Failure of Hubs to provide financial acquittal and audit certificates as required by Funding Agreement	High	Rare	Moderate	Accept	Periodic (12 monthly) review of systems to ensure processes are effective. Also introducing end of project acquittals for all projects (currently in progress)
<u>Refined existing risk</u> 10. Loss of Key Staff decreases research impact	Moderate	Likely	Medium	Reduce	Regular contact with theme and project leaders and checking quarterly project reports will identify issues promptly facilitating a quick solution. A new Hub Director commenced in March 2020 and a handover period with the Hub Executive is in progress. A new Hub Communication Support Officer has commenced and a hand-over period with the out-going officer has been completed
<u>Refined existing risk</u> 11. Not delivering on time for research-users decreases project impact	Moderate	Likely	Medium	Reduce	Continue with quarterly project progress reporting to promote completion of milestones on time. Where milestone delays are flagged work closely with DAWE, project leaders, and Partners, where necessary, to ensure the effect of delays (i.e. consequences) on research-user needs are minimised. Maintain communication with project leaders to track delivery of delayed milestones and ensure research-users are kept informed. Increase engagement of theme leaders in monitoring project delivery, through RLT. Add Executive Officer as required to RLT meetings. In March 2020 assess, prioritise and manage risks of delayed project milestones and deliverables resulting from partner, research-user and societal responses to COVID-19

Added/refined risks	Consequence	Likelihood	Rating	Response	Treatments
<u>Refined existing risk</u> 12. Ineffective engagement and communication with key stakeholders reduces research impact	Moderate	Possible	Medium	Reduce	Increase Hub Executive and RLT focus on knowledge brokering and communication on priority engagements including projects A12, D2, D6, D7 E1, E3, E4, Indigenous engagement and engagement with Parks Australia. Organising engagement event with the Australian Fisheries Management Authority (AFMA) to enhance understanding about research benefits and impact. Undertake a review of research-user engagement and communication in March/April 2020 to manage risks associated with emerging issues (i.e. partner and research user responses to COVID-19, major DAWE restructure and succession of Hub Executive staff)

The Hub has updated several risks in its risk register over the course of 2019 to reflect changes to risk ratings and risk treatments, for example: risk associated with loss of key staff; and failure of Hubs to provide financial acquittal and audit certificates.

Financial Information

Annual financial reporting

Financial information for the Marine Biodiversity Hub is provided at Attachment C.

MBH 2019 Annual Progress Report – Attachment B

Compiled Impact Stories

- 1. Uncovering the patchiness of life in Australia's remote deep sea**
- 2. Supporting Australia's commitments to hammerhead shark conservation**
- 3. Advancing Indigenous engagement and participation in sea country research**
- 4. Charting the reach of recreational fishing in Commonwealth marine parks and fisheries**
- 5. What people think about Australian Marine Parks**
- 6. Tracking the recovery of southern right whales**

Title

Uncovering the patchiness of life in Australia's remote deep sea

Project/s

[Project D3 - Implementing monitoring of AMPs and the status of marine biodiversity assets on the continental shelf](#)

[Project D4 - Expanding our spatial knowledge of marine biodiversity to support future best-practice reviews](#)

Short version

Surveys in nine deep-sea Australian Marine Parks (AMPs) have improved our understanding and prediction of deep-sea biodiversity. The new knowledge was built on national and international research collaboration and provides an evidence base for understanding, managing and showcasing the values of AMPs south and east of Australia.

Narrative

CONTEXT/PROBLEM

The deep sea is the world's largest ecosystem and a vast potential resource for fishing, mining, and oil and gas exploration. Exploitation of these resources may cause irrevocable damage to local deep-sea environments, so we must choose priority areas for protection.

AMPs established to manage and protect Australia's marine biodiversity cover vast areas of deep sea. They were placed according to broad-scale predictions of seafloor biodiversity, based on the best available scientific information. AMP managers need to make decisions about sustainable use and build societal understanding about the value and wonder of these parks.

Mapping deep-sea life and understanding its evolution is essential to answering fundamental questions. What are AMPs protecting? Is deep-sea life as scientists predict? Only a fraction of the deep sea has been studied, however. We have better maps of the moon's surface than of the Earth's deep seafloor.

RESEARCH IMPACT

Hub-supported surveys in nine AMPs have dramatically improved our understanding and predictive capability for deep-sea environments in Australian waters, with global implications. New knowledge of deep-sea biogeography, including the underlying evolutionary and environmental influences, provides the evidence base for managing AMPs south and east of Australia.

Surveys off eastern Australia revealed for the first time that deep seafloor communities are not similar. In fact, clear differences exist between Australia's south-eastern, north-eastern and southern provinces, and between depth layers. This validates the broad-scale predictions developed by the first Hub two decades ago, and their value to the design of Australia's Marine Park Network.

While deep-sea research is expensive and technically challenging, good national and international collaboration makes it feasible. The collation of scant data, prediction of biodiversity patterns and collection of new data to test predictions, provides the knowledge required to prioritise research and management. For many areas across multiple marine parks, this work also highlights what is being protected: for decision-makers, park users and stakeholders.

Expertise developed during the AMP surveys is being extended to understand the evolution and biogeography of precious deep-sea environments globally. This includes identifying Ecologically and Biologically Significant Areas under the UN Convention on Biological Diversity, developing spatial management options for the South Pacific and Indian oceans with the UN Fisheries and Agricultural Organisation, and identifying 'vulnerable marine ecosystems' (VME) as focus areas for conservation.

HOW THE IMPACT WAS ACHIEVED

This research is the result of the Hub's focus on building national methods, information streams and expertise since 2007. Early Hub outputs predicted national marine biogeography – provincial structure, depth structure and geomorphology – as requested by the Environmental Resources Information Network to help design the AMP network.

Teams of taxonomists, ecologists, gear specialists, data analysts, park managers and technicians – from Australian and international museums, universities and government agencies – conducted effective surveys south and east of Australia from the Marine National Facility research vessel. The Hub has helped build the capacity for these successful teams and provides leadership that increases both the scientific value and management impact of the research. Voyage highlights were shared with a large public audience through effective and collaborative science communication.

Findings relating to understanding and predicting deep-sea life have been presented at international conferences and meetings in 2019, including those advancing international seafloor mapping to identify VME, and enhance biogeographic knowledge of the South Pacific and Indian oceans.

Supporting evidence

TESTIMONIAL

"This research has brought to life vast unknown areas of our Australian Marine Parks. It has helped us better understand the marine environment by providing seafloor and habitat maps, as well as incredible imagery of fascinating marine life that is accessible to all. The amazing diversity of deep-sea communities validates the value of these special places and the need for good marine park management. Our managers have benefited hugely from experiencing first-hand deep-sea science on board the voyages and a greater understanding of how to align

management activities to the characteristics and requirements of deep-sea communities in our parks.”

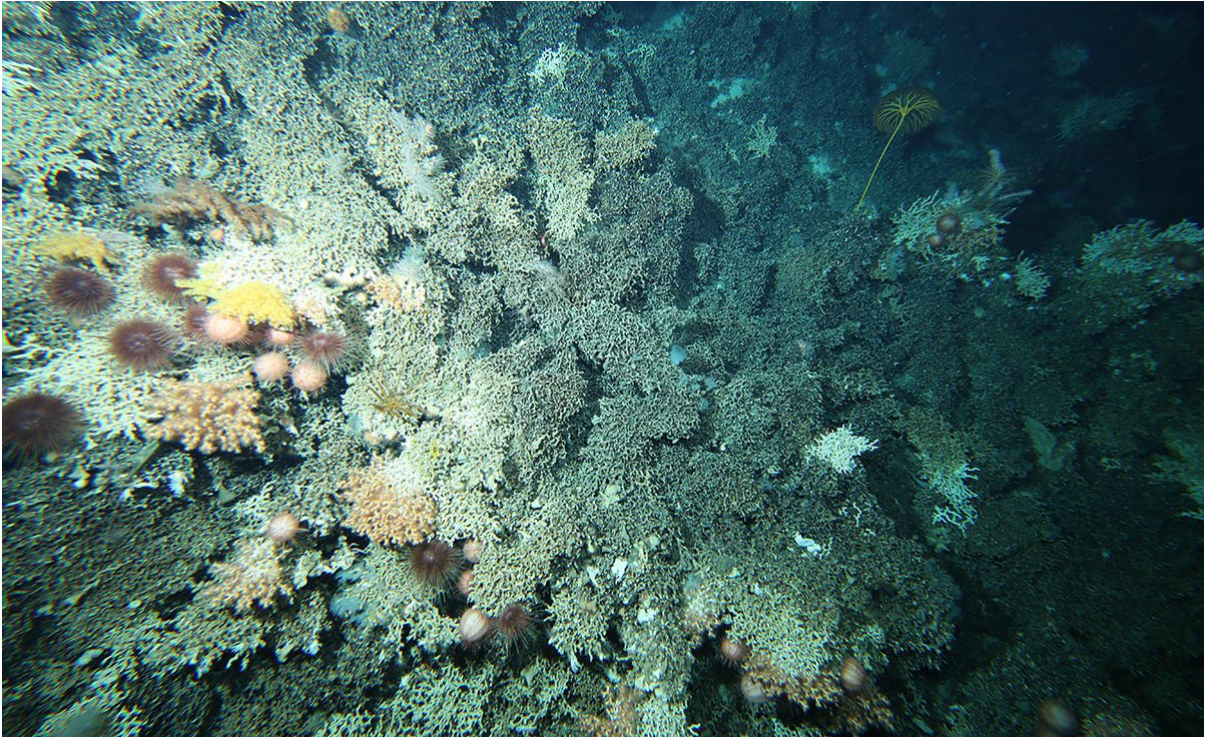
Kim Farrant – Assistant Secretary, Marine Parks Branch, Parks Australia

Research outputs

- ☐ [T.D. O'Hara; A. Williams; F. Althaus; A.S. Ross; N. Bax. Regional-scale patterns of deep seafloor biodiversity for conservation assessment \(2020\)](#)
- ☐ [T.D. O'Hara; A.F. Hugall; S.N.C. Woolley; G. Bribiesca-Contreras; N. Bax. Contrasting processes drive ophiuroid phylodiversity across shallow and deep seafloors \(2019\)](#)
- ☐ [T.D. O'Hara. The eastern Australian Marine Parks: biodiversity, assemblage structure, diversity and origin \(2019\)](#)
- [L. Gunton; E. Kupriyanova; P. Hutchings; R. Wilson; A. Murray; H. Paxton; I. Burghardt; J. Zhang; T.D. O'Hara. Polychaetes from Australia's Eastern Abyss \(2018\)](#)
- ☐ [P.K. Dunstan; N. Bax; J.M. Dambacher; K.R. Hayes; P.T. Hedge; D.C. Smith; A.D.M. Smith. Using ecologically or biologically significant marine areas \(EBSAs\) to implement marine spatial planning \(2016\)](#)
- ☐ Article in The Conversation: [Sludge, snags, and surreal animals: life aboard a voyage to study the abyss](#)
- ☐ Journal article: [Contrasting processes drive ophiuroid phylodiversity across shallow and deep sea floors](#) - Nature, 23 January 2019
- ☐ NESP Marine Biodiversity Hub voyage blog: ["Blogging the Abyss"](#) - 15 May to 16 June 2017
- NESP Marine Biodiversity Hub voyage blog: [Seamount corals survey](#) – 23 Nov–19 Dec 2018
- ☐ Nature blog: ['How we found that deep-sea biogeography doesn't obey the rules \(link is external\)'](#)
- ☐ Museums Victoria Collections article and images: [Sampling the Abyss voyage \(link is external\)](#) - 15 May to 16 June 2017

Attributions

- Tim O'Hara, Museums Victoria: Chief scientist Investigator IN2017_V03: Voyage to Australia's eastern abyss
- ☐ Skip Woolley and Scott Foster, CSIRO: statistical analyses
- ☐ Alan Williams, CSIRO: chief scientist: Investigator IN2018_V06: Seamount corals survey
- ☐ Nic Bax: Marine Biodiversity Hub Director, CSIRO
- ☐ Piers Dunstan: CSIRO
- ☐ Rachel Przeslawski: Geoscience Australia



Stony coral on a seamount south of Tasmania, pictured by the deep-towed camera deployed from RV *Investigator* during the 2018 Seamount Corals Survey. Image: CSIRO Marine National Facility



Lupita Bribiesca-Contreras, Tim O'Hara and Dianne Bray of Museums Victoria inspect brittle-stars collected from RV *Investigator* during the voyage to Australia's eastern abyss in 2017. Image: CSIRO Marine National Facility/Asher Flatt



An isopod collected by the beam trawl. Image: Fraser Johnston

Title

Supporting Australia's commitments to hammerhead shark conservation

Project/s

[Project A5 - Defining the connectivity of Australia's hammerhead sharks](#)

Short version

Collaborative research led by the Marine Biodiversity Hub has generated a new understanding of how hammerhead shark populations are structured and connected across northern Australia and neighbouring nations. The knowledge is contributing to national stock assessment and helping Australia meet national and international measures to conserve these shark species, which are susceptible to overfishing.

Narrative

CONTEXT/PROBLEM

Northern Australia's two large species of hammerhead shark – the Scalloped Hammerhead Shark and the Great Hammerhead Shark – are susceptible to fisheries bycatch and overfishing driven by international trade in fins and meat. National and international measures are in place to support their conservation.

The Scalloped Hammerhead Shark is listed as Conservation Dependent under Australia's *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), and both species are listed under the Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES).

The CITES listing reduces the threat posed by global trade. To receive an export permit, Australian fisheries that harvest these hammerhead species as bycatch must show that they are not substantially increasing the risk of the sharks' extinction. This is called a Non-Detriment Finding (NDF).

The Australian Government and state government agencies need a better understanding of hammerhead stocks in Australian waters to meet their obligations under CITES and the EPBC Act, and to manage hammerhead shark populations caught in fisheries.

A key question is whether the population(s) in Australian waters interbreed with populations overseas. International assessment and management may be required if the stocks are shared.

RESEARCH IMPACT

Hub researchers studied the movements and genetics of hammerhead sharks to better understand their connectivity and population structure. They briefed Department of Agriculture, Water and the Environment (DAWE) staff and the Threatened Species Scientific Committee (TSSC) on the findings. The new knowledge underpins recommendations to the Minister for Agriculture, Water and the Environment in relation to an upcoming NDF review.

A national stock assessment being developed by state agencies will also be considered as part of the NDF review. The Hub project has provided critical data on movement and population structure for this assessment.

Ongoing CITES controls and associated non-detriment assessments are a significant step in the global conservation of these shark species. They necessitate heightened management, regulation and monitoring in Australian waters, including for export fisheries that have significant bycatch.

Knowledge gained during this project also contributed to the EPBC listing of the Scalloped Hammerhead Shark as Conservation Dependent in 2018. The listing adds another layer of nationally directed management and monitoring to support conservation.

These outcomes further the Hub's significant contribution to informed decision-making on trade of endangered shark species and the national EPBC listing and state-based management of populations. The Hub's shark action plan for Australia is identifying further priority species for research.

HOW THE IMPACT WAS ACHIEVED

The need for this project was identified through discussions with the Department and the TSSC. A national team was assembled from science institutions, the fishing industry, governments and Traditional Owner groups. Effective engagement with these stakeholders facilitated a shared understanding of the issues and knowledge gaps, and collaborative research.

Hammerhead sharks were tagged and tracked by researchers from the Australian Institute of Marine Science, Western Australian Fisheries, Northern Territory Fisheries and James Cook University. Commercial and charter fishers advised the team on where to find the sharks, and Indigenous rangers from the Giringun Aboriginal Corporation, Yuku Baja Muliku, and Yirrganydji Traditional Owners joined Queensland tagging expeditions.

National collaboration with data holders opened up access to existing data, including records of commercial fisheries catch. These were combined with the new project data – from tagging, genetics and shark parasite research – and Indigenous knowledge.

The findings were shared in briefings with departmental staff and the TSSC, to help form recommendations to the Minister for the NDF review. The findings also feed into a national stock assessment under way for hammerhead sharks.

Supporting evidence

TESTIMONIALS

“We used the results of this study extensively to determine where populations of *S. lewini* existed in Australia and what level of connectivity these populations had with Indonesia and Papua New Guinea to assess the status of this species in Australian waters. Without this information the stock assessment would have been extremely complicated due to the need of identifying large, relatively unreported catches of *S. Lewini* from this international jurisdictions.”

- *Northern Scalloped Hammerhead Stock Assessment Team* (received from Thor Saunders, Northern Territory Department of Primary Industry and Resources)

“Early results from “Project A5 – defining the connectivity of Australia’s hammerhead shark”, provided useful information to inform the spatial structure of the stock assessment. It also better informed our assumptions regarding connectivity between fisheries in other countries. Based on results from this project, we developed a stock assessment model for the western stock (Western Australia), the northern stock (Northern Territory and Gulf of Carpentaria) and the eastern stock (Australia East Coast). Results from these assessments will be available to the Threatened Species Scientific Committee later this year (2020).”

National Scalloped Hammerhead Stock Assessment Team – included staff from Northern Territory Department of Primary Industry and Resources, Western Australia Fisheries and Marine Research Laboratories, Queensland Department of Agriculture and Fisheries, Northern Territory Fisheries, Sea Sense Australia, Great Barrier Reef Marine Park Authority and NSW Department of Agriculture and Fisheries (received from Sue Helmke, Manager, Stock Assessment, Fisheries Queensland)

Research outputs

- ☐ F. Moravec; D.P. Barton: [Description of *Piscicapillaria bursata* sp. nov. \(Capillariidae\) and Redescription of *Parascarophis sphyrnae* Campana-Rouget, 1955 \(Cystidicolidae\), Two Nematode Parasites of Hammerhead Sharks \(*Sphyrna* spp.\) off Australia](#)
- ☐ A. Chin: [Northern Australia Hammerhead Shark Tagging Program - Fact Sheet \(Update January 2019\)](#)
- ☐ K. Gerhardt, [Indigenous knowledge and cultural values of hammerhead sharks in Northern Australia](#)
- ☐ Chin; C.A. Simpfendorfer; W.T. White; G.J. Johnson; R.B. McAuley; M.R. Heupel: [Crossing lines: a multidisciplinary framework for assessing connectivity of hammerhead sharks across jurisdictional boundaries](#)
- ☐ S. Shamsi; D.P. Barton; X. Zhu: [Description and characterisation of *Terranova pectinolabiata* n. sp. \(Nematoda: Anisakidae\) in great hammerhead shark, *Sphyrna mokarran* \(Rüppell, 1837\), in Australia](#)

Attributions

- ☐ Michelle Heupel: (formerly) Australian Institute of Marine Science
- ☐ Colin Simpfendorfer: James Cook University
- ☐ Andrew Chin: James Cook University
- ☐ Will White: CSIRO
- ☐ Sharon Appleyard: CSIRO
- ☐ Madi Green: UTAS
- ☐ Di Barton: Northern Territory Fisheries; Charles Sturt University
- ☐ Grant Johnson: Northern Territory Fisheries



Hammerhead sharks have been tagged with satellite tags to learn how they move between Western Australia, the Northern Territory, the Torres Strait and Queensland, and Indonesia and Papua New Guinea.

Title

Advancing Indigenous engagement and participation in sea country research

Project/s

Indigenous engagement and participation (research facilitation)

Short version

Indigenous groups from Esperance to the Kimberley joined marine science providers and managers at the fourth regional Australian Marine Sciences Association (AMSA) Indigenous workshop at Fremantle in July 2019. A broad range of specific opportunities were identified for advancing collaborative and respectful research and monitoring in Western Australia. This laid the groundwork for advancing regional and standards-based approaches to sea country research and management, and provided valuable insights for New South Wales: the location of the next AMSA Indigenous workshop.

Narrative

CONTEXT/PROBLEM

Indigenous groups in WA are increasingly participating in sea country research and monitoring. At the same time, numerous marine research institutions and management agencies in WA are devising policies and guidelines for Indigenous engagement, with varying degrees of Indigenous input. While this is an encouraging sign for collaborative partnerships, the duplication in these processes is unhelpful. A standard approach that all Indigenous groups and research providers could aspire to is a better way forward.

RESEARCH IMPACT

Indigenous groups from Esperance to the Kimberley joined marine science providers and managers at the fourth regional AMSA Indigenous workshop at Fremantle in July 2019. They identified a broad range of specific opportunities for collaborative sea country research and monitoring, shaping a vision for Indigenous engagement in marine science and monitoring in WA.

The vision is a standards-based, consistent approach to Indigenous engagement across marine sectors that incorporates guiding principles and regional protocols. The approach incorporates Aboriginal Institute of Torres Strait Islander Studies Guidelines for Ethical Research and builds on regional engagement protocols developed for the Kimberley. Greater coordination between science institutions and stronger regional Indigenous alliances were seen as critical.

The initiative has helped to advance new collaborative approaches to research and management on sea country in WA. The first of these is occurring in Shark Bay where the Malgana Aboriginal Corporation is collaborating with marine research providers, including Hub partners, to develop regional protocols similar to those used in the Kimberley.

This is the fourth regional AMSA Indigenous engagement workshop championed and funded by the NESP Marine Biodiversity Hub. The regional workshops have become an important event on the annual agenda for the Hub and AMSA and are helping us step toward respectful,

collaborative partnerships for sea country research and monitoring. The fifth regional workshop will be convened in NSW. We expect the momentum and learnings from previous workshops to be very useful in shaping regional approaches to Indigenous partnerships for sea country research and monitoring on Australia's eastern seaboard. The aspiration is to establish a national approach to Indigenous engagement that strikes the right balance between the use of standards and principles, and the need to accommodate regional differences.

HOW THE IMPACT WAS ACHIEVED

Regional AMSA Indigenous workshops require considerable planning including the targeting of key participants from Indigenous groups and marine research providers. This includes completing reports that capture key information about Indigenous sea country groups and marine science providers.

A trusted facilitator is engaged by the workshop committee to ensure the workshops have a clear purpose and deliver benefits to Indigenous groups and marine science providers.

We have secured eight marine science provider sponsors to demonstrate the breadth of interest for improved approaches to Indigenous engagement in WA.

Trusted relationships have been developed and maintained with AMSA (over 10 years) and key Indigenous people (since 2016).

We plan ahead to ensure that workshops are attended by a small number of Indigenous people from next year's region (in 2019 this was Indigenous people from NSW) so they observe the workshop and begin to generate ideas about what to do in the next regional workshop on their country.

Supporting evidence (2019 workshop)

TESTIMONIALS

"This is a testimonial to advancing the development of the AMSA partnership with the Indigenous community from Esperance to the Kimberley with a joined-up marine science approach in an historic event to forge a better, standards-based approach to Indigenous engagement in marine science in Western Australia.

I was part of the workshop that provided a broad range of specific opportunities for advancing collaborative and respectful research and monitoring in WA. The initiative laid the groundwork for advancing regional approaches to sea country research and management in WA and has also provided valuable insights for similar approaches in NSW – the location of the next AMSA Indigenous workshop.

The leadership provided by AMSA should be commended and showcased as the future process for collaboration and the conducting of respectful research upon all our sea-country across Australia. The work conducted over the past four years by AMSA and their partners in establishing this partnership highlights through meaningful workshops will assist cultural values of the Indigenous communities to be included in future important scientific research being conducted.

This partnership also allows for the development of western science marrying up with the cultural science to ensure sea-country is included in the quadruple bottom line for marine

science in Australia. This will ensure a brighter future for improving this partnership that includes Indigenous cultural values at the forefront but also abides by the cultural protocols attached to the various sea-country around Australia.”

- *David Collard, Principal Consultant, David Collard & Associates and Noongar/Ballardong man*

“The Western Australian Marine Research Institution (WAMSI) is a marine research collaboration with 14 partners including Commonwealth and State agencies, and WA universities. Our objective is to enhance the economic, social and environmental values of WA’s marine estate. In 2018 the WAMSI Board agreed that all future WAMSI marine research programs should include Indigenous voices with free prior informed consent for engagement and consultation. Through the WAMSI funded Kimberley Marine Research Program a guide was developed for researchers to undertake collaborative science on Kimberley Saltwater Country.

The 2019 AMSA Indigenous Workshop convened by NESP provided an excellent opportunity to understand how the WAMSI Kimberley protocols for engagement had been received and whether the process could be replicated in other regions of Western Australia. The AMSA workshop provided an excellent neutral space for Western Australian scientists and Indigenous groups to come together to workshop how future engagement might be rolled out more widely. The workshop provided the opportunity for Kimberley Saltwater people to outline how the programs had been successfully implemented on Country and share the pros and cons of entering into relationships with scientists. The outputs have helped develop WAMSI’s strategies for future regional science plans and have recently been applied to the WAMSI Shark Bay science plan. Through this process WAMSI has engaged with the Malgana Aboriginal Corporation to include Indigenous voices in the WAMSI Science Plan for Shark Bay and has started a discussion on how scientists should progress engagement with the Malgana on future in Shark Bay projects.

Paul Hedge was instrumental in planning and coordinating the workshop, which took many months of careful consideration and negotiation. The workshop was well received by the Western Australian Indigenous groups that attended, which was reiterated by the group calling for follow-up workshops to develop protocols for marine scientist engagement with Indigenous Saltwater groups in other regions of WA. WAMSI is grateful to NESP and especially to Paul Hedge for his tenacious efforts organising the 2019 AMSA Indigenous Workshop.”

- *Luke Twomey, CEO, WAMSI*

“As President, I represented the Australian Marine Sciences Association (AMSA) at the Indigenous Engagement Workshop at the AMSA Conference in Fremantle in July 2019. AMSA is in a unique position to provide a link between scientists and indigenous people and to encourage a uniform approach to working together. The Workshop brought together Indigenous people from Sea Country all over WA, and a range of scientists and agencies. I was amazed to learn that the Indigenous people had never been in the same room together and had never had the opportunity to share their experiences of collaborating with scientists. I was proud that AMSA had been able to help facilitate this interaction. The experience of the Indigenous people with research was varied, with some having little interaction and a

somewhat naive approach, through to others with a sophisticated view of how research projects on Sea Country should be developed and conducted. I hope AMSA can continue to develop a framework for better interaction between Indigenous people and scientists. As a result of the workshops supported by NESP, we have a sub-committee of our National Council dedicated to this task.”

- *Reflections on the Indigenous Engagement Workshop at the AMSA Conference, Fremantle 2019 Dr Penny Berents, AMSA President*

Research outputs (2019-2017)

- [Hedge, P. and Bessen, B. \(Eds\). 2019 AMSA Indigenous Workshop: Summary Report – Promoting collaborative partnerships for sea country research and monitoring in Western Australia. Report from Workshop Organising Committee to the Australian Marine Sciences Association and the National Environmental Science Program, Marine Biodiversity Hub. 2019 AMSA Indigenous Workshop Organising Committee](#)
- ☐ [Research and Monitoring in Western Australia: A snapshot of Indigenous, science and management agency partners, Version 1. Report to the National Environmental Science Program, Marine Biodiversity Hub. Mosaic Environmental](#)
- [Reinhold, S.L., Hemming, S., Holland, S., Nursey-Bray, M., Rogers, P., Sutherland, L., Hedge, P., Duncan, P., Marshall, C., Lee, E., Goldsmith, G., Rose, D., Collard, D., Reynolds, D., Rigney, D., Evans-Illidge, L., Forster, T. and O'Brien, R. \(2019\) AMSA Marine Sciences and Meeting Indigenous Research Priorities 2018 Workshop Summary. Australian Marine Sciences Association Publication No. 978-0-646-80061-5](#)
- ☐ [Hedge, P. \(Ed\). 2017. AMSA Indigenous Engagement Workshop Summary. Report to the National Environmental Science Programme, Marine Biodiversity Hub. 2017 AMSA Indigenous Engagement Workshop Working Group.](#)

Attributions (2019 Workshop)

- ☐ Leader of initiative: Paul Hedge (Deputy Director and Knowledge Broker, MBH)
- ☐ Workshop organising Committee (alphabetical order)
 - Kevin Bancroft – Western Australia Department of Biodiversity, Conservation and Attractions
 - David Collard – Nyoongar elder Zoe Cozens – Parks Australia
 - Libby Evans-Illidge – Australian Institute of Marine Science
 - Tracey Lee Forester – Australian Institute of Marine Science
 - Paul Hedge – National Environmental Science Programme Marine Biodiversity Hub (Chair & Secretariat)
 - Cass Hunter – CSIRO
 - Gina Lincoln – Mosaic Environmental, Kimberley
 - Sean McNear – Yamatji Marlpa Aboriginal Corporation
 - Dean Mathews – Nyamba Buru Yawuru Ltd
 - Daniel Oades – Kimberley Land Council
 - Marika Oakley – Malgana Aboriginal Corporation
 - Doc Reynolds – Kepa Kurl Enterprises Pty Ltd

- Alicia Sutton – Australian Marine Sciences Association
- Luke Twomey – Western Australia Marine Science Institution
- Kelly Waples – Western Australia Department of Biodiversity, Conservation and Attractions
- Scott Whiting – Western Australia Department of Biodiversity, Conservation and Attractions
- ☐ Consultants
 - Commissioned to facilitate – Bevan Bessen (Tuna Blue Pty Ltd)
- ☐ Commissioned to lead production of report Lincoln, G. and Hedge, P. (2019)
- ☐ Workshop sponsors (alphabetical order)
 - Australian Institute of Marine Science - AIMS, CSIRO, Geoscience Australia, NESP Marine Biodiversity Hub, University of Western Australia - UWA, Western Australian Department of Biodiversity, Conservation and Attractions - DBCA, and Western Australia Marine Science Institution – WAMSI)



The Marine Biodiversity Hub has developed and maintained trusted relationships with Indigenous people. Image: Michael Lawrence-Taylor

Title

Charting the reach of recreational fishing in Commonwealth marine parks and fisheries

Project/s

[Project E4 - Recreational fishing in Commonwealth waters](#)

Short version

This project demonstrated the potential value of state-based surveys to interest managers of Australian Marine Parks (AMPs) and commercial fisheries in Commonwealth waters. It has built the capacity of Parks Australia (PA) and the Australian Fisheries Management Authority (AFMA) to work with the states to assess trends and potential impacts, and implement cost-effective survey approaches.

Narrative

CONTEXT/PROBLEM

Recreational fishing is popular in Australia's state and Commonwealth waters, including some AMPs. As more fishers venture offshore, AMP managers need to understand how fishers are using these parks: when they visit, where they go and what they catch.

Since a national baseline for recreational fishing was established in 2000/01, most states have continued statewide or regional surveys, but these have been inconsistent in frequency and timing. Australia therefore lacks a time-series of coordinated national recreational fisheries statistics.

Recreational fishing is so popular for some species that recreational catches exceed the commercial harvest. Therefore, understanding recreational fishing in Commonwealth waters is important to developing and implementing harvest strategies administered by AFMA. This includes transboundary stocks such as Southern Bluefin Tuna.

RESEARCH IMPACT

This project generated an improved understanding of marine recreational fishing in targeted areas of Australia's Exclusive Economic Zone, and the potential for state-run surveys to provide information of value to managers of Australia's Commonwealth marine parks and fisheries.

A new, low-cost technique to sample activity at high-traffic boat ramps combined with weather observations and modelling has the potential to generate accurate predictions about recreational fishing.

For the first time, analysis and reporting of data collected by state agencies showing how recreational fishers use Ningaloo Marine Park (Commonwealth Waters) (WA) and Hunter Marine Park (NSW) has been provided directly to PA. Based on this information, PA is better positioned to work with the states on assessing trends in recreational fishing inside and outside AMPs. In parks such as Ningaloo, this information helps inform outreach to park visitors to ensure the sustainable use of marine resources, and the fishing experience.

The project also increased AFMA's understanding of selected commercial species affected by recreational fishing, and the implications for fishery stock assessments and harvest strategies. For example, recreational catches of flathead and school sharks were found to be at levels requiring their explicit consideration in stock assessments.

HOW THE IMPACT WAS ACHIEVED

The Marine Biodiversity Hub established a multi-jurisdictional research team and a network of key stakeholders to scope and implement the project. This included participants from CSIRO, WA Department of Primary Industries and Regional Development, NSW Department of Primary Industries, University of Tasmania, and managers from PA and AFMA.

Hub researchers collaborated with WA and NSW agencies to access existing state survey datasets and analyse and compare findings. Workshops were held to facilitate effective engagement and communication with research users. The established network has built capacity for ongoing collaboration and exchange of information about recreational fishing.

A boat ramp survey and low cost sensor method trialled adjacent to the Freycinet Marine Park determined recreational fishers' understanding of management, values and uses of offshore areas. Usage data were modelled with weather observations to predict fishing metrics such as number of launches and duration of trips.

The project leader, Dr Tim Lynch, presented the findings of the boat ramp trial at the International Council for the Exploitation of the Sea Annual Science Conference in Sweden in September 2019 where the survey technique received interest from the Swedish National Board of Fisheries.

Supporting evidence

TESTIMONIALS

"Managers need to understand the level of recreational fishing in Australian Marine Parks to provide benefits to fishers while protecting marine life. Nationally consistent datasets are critical to best manage fishing in our parks. This research made good progress towards this by improving collaboration with state fisheries agencies and recreational fishers to enhance access to up-to-date information and identify improvements in data collection methods. We are very thankful for the hard work of researchers and the willingness of partners to share their data and methods - a crucial first step."

– Kim Farrant – Assistant Secretary, Marine Parks Branch, Parks Australia

Research outputs

- ☐ [T.P. Lynch, C.B. Smallwood, F.A. Ochwada-Doyle, J Lyle, J Williams, KL Ryan, C Devine, B Gibson, A Jordan, A cross continental scale comparison of Australian offshore recreational fisheries research and its applications to Marine Park and fisheries management](#)
- ☐ [T. Lynch; C. Smallwood; F. Ochwada-Doyle; J. Williams; K. Ryan; C. Devine; B. Gibson; M. Burton; A. Hegarty; J. Lyle; S.D. Foster; A. Jordan. Recreational fishing in Commonwealth waters \(2019\)](#)
- ☐ [Tim P. Lynch, Georgina Wood, David J. Flynn, Carlie Devine, David Hughes, Gary Curtis, William Figueira, Michael Burton, Alexandra Hegarty, Jeremy Lyle, Scott Foster \(2019\). Big](#)

- ☐ [camera, little camera: panoramic giga-pixel and trail cameras for studies of recreational fishers. ICES conference Gutenberg 2019.](#)

Attributions

- ☐ Tim Lynch, CSIRO: led, field work, main author, analysis, conceptualisation
- ☐ Claire Smallwood (WA DPIRD), Faith Ochwada-Doyle (NSW Government), Joel Williams (NSW DPI), Michael Burton (UWA): analysis, methods authors, conceptualisation
- ☐ Karina Ryan (WA DPIRD), Beth Gibson (AFMA), Jeremy Lyle (IMAS): editing and comment, resourcing, conceptualisation
- ☐ A Hegarty: field work, data entry, data analysis,
- ☐ Carlie Devine (CSIRO): field work, data entry, data analysis, editing, project management,
- ☐ Scott Foster (CSIRO): statistical consultant



Marine recreational fishing is popular in Australia's state and Commonwealth waters, including some AMPs. Image: CSIRO



A boat ramp survey and low cost sensor method trialled adjacent to the Freycinet AMP determined recreational fishers' understanding of management, values and uses of offshore areas. Image: CSIRO

Title

What people think about Australian Marine Parks

Project/s

[Project D6 – Socioeconomic benchmarks](#)

Short version

The Marine Biodiversity Hub's social and economic benchmarks project is delivering nationally on improving the quality of social and economic assessments of marine parks, particularly the Australian Marine Parks (AMPs). The project has engaged all major Australian marine park agencies in Australia into a national conversation on social and economic research, produced recommendations for robust metrics to be monitored for AMPs, and started national data collection for these metrics.

Narrative

CONTEXT/PROBLEM

In Australia, marine parks are about marine biodiversity conservation and sustainable use of marine resources. They affect people's behaviour through zoning and are designed to provide benefits and opportunities for people to explore and enjoy marine environments both now and into the future.

To date, the social and economic dimensions of marine parks have been largely ignored in park monitoring. Park managers recognise the need for a rigorous method for quantifying the social and economic benefits and costs of no-take national park zones. The Hub's social and economic benchmarks project is considering this for AMPs.

RESEARCH IMPACT

Since its commencement in early 2019, the project has worked collaboratively with Parks Australia (PA) and state marine park agencies to improve understanding about the social and economic costs and benefits of marine parks in Australia.

Hub researchers have started a national conversation on the need to improve understanding of the costs and benefits of marine parks. This conversation is vital as many marine park agencies have limited capacity for social and economic research. Most marine park agencies in Australia have been involved, enabling inter-agency exchange of ideas, training and capacity building in social and economic research.

Hub researchers have also played a vital role in designing and implementing a rigorous social and economic monitoring program for AMPs. Drawing on conversations with state marine park agencies, they have recommended a suite of cost effective social and economic metrics and begun benchmark data collection. These data provide the first nation-wide glimpse into how aware marine park users are of AMPs, which areas they are using, and their perceptions of the parks.

Preliminary data has already been directed to PA's compliance and education teams to inform their stakeholder engagement strategies. Data are also being collected on adjacent state

marine parks, delivering unparalleled understanding of awareness, use and perceptions of state and Commonwealth marine parks nationally.

HOW THE IMPACT WAS ACHIEVED

The project consists of two phases.

In the first phase, the researchers held regional workshops with more than 35 marine park agency staff nationally, including PA, Great Barrier Reef Marine Park Authority, Parks Victoria, South Australian Department of Environment, Water and Natural Resources, New South Wales Department of Primary Industries and Western Australian Department of Biodiversity, Conservation and Attractions.

These workshops were used as an opportunity to leverage the collective experiences of state marine park agencies, with results used to inform recommendations to PA for social and economic monitoring of AMPs. The workshops are being followed up with a national workshop in May 2020 to build on the progress, and work towards a nationally consistent approach to social and economic monitoring.

The second phase involves benchmark data collection. Data collection is in progress and will include surveys targeting recreational fishers, non-fishing recreational users, charter operators and the general public. To date, boat ramp surveys have been conducted in nine key locations measuring awareness, use and perceptions of 778 marine park users. Surveys targeted at the general public, charter operators, and fishing/boat clubs will begin soon, and together will establish a national benchmark on awareness, use and perceptions of AMPs.

Supporting evidence

TESTIMONIALS

“Effective management of our Australian Marine Parks relies on support from marine park users, the Australian public and management partners. This research is giving critical insight into the perceptions and awareness of those people we are managing the parks for. This foundational work will allow Parks Australia to monitor and meet the varying needs of all those who care about and benefit from the precious resources and incredible marine life in our parks. The close collaborative way in which the lead researchers have approached the entire project has resulted in very targeted and valuable outputs to inform marine park management.”

– Kim Farrant – Assistant Secretary, Marine Parks Branch, Parks Australia

Research outputs

☐ Not yet published

Attributions

- ☐ Tim Langlois, UWA School of Biological Sciences
- ☐ Matt Navarro, UWA School of Biological Sciences
- ☐ Michael Burton, UWA School of Agriculture and Environment
- ☐ Marit Kragt, UWA School of Agriculture and Environment
- ☐ Abbie Rogers, UWA School of Agriculture and Environment



Boat ramp surveys have been conducted in nine key locations measuring awareness, use and perceptions of 778 marine park users. Image: UWA

Title

Tracking the recovery of southern right whales

Project/s

[Project A7 - Monitoring population dynamics of 'western' right whales off southern Australia](#)

[Project A13 - Estimation of population abundance and mixing of southern right whales in the Australian and New Zealand regions](#)

Short version

This project is providing the Australian Government with the evidence it needs to understand and report on the status and recovery of Endangered southern right whales in Australian waters. The tracking of southern right whale recovery in 2016–2020 supports the implementation of specific actions in the [Southern Right Whale Conservation Management Plan](#) (CMP) and provides scientific evidence required by Australia's delegation to the International Whaling Commission (IWC). It is also contributing to providing the Australian Government and the IWC in 2020 with the first estimate of southern right whale population abundance in Australian waters.

Narrative

CONTEXT/PROBLEM

The southern right whale is listed as Endangered under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and subject to conservation listings in five other Australian states due to a crash in numbers caused by historical commercial whaling. The Australian Government's CMP for the southern right whale serves as a recovery plan under the EPBC Act. It also provides a framework for collaboration between countries and other stakeholders to protect and rebuild populations, as required under Australia's membership of the IWC.

The southern right whale CMP must be periodically updated to reflect new knowledge and prioritise research needed to monitor population recovery and predict the impacts of threats. For example, climate change has the potential to affect the whales' food and habitat, migration and breeding.

Aerial surveys occur annually off south-western Australia, but the relatively smaller south-eastern population has proven elusive. We therefore lack a comprehensive understanding of how right whale populations mix around Australia, and their overall population abundance. This makes it impossible to assess the effectiveness of management measures.

RESEARCH IMPACT

This project is providing the Australian Government with the evidence it needs to understand and report on the status and recovery of southern right whales in Australian waters. The tracking of southern right whale recovery in 2016–2020 supports the implementation of specific actions in the southern right whale CMP and provides scientific evidence required by Australia's delegation to the IWC. It is also contributing to providing the Australian

Government and the IWC in 2020 with the first population estimate of southern right whale populations in Australian waters.

The population model is being developed in collaboration with the University of Auckland and the British Antarctic Survey. It will estimate the whole Australian population, and identify any mixing between populations observed east and west of Bass Strait. Progress on this work will be presented to the IWC by the Australian delegation in May 2020.

HOW THE IMPACT WAS ACHIEVED

This project was identified as a high priority by the community and the Australian Government. Hub researchers worked closely with the Department of Agriculture, Water and the Environment (DAWE) to ensure the research program responds to departmental needs.

A team of national and international specialists was assembled to expand the capability and useability of the online Australasian Right Whale Photo-Identification Catalogue (ARWPIC).

Data streams associated with right whale sightings across user groups in Australia were unified and corrected, making data comparable and useable at a national level. All data for south-eastern Australia are now in the catalogue, updating records by four years to include 2016–2020. This includes all Head of the Bight data (28 years of records). Nineteen years of data from the annual Cape Leeuwin to Ceduna aerial survey are also being migrated.

This comprehensive national dataset is a vital first step towards answering questions at a national level. The data available for population modelling are now reliable and far more comprehensive, both spatially and temporally, with more than 6000 sightings of nearly 2500 individuals. Southern right whale sighting information is now more widely logged, shared and used, and a bespoke population model is on the horizon for southern right whales in the Australian region.

Supporting evidence

TESTIMONIAL

“The Southern Right Whale (*Eubalaena australis*) is listed as Endangered under the Environment Protection and Biodiversity Conservation Act 1999. Since the collapse of global whale populations, cetacean protection and conservation has been an important issue for the Australian Government and the global community including the International Whaling Commission. The NESP Marine Biodiversity Hub SRW projects are an excellent example of national and international collaboration and results will provide fundamental information on the recovery status of the SRW populations, and will contribute significantly to the conservation and management of this iconic threatened species.”

Belinda Harding, Policy Advisor, Migratory Species Section, Department of Agriculture, Water and the Environment

Research outputs

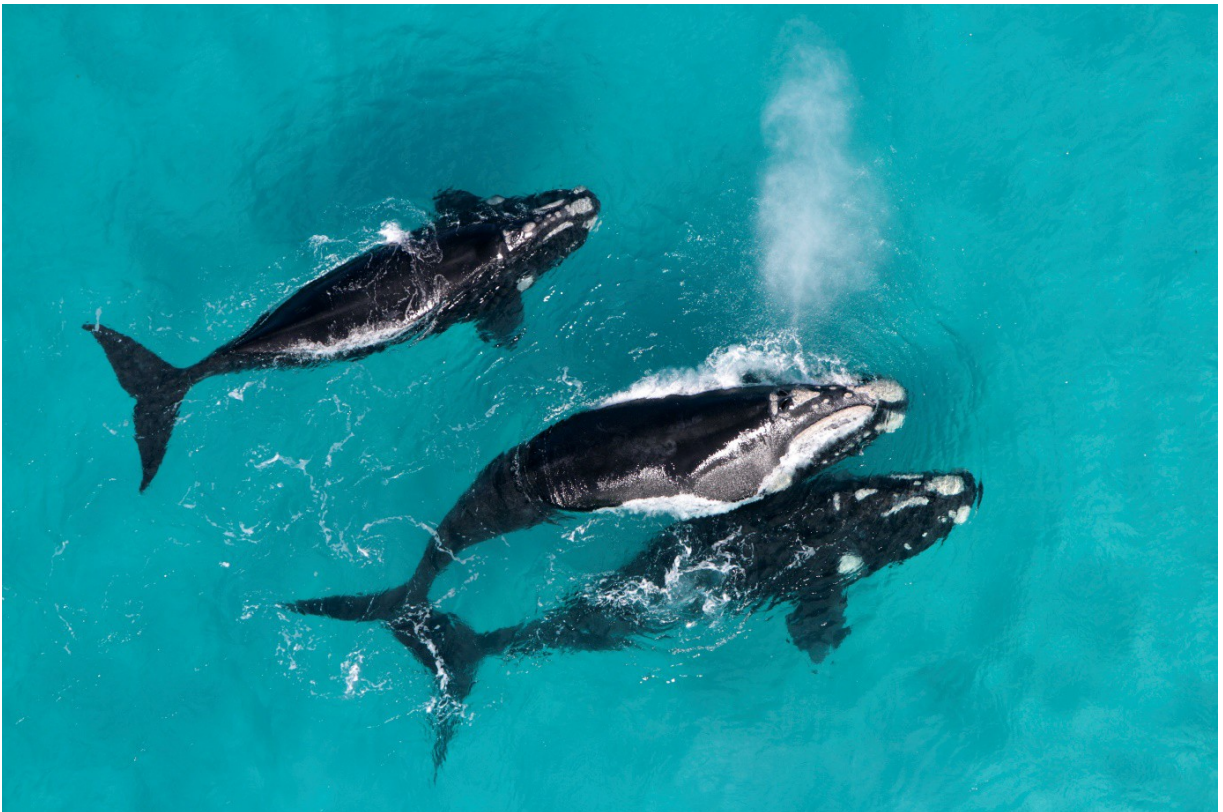
PUBLICATIONS

- [Monitoring Population Dynamics of ‘Western’ Right Whales off Southern Australia 2018-2021 - Final Report on activities for 2018](#)

- [Monitoring Population Dynamics of 'Western' Right Whales off Southern Australia - Final Report on activities for 2017](#)
- [Monitoring Population Dynamics of 'Western' Right Whales off Southern Australia - final report on activities for 2016](#)
- ☐ [Aerial survey monitors right whales off southern Australia - Fact sheet](#)
- ☐ [Tracking the giants of the deep: ABC online story 2019](#)

Attributions

- ☐ John Bannister [decd], Western Australian Museum
- ☐ D Jones, Western Australian Museum
- ☐ K Travouillon, Western Australian Museum
- ☐ Mike Double, Australian Antarctic Division
- ☐ Joshua Smith, Murdoch University
- ☐ Karen Evans, CSIRO
- ☐ Claire Charlton, Curtin University
- ☐ Mandy Watson, Department of Environment, Land, Water and Planning
- ☐ Kris Carlyon, Department of Primary Industries, Parks, Water and Environment



Between May and October, Australian right whales migrate from higher latitude feeding grounds to calving and nursery grounds in coastal Australian waters. The Hub has funded annual aerial surveys of right whales between Cape Leeuwin and Ceduna since 2015, continuing a sequence of data dating back to the 1993.

More than 2000 individuals have been identified altogether during the surveys, with about 700 animals including approximately 250 cow and calf pairs seen each year. The population trend analysis indicates a continued increase in whale numbers by approximately 6% per year (based on counts of cow/calf pairs), with no apparent slowdown in the population growth rate.

Image: Andrew Halsall, WA Museum



As pods of whales are encountered, images of the individual callosity pattern on the heads, and body marks such as white or grey dorsal blazes are photographed. The photographs are being used innovative mark recapture analyses to estimate the connectedness of populations.

Image: Andrew Halsall, WA Museum

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A1	Northern Australian hotspots for the recovery of threatened euryhaline species	Euryhaline elasmobranchs represent over half of the EPBC-listed threatened sharks and rays, with northern Australia of national importance for this threatened species community. Critical information gaps remain, limiting the implementation of Recovery Plan objectives. This project will fill many data gaps through the application of acoustic telemetry, traditional and advanced molecular research (population genetics and close-kin mark-recapture), life history studies and Indigenous knowledge and education. The focus is to improve management and facilitate recovery of these threatened species, through three research themes: 1) monitoring and understanding euryhaline species; 2) Indigenous partnerships for management of euryhaline species; and 3) knowledge for the reassessment of river shark status.	Peter Kyne	Charles Darwin University	846,509	890,346	1,736,855	01.07.15	31.03.20	Ongoing
A2	Quantification of National Ship Strike Risk	See Project C5	David Peel	CSIRO	-	-	-	1.07.15	31.03.20	Ongoing
A3	A national assessment of population status of white sharks	White sharks are listed as Vulnerable under the EPBC Act and the subject of a national recovery plan, yet there is still no effective way to assess their population status and thus no way of determining the efficacy of conservation actions. Recent debate due to various human-shark interactions has highlighted the need for further information. This project will provide a national assessment of population size and status in order to establish the efficacy of existing recovery actions and provide a scientifically sound and rational basis from which to develop policies that balance conservation objectives and public safety.	Barry Bruce	CSIRO	764,000	808,336	1,572,336	01.07.15	28.02.18	Completed
A4	The Status of Human-Shark Interactions and Initiatives to Mitigate Risk in Australia	Considerable political, public and media attention have recently been focused on human-shark interactions, specifically surrounding shark attack and ways to mitigate this risk. Finding the most appropriate policy balance between conservation of sharks, maximising public safety and understanding the broader social and economic ramifications/drivers for doing so is a continuing challenge for Government. To deliver this need the project has reviewed the status of human-shark interactions in Australia, provided a synthesis of current initiatives to reduce risk, reviewed recent international efforts to address these issues and identified knowledge gaps to provide an informed base to determine the most appropriate future research and policy support.	Barry Bruce	CSIRO	50,000	42,359	92,359	01.06.15	15.12.15	Completed
A5	Defining Connectivity of Australia's hammerhead sharks	Hammerhead sharks are the focus of conservation management through recent listing on CITES and CMS. The clear data gap for DOE and GBRMPA is connectivity of populations across national and international jurisdictions. This project applies genetic and satellite telemetry to examine the movement and connectivity of hammerhead sharks. This will help refine use of CMRs and the GBRMP, and define BIAs where possible. These data will be assimilated with current research to provide a more comprehensive understanding of the status of hammerhead shark populations to inform species listing and assist management and conservation policies at national and international levels.	Michelle Heupel	Australian Institute of Marine Science (AIMS)	742,852	767,344	1,510,196	01.07.15	31.12.19	Completed
A6	Prioritisation of research and management needs for Australian elasmobranch species	NERP successfully demonstrated new ways to get the raw ingredients for evidence-based management of previously intractable species: abundance, survival, connectivity. But there is still a need to explore/demonstrate how management can use these tools (e.g. adaptive control of bycatch, or deciding if more monitoring is needed), and which species are suitable. This project comprised (i) a workshop to re-assess Australian shark and ray species in terms of degree-of-concern, state-of-knowledge-for-management, and feasibility-of-filling-knowledge-gaps; and (ii) a desk study exemplifying one pathway to management use. In 2016, we have worked with DoEE to prioritise species for research and explore more management pathways.	Michelle Heupel	Australian Institute of Marine Science (AIMS)	88,493	94,516	183,009	01.05.15	31.12.15	Completed
A7	Monitoring population dynamics of 'Western' right whales off southern Australia	Continuation (since 1993) of annual aerial surveys, to include counts and identification photographs, of Southern Right Whales between Cape Leeuwin (WA) and Ceduna (SA), where wintering animals come close to the coast – adult females to calve, at approximately three-year intervals, other adults and juveniles less regularly. The area is the main wintering ground of a major 'western' subpopulation of 'Australian' right whales, differing in number and extent of recovery (from 19th century hunting) from an 'eastern' subpopulation which so far shows little if any recovery. Counts allow estimation of population trend and current numbers; identification photographs allow estimation of life history parameters.	Diana Jones	The Western Australian Museum	249,000	30,000	279,000	15.08.15	31.3.2021	Ongoing
A8	Exploring the status of Western Australia's sea snakes	All sea snakes are listed marine species under the EPBC Act and three Australian endemic species are listed as Critically Endangered or Endangered, and as such are a national conservation priority. This project examines sea snake abundance and diversity from broad-scale and targeted surveys at reef and coastal sites to update Conservation Advices, refine status within CMRs and inform policies of DoEE, DPaW, PA and others. This research will improve our understanding of population status to guide on-ground conservation to reduce population declines.	Michelle Heupel	Australian Institute of Marine Science (AIMS)	453,015	477,429	930,444	01.02.16	30.06.2020	Ongoing
A9	Grey Nurse Shark Ck-MR Population Estimate - East Coast	A review of the 2002 National Recovery Plan for Grey Nurse Shark (DEWHA 2009) concluded it was not possible to determine if the east coast population had shown any signs of recovery (DoE 2014). Action 1.1 of the new recovery plan (DoE 2014) is to resurvey Grey Nurse Shark populations to assess population trends and dynamics. This project will resample the east coast population and use genetic SNP data to inform close kin-mark recapture analysis to estimate population size and trend, and provide guidance on future monitoring strategies for the east coast population of Grey Nurse Shark.	Russell Bradford	CSIRO	115,000	-	106,174	01.01.16	20.06.18	Completed

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A10	Conservation of spotted handfish and their habitat	Spotted handfish are critically endangered and in accordance with the signed recovery plan we will conserve them through various direct conservation actions guided by research. This includes replanting of the degraded plastic artificial spawning habitats (ASH) with a re-designed array of ceramic units, assessment of taut eco-friendly moorings in critical spotted handfish habitat, genetic and capture mark recapture studies, a population viability analysis (PVA) and performance assessment of management actions. We will also continue our captive breeding project with industry and engagement with the broader community through talks, outreach and publications and re-establishment of the handfish recovery team.	Tim Lynch	CSIRO - Oceans & Atmosphere	633,743	1,470,328	2,104,071	01.03.16	31.12.20	Ongoing
A11	Shark action plan	Conservation of elasmobranch species (sharks and rays) is an increasing priority globally, including Australia, as evidence of overexploitation of some species becomes apparent. Common issues and threats among elasmobranch species may improve management if considered holistically. This project will produce a Shark Action Plan assessing requirements for improved management including a summary of current status across the taxa, guidelines for reducing impacts and improving management, and identification of key knowledge gaps impeding conservation and management. This Plan will help guide policy for Australian elasmobranchs developed by DoEE and fishery managers. On-ground conservation will be developed from recommendations in this plan.	Michelle Heupel	Australian Institute of Marine Science (AIMS)	235,092	319,724	554,816	10.01.17	31.03.20	Ongoing
A12	Australia's Northern Seascape: assessing status of threatened and migratory marine species	Northern Australia has a relatively untouched natural environment and is the current focus of substantial economic development, which has the potential to impact biodiversity and cultural values. The Northern Seascapes Project Phase 2 will map the distributions of several <i>EPBC</i> -listed threatened and migratory marine species at a broad-scale, and develop and trial a cost-effective rapid assessment approach ('SeaBlitzes') to gather finer-scale spatial data on priority marine species of the northern seascape, including the critical habitats they depend on. SeaBlitzes will survey selected hotspots determined through scoping undertaken in Phase 1 of the Northern Seascapes Project (to be delivered end 2017). The data and knowledge generated by the rapid assessments will establish baselines, and grow the information base for decision-making on proposed activities under Commonwealth and Territory environmental regulations. This approach will deliver on actions in threatened species Recovery Plans, Sea Country Plans, and management plans for protected areas (e.g. Indigenous Protected Areas and Marine Reserves), and will develop capacity for continued data collection through a community-based participatory approach.	Peter Kyne	Charles Darwin University	1,347,105	1,448,603	2,795,708	1.01.17	31.12.20	Ongoing
A13	Estimation of population abundance and mixing of 'Southern' right whales in the Australian and New Zealand regions	This project will provide, for the first time, an abundance estimate of the total Australian population of southern right whales. It will also investigate the movement and connectedness of whales that utilise breeding areas on the eastern, southern and western coasts of Australia. Information on the population abundance and movements of southern right whales provided by this project will allow the Australian government to better evaluate progress made against the Conservation Management Plan for the species and ensure conservation efforts for the species are effectively coordinated at the regional level.	Karen Evans	CSIRO	297,374	149,661	447,035	1.04.18	01.12.20	Ongoing
A14	Identification of near-shore habitats of juvenile white sharks in Southwestern Australia	There is credible evidence that juvenile white sharks are present in a relatively restricted region between the head of the Great Australia Bight (GAB) and Ceduna, which encompasses the boundaries of State and Commonwealth managed marine parks and reserves, some of which are accessed via Indigenous Protected Areas. This pilot project is to undertake visual surveys (using Unmanned Aerial Vehicle – UAV) for juvenile white sharks during spring and summer. The on-land surveillance approach outlined in this proposed pilot project will inform decision makers on the efficacy of supporting subsequent on-water activity to capture and electronically tag juvenile white sharks to assess habitat use in the Great Australian Bight Marine Park (Commonwealth waters) and Far West Coast Marine Park (State waters).	Russell Bradford	CSIRO	50,000	100,500	150,500	14.01.19	1.03.20	Ongoing
A15	Conservation Status of Tropical Inshore Dolphins	The Conservation Status of Tropical Inshore Dolphins project will entail the compilation and review of the results of numerous research projects completed under the Whale and Dolphin Protection Plan, as well as monitoring and offset programs associated with port developments. The aim is to determine the conservation status and address the listing criteria of the: Australian snubfin dolphin, <i>Orcaella heinsohni</i> ; Australian humpback dolphin, <i>Sousa sahulensis</i> ; and Indo-Pacific bottlenose dolphin, <i>Tursiops aduncus</i> .	Simon Allen	UWA	35,000	35,000	70,000	01.01.20	31.12.20	New
B1	Road testing decision support tools via case study applications	This project will deploy tools from economics and decision science to identify sound investments within constrained budgets for: 1. Ecological monitoring of Commonwealth Marine Reserves 2. Management actions for threatened and migratory species or threatened communities, and 3. Restoration of saltmarsh and shellfish habitats. The three case studies involve coherent integration of ecological understanding, social and organisational value judgements, and economic analysis.	Terry Walshe	Australian Institute of Marine Science (AIMS)	452,099	432,591	884,690	01.07.15	31.12.19	Completed
B2	Analysis and elicitation to support State of the Environment reporting for the full spectrum of data availability	The availability and quality of observation data that may be used to support State of the Environment reporting lies on a spectrum from: (i) high quality (e.g. Reef Life Survey, Long term reef monitoring programme, Temperate Reef Monitoring programme, state-based MPA monitoring programmes); (ii) moderate quality (e.g. continuous plankton recorder, occasional by catch surveys); (iii) low quality (anecdotal information) to (iv) expert beliefs but no empirical observations. The project has been completed, and provided direct input to the marine chapter of the 2016 State of the Environment report, by providing expert assessment of environmental status indicators defined for the 2011 State of the Environment report.	Simon Barry	University of Tasmania, CSIRO	62,942	63,640	126,582	01.07.15	30.06.17	Completed

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B3	Enhancing access to relevant marine information – developing a service for searching, aggregating and filtering collections of linked open marine data	This project aims to improve the searchability and delivery of sources of linked open data, and to provide the ability to forward collections of discovered data to web services for subsequent processing through the development of a linked open data search tool. The work will improve access to existing data collections , and facilitate the development of new applications by acting as an aggregator of links to streams of marine data. The work will benefit managers (i.e. Department of the Environment staff) by providing fast and simple access to a wide range of marine information products, and offering a means of quickly synthesizing and aggregating multiple sources of information.	Johnathan Kool	Geoscience Australia	91,750	47,749	139,499	01.07.15	31.12.16	Completed
B4	Underpinning the repair & conservation of Australia’s threatened coastal-marine habitats – phase II.	The objective of this research is to support the scaling-up of repair efforts for two threatened nearshore marine ecological communities, shellfish reefs and salt marshes. Both habitats harbour significant marine biodiversity and play a critical role in supporting healthy estuarine and nearshore systems. The research synthesis will be used to guide the development of more effective policy on coastal-marine repair, improve community education on the importance of habitats to estuary health and develop a detailed business case to support investment in marine repair activities for private industry stakeholders.	Colin Creighton Dr Ian McLeod Dr Chris Gillies	James Cook University	520,000	616,569	1,136,569	01.07.15	30.06.18	Completed
C1	Improving our understanding of pressures on the marine environment	The marine environment in Australia is impacted by a wide range of different pressures. This project aims to assist DoE, and other research users, to improve understanding of the potential impacts of anthropogenic disturbance to marine conservation values by providing up-to-date data and analyses on the spatial distribution of pressures and trends. The research is designed to inform decision making under the EPBC Act (acceptability of proposed activities, evaluation of effectiveness of mitigation measures) on NMES (including Key Ecological Features), implementation of multiple strategies in four Marine Bioregional Plans management of Commonwealth Marine Reserves and State of the Environment reporting.	Piers Dunstan	CSIRO	551,278	568,387	1,119,665	01.07.15	31.03.2020	Ongoing
C2	Continental-scale tracking of threats to shallow Australian reef ecosystems	The project will integrate Australia’s largest, most detailed datasets of shallow-water tropical and temperate marine biodiversity, and assess how pollution, fishing, rising sea temperatures and introduced species are impacting associated natural values. An initial outcome will be the identification of state-of-the-environment indicators for inclusion in the 2016 State of the Environment report, with subsequent activities aimed at contributing additional data products needed for other NESP projects, Parks Australia, and the Essential Environmental Measures initiative. The project will also describe a national shallow-water baseline of biodiversity in Commonwealth Marine Reserves for assessment of change through the long term.	Graham Edgar	University of Tasmania	807,147	1,628,563	2,435,710	01.07.15	31.12.17	Completed
C3	Change detection and monitoring of key marine and coastal environments – application of the Australian Geoscience Data Cube	This project aims to leverage the extensive time-series of earth observation image data in the Australian Geoscience Data Cube (AGDC) by developing change detection algorithms to analyse key environmental parameters in the coastal and marine zone. Spatial information produced by this project can inform management decisions, and assist in evaluating management action outcomes, by providing a quantifiable measure of historical change and ongoing monitoring and change detection capabilities. Phase 1 of this project aimed to demonstrate the capability of using the AGDC through the development of an inter-tidal zone change detection algorithm and data set, with a view to developing and implementing an expanded range of stakeholder targeted algorithms to inform decision making processes in Phase 2.	Stephen Sagar	Geoscience Australia	56,500	42,790	99,290	01.05.15	01.12.16	Completed
C4	The National Outfall Database project (Clean Ocean Foundation)	NOD addresses the need of government and community to understand the impacts on health and the ocean environment that occur from sewerage outfalls around Australia. The project will be delivered over a three year time frame and will provide: 1) A publically accessible national outfall database and reports. 2) A ranking of the outfalls (and sewerage treatment systems) according to health and impact criteria with peer review of the ranking system and resulting ranking outcomes. 3) Comparison of geographical regions in sewerage volume and pollution impact. 4) Mapping of the database. 5)Community engagement in conduct of this research and consumption of the outcomes.	John Gemmill	Clean Ocean Foundation	520,000	520,000	1,040,000	01.07.15	30.06.2020	Ongoing
C5	Quantification of risk from shipping to large marine fauna across Australia	Given the substantial and ongoing increases in coastal and port development along the Australian coastline, and an associated increase in recreational and commercial shipping, there is an increasing potential for adverse interactions with marine species. Two risks associated with these activities for large marine fauna are ship collisions (particularly relevant for marine mammals, turtles and whale sharks) and the impact of chronic ocean noise (across a wide range of species). This project aims to provide directed and robust science (species- and area-specific) to inform management and administrative decision-making by the Department of Environment in its application of the EPBC Act.	David Peel	CSIRO	367,000	392,000	759,000	01.07.15	30.06.18	Completed
D1	National Data Collation, Synthesis and Visualisation to Support Sustainable Use, Management and Monitoring of Marine Assets	Effective management of marine assets requires an understanding of ecosystems and the processes that influence patterns of biodiversity. Through collaboration and synthesis of existing data this project will improve access to, and usability of, marine data to better inform management and improve public understanding of biodiversity in the marine estate. End-users and stakeholders will benefit from improved regional and national descriptions of biodiversity assets for the Commonwealth marine estate, including Commonwealth Marine Reserve network and other high-priority marine areas. In turn, this will inform prioritisation of future investments in monitoring marine ecosystems and State of the Environment reporting.	Karen Miller	Australian Institute of Marine Science (AIMS)	1,595,900	1,653,812	3,249,712	01.07.15	30.06.19	Completed

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D2	Standard Operating Procedures (SOP) for survey design, condition assessment and trend detection	Understanding of the status and trends of indicators in Australia’s marine environment requires standardised monitoring. This project will develop Standard Operating Procedures (SOP) in the planning, collection, analysis, and reporting of monitoring data. In particular, the project will: 1) provide guidance on what kind of monitoring is required (and where and when), 2) provide a simple yet powerful survey design tool, 3) provide two worked SOP examples (one benthic and one pelagic), 4) develop field manuals for some high priority sampling platforms (e.g. underwater video) with prioritisation stemming from a comparative analysis, and 5) assess approaches for monitoring pelagic ecosystems.	Scott Foster	CSIRO	837,712	939,130	1,776,842	01.07.15	15.12.2020	Ongoing
D3	Implementing monitoring of AMPS and the status of marine biodiversity assets on the continental shelf	New [RPv3] - There is a significant need to support Parks Australia in the establishment of a baseline inventory and monitoring program for CMR networks, and ensure it is integrated within a broader national monitoring framework. This project will provide the science support for program development, and a prioritisation framework for implementation. By facilitating national approaches, including a standards-based approach to collecting new marine data, project outcomes will include key steps to assist Parks Australia to implement and initiate a CMR monitoring program, new knowledge to inform CMR management, a national integrated framework for SOE reporting, and collaboration between State-based and Commonwealth-based programs.	Neville Barrett	University of Tasmania	4,829,464	4,897,964	9,727,428	01.01.17	31.12.20	Ongoing
D4	Expanding our spatial knowledge of marine biodiversity to support future best-practice reviews	This project will fill data gaps and evaluate methods relevant to the ongoing spatial management of seafloor biota across the Australian marine domain. The objective is to prepare Australian, State and Territory governments for future best-practice reviews of Australia’s marine bioregionalisation that can be used to improve marine spatial planning and management initiatives (e.g. marine bioregional plan and marine protected area reviews, environmental impact and natural heritage assessments). The project will incorporate results from field trips to unexplored offshore areas of Australia’s marine domain and communicate biodiversity values of the CMR network to the Australian public.	Tim O'Hara	Museum Victoria	770,000	1,638,774	2,408,774	01.07.17	31.12.20	Ongoing
D5	A standardised national assessment of the state of coral and rocky reef biodiversity	This project will involve integration of a national suite of reef biota Underwater Visual Census (UVC) monitoring datasets (Reef Life Survey, UTas, AIMS, Parks Victoria, SA DEWNR) to provide a comprehensive update to the state of Australian Reefs report for the next national State of the Environment Report. Maps and indicator trends will show changes in the health of rocky and coral reefs nationally from 2005 to 2020. The update will include addition of a new index which summarises the population trajectories for 600-1000 reef species nationally. Individual species trajectories will provide the only threat status information for the majority of these species, assisting future listing of previously unassessed species if significant declines are detected.	Rick Stuart-Smith	University of Tasmania	199,233	538,889	738,122	01.01.2019	31.12.2020	Ongoing
D6	Socioeconomic benchmarks	Social and economic values are key drivers for marine science and marine policy but are too rarely integrated with marine biodiversity monitoring programs. In close consultation with PA we will review existing metrics used to survey social and economic values associated with marine parks. This review will include consulting with national and international expertise and actively consulting with State and other Commonwealth agencies, some of whom are currently conducting reviews or have existing frameworks for surveying social and economic values (e.g GBRMPA, NSW DPI and Vic Parks). In collaboration with national partners and PA we will organise a national methods workshops to discuss and refine metrics and methods to quantify social and economic benchmarks for State and Australian Marine Parks (AMPs) and produce an SOP relevant to AMPs taking into consideration the DoEE’s environmental accounting processes and PA’s Monitoring, Evaluation, Reporting and Improvement (MERI) framework.	Tim Langlois	University of Western Australia	281,902	501,754	783,656	10.01.2019	31.12.2020	Ongoing
D7	Support for PA MERI Implementation	This application is to facilitate Hub engagement with Parks Australia during development and initiation of their Monitoring, Evaluation, Reporting and Improvement (MERI) System for Australian Marine Parks. A key priority for the Marine Parks Branch in the 2019-20 financial year is finalising the Australian Marine Park MERI system. The Marine Biodiversity Hub will play an important role in development and implementation of this system. Hub partners have had previous experience in developing the integrated monitoring framework for the Great Barrier Reef, developing a process for identifying indicators for monitoring Key Ecological Features, and also have collected much of the ecological data that exists within Australian Marine Parks.	Neville Barrett/Piers Dunstan	University of Tasmania/CSIRO	100,000	100,000	200,000	2.1.2020	20.12.2020	New
D8	SOI Gascoyne Marine Park	The approved survey to the Gascoyne canyons aims to map the surrounding marine park using multibeam sonar and to characterise the biodiversity of North-West canyon fauna, using an ROV to undertake a comprehensive taxon inventory and eDNA analyses to provide a methodological comparison. The proposed project will extend the survey’s capability and increase its relevance to marine park management, particularly in deep-sea and canyon habitats. The proposed project will yield communication products such as a fly-through, eco-narrative, and image library, as well as products consistent with previous NESP reporting such as a voyage plan and post-survey report.	Rachel Przeslawski	Geoscience Australia	30,000	90,000	120,000	01.01.2020	31.12.2020	New
E1	Guidelines for analysis of cumulative impacts and risks to the Great Barrier Reef	Existing guidance and standards for assessing impacts and risk (e.g. ISO 31000) are specified at a high-level allowing for considerable variation in approach, cost and outcomes from assessments and no guidance on direct or cumulative impacts. We will develop a national standard to support analysis of impacts and risks to the environmental, social and economic values required by the EPBC Act. The standard will be compatible with and support the process outlined in the Significant Impact guidelines for MNES and for Australian Marine Parks (AMP), including the means to calculate the impact and risk of upstream, downstream, facilitated and indirect impacts that will be presented in clear tabular and graphic formats, including maps as appropriate.	Piers Dunstan	CSIRO	400,000	669,132	1,069,132	01.01.2018	31.10.2020	Ongoing

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E2	Characterising anthropogenic underwater noise to improve understanding and management of acoustic impacts to marine wildlife	Shipping noise is a marine pollutant that contributes significantly to the marine soundscape and is a stressor of marine animals, particularly marine mammals. In Australia, the characterisation and actual impacts of shipping noise on species behaviour are not clearly understood and information is needed. This research will provide quantitative spatial and temporal maps of vessel noise exposure and impacts to MNES. The outputs will provide key information to marine regulators and management agencies such as DoEE, AMSA and GBRMPA, and their counterparts in state and territory governments, to help them meet responsibilities and obligations under international and national law and policy to minimise the impacts of the shipping noise on MNES.	David Peel	CSIRO	401,855	401,855	803,710	01.01.2018	15.12.2020	Ongoing
E3	Marine Plastics	The project will inform national policy and action to reduce the release and impacts of microplastics on our environment and oceans: 1) A literature review will firstly identify key marine microplastics research and policy development internationally, with a focus on research that is contextual to microplastics in the Australian marine environment; 2. From this literature review, an options paper will be developed to explore the most feasible and impactful policy approaches for the Australian context and that can be used to form the basis for discussions at a workshop; 3) A one day workshop will draw together policy-makers, researchers and relevant industry peak bodies to discuss and recommend policy and other options to limit microplastics release into the environment. A workshop report will be drafted to summarise findings, recommendations, and next steps. The report will provide evidence to underpin the development of national policy aimed at reducing microplastic pollution, including by identifying priority actions to deliver Australia's 2018 National Waste Policy.	Marcus Haward	University of Tasmania	50,000	50,000	100,000	01.02.2020	30.11.2020	New
E4	Recreational fishing in Commonwealth waters	Australia's recreational fishing sector is moving further offshore in pursuit of fishing opportunities, which places them in areas managed by the Australian Government. Most recreational fisheries research is state based and at two case study sites - Hunter Australian Marine Park (AMP) and the Ningaloo AMP - this data will be assessed for its usefulness to quantify offshore fishing. New data will also be collected will also be collected using creel, socio-economic and remote sensing techniques to better understand fisher's effort, harvest and motivations. As well, the response by fish communities to harvest and the fishery to climate change will be assessed at larger scales. As recreational fishers are key stakeholders in marine management and regulation, a better understanding of their values is required to effectively inform administration of the EPBC Act (e.g. effects of Matters of National Environmental Significance), use of Australian Marine Parks and Commonwealth managed commercial fisheries.	Tim Lynch	CSIRO	253,883	288,651	542,534	01.01.2018	31.12.2019	Ongoing
E5	The role of restoration in conserving MNES	Restoration of marine ecosystems offers the prospect of effective conservation in the face of chronic degradation and climate change. But techniques for restoration are generally in their infancy. In 2018 this project will review the capacity for recent advances in restoration of <ul style="list-style-type: none">• giant kelp forests,• coral reefs,• seagrass communities,• saltmarsh communities, and• shellfish communities, to reduce conservation risks associated with matters of national environmental significance (MNES) listed under the Cth EPBC Act. In subsequent years we will trial and extend restoration techniques in the more promising habitats and develop a restoration decision framework to guide future investments.	Ian McLeod	James Cook University	221,750	282,913	504,663	01.01.2018	31.12.2020	Ongoing
E6	Assisting restoration of ecosystem engineers through seed-based and shoot-based programs in the Shark Bay WHS	This project will develop community-based seeding and shoot planting restoration practices in the Shark Bay World Heritage Site (WHS). The goal is to scale up the existing restoration research to practice and assist recovery of the dominant seagrasses, Amphibolis antarctica and Posidonia australis following the 2011 marine heat wave. The Shark Bay WHS is unique globally for its natural values, including stromatolites, extensive seagrass meadow that have constructed sills and banks over 1,000s of years resulting in restricted exchange with the ocean, unique and abundant marine megafauna including 1/8th of the worlds population of dugongs, large populations of sharks and turtles, and one of the longest studied populations of dolphins in the world. The inshore waters of the WHS provides connectivity to the deeper waters of the adjacent Commonwealth Shark Bay Marine Park. Shark Bay seagrasses have recently been devastated by the marine heatwave of 2010-2011 and these events are predicted to increase in frequency and intensity with global warming. The loss of 23% of seagrass cover in the bay (860 km2) had a flow on effect to mega herbivores, fish, tourism and the commercial aquaculture and fisheries industries dependent of the ecosystem. There is a critical need to develop management actions to respond to such events and to prepare for predicted future events. Seagrass restoration has been explored at Useless Loop and on both sides of the Peron Peninsula near Denham and Monkey Mia over the past 6-8 years (3 ARC Linkage, 1 ARC Discovery Grant), resulting in an increased understanding of the factors required for successful seagrass restoration along the extreme salinity gradient found in Shark Bay. The Malgana people have responsibilities for sea country in Shark Bay and a strong tie to the land and inshore seas that make up the Shark Bay WHS. This project is a collaboration between scientists and the Mulgana community whereby methods will be jointly developed to assist natural recovery in preparation for future devastating impacts of climate change.	Gary Kendrick	University of Western Australia	200,000	216,282	416,282	31.01.2019	30.01.2021	Ongoing

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Project Number/ID	Project Name/Title	Project Summary	Project Leader	Lead Organisation	Approved Funding Research Plan Versions 1-6			Start Date	Completion Date	Status
					NESP Funding	Total Other Contributions	Total Budget			
E7	Assessing the feasibility of restoring giant kelp beds in eastern Tasmania	The proposed research will extend on externally funded work commencing in 2018 to select for thermally tolerant and low-nutrient-tolerant giant kelp (<i>Macrocystis pyrifera</i>) genotypes, and which will examine effects of acclimation of selected genotypes by pre-exposure to warm, nutrient poor conditions. The project will outplant pre-exposed selected genotypes of giant kelp as micro-sporophytes in experiment providing / not providing an added source of nutrient. The work is designed to assess the feasibility of this approach as a means to develop minimum patch sizes for giant kelp that can be self-replacing and self-expanding.	Craig Johnson	University of Tasmania	150,000	446,884	596,884	01.01.2019	31.12.2020	Ongoing
SS1	Synthesis Project 1: Cross-Hub Integrated Assessment - Northern Australia	This project is a cross-hub research collaboration that draws on the considerable experience, regional knowledge, data and networks in the NESP Hubs to explore the potential application, and benefits, of integrated environmental assessments (IEA), focusing on Northern Australia. The project will develop a process framework to guide IEA, identifying available information and critical knowledge gaps, methods for synthesis and analysis, and participatory approaches and governance settings. The project will review the existing tools and systems to support IEA and identify opportunities and potential location/s to test implementation in Northern Australia. The project will provide decision-makers in the Department (and State and Territory regulatory and planning agencies) with pathways for undertaking IEA approaches in Northern Australia, to underpin sustainable regional development and, avoid environmental harm to internationally important biodiversity assets and cultural heritage values.	Nic Bax	CSIRO	39,593	-	39,593	01.10.2019	31.12.2020	New
SS2	Synthesis Project 2: Interpreting pressure profiles	This project has three objectives: (i) to provide a geo-spatial analysis of the relative risks posed to Matters of National Environmental Significance (MNES) by pressures that operate within Australia’s Exclusive Economic Zone and state/territory waters (a “hotspots” analysis). This relative risk assessment will provide interval-scale risk estimates – also known as semi-quantitative risk estimates - that are meaningful when compared within a study, e.g. between locations within the study’s geographic scope, but are not calibrated to observable outcomes in nature; (ii) provide a proof of concept of an adaptive, probabilistic assessment of the cumulative risks posed to MNES in the North Marine Bioregion in a manner that is consistent with the seascape-scale cumulative assessment described in the “Guidelines for analysis of cumulative impacts and risks to the Great Barrier Reef” (developed and tested with Commonwealth, State and Industry stakeholders). This will provide a proof of concept of a fully quantitative risk assessment, providing risk estimates on a ratio scale that are calibrated with, and hence can be compared to, observed outcomes in nature; and (iii) provide additional support to the Marine Biodiversity Hub’s contribution to the NESP cross-hub Northern Integrated Knowledge project.	Keith Hayes	CSIRO	151,777	151,777	303,554	15.01.2020	30.12.2020	New
SS3	Synthesis Project 3: National trends in coral species following heatwaves	This project will engage coral taxonomic experts to annotate existing Reef Life Survey photoquadrats taken across northern Australia before and after major disturbances, to allow: 1) Quantification of the spatial and species-level responses of Australian corals to the 2016 and 2017 marine heatwave and mass bleaching events (and cyclones that occurred during this period); 2) Identification of the species most threatened by warming and cyclones, and species likely to respond best to restoration efforts; and 3)Contribution to a coral-specific analysis to the next national State of the Environment report, through project D5.	Rick Stuart-Smith	University of Tasmania	52,000	104,850	156,850	01.10.2019	30.11.2020	New
					19,900,968	23,919,102	43,811,244			

Marine Biodiversity Hub Research Plan Version 6 - Attachment A					
Project Number/ID	Project Name/Title	Project Summary	Outputs	Link to Output ²	Outcomes
A1	Northern Australian hotspots for the recovery of threatened euryhaline species	Euryhaline elasmobranchs represent over half of the EPBC-listed threatened sharks and rays, with northern Australia of national importance for this threatened species community. Critical information gaps remain, limiting the implementation of Recovery Plan objectives. This project will fill many data gaps through the application of acoustic telemetry, traditional and advanced molecular research (population genetics and close-kin mark-recapture), life history studies and Indigenous knowledge and education. The focus is to improve management and facilitate recovery of these threatened species, through three research themes: 1) monitoring and understanding euryhaline species; 2) Indigenous partnerships for management of euryhaline species; and 3) knowledge for the reassessment of river shark status.	Troubled waters: Threats and extinction risk of the sharks, rays and chimaeras of the Arabian Sea and adjacent waters	https://www.nespmarine.edu.au/document/troubled-waters-threats-and-extinction-risk-sharks-rays-and-chimaeras-arabian-sea-and	The project has significantly improved shared understanding about the status and habitat use of large-tooth sawfish and river sharks in Northern Territory rivers. This new understanding delivers on actions in the existing EPBC Act Recovery Plan for Sawfish and River sharks and provides evidence to inform referrals and assessments under the EPBC Act and NT environmental legislation. The project has also build capacity of Indigenous ranger groups to monitor and recover largetooth sawfish in Northern Australia rivers and rescued 40 juveniles from drying flood plains to increase juvenile survival.
			Categorising use patterns of non-marine environments by elasmobranchs and a review of their extinction risk	https://www.nespmarine.edu.au/document/categorising-use-patterns-non-marine-environments-elasmobranchs-and-review-their-extinction	
			The scientist abroad: maximising research impact and effectiveness when working as a visiting scientist	https://www.nespmarine.edu.au/document/scientist-abroad-maximising-research-impact-and-effectiveness-when-working-visiting	
			Data report to synthesize the available telemetry data from this project		
			Concise report on CKMR population estimate for <i>G.garricki</i>	https://www.nespmarine.edu.au/document/close-kin-mark-recapture-population-size-estimate-glyphis-garricki-northern-territory	
			Manuscript on population structure of <i>G.garricki</i>		
			A rare contemporary record of the Critically Endangered Ganges Shark, <i>Glyphis gangeticus</i>	https://www.nespmarine.edu.au/document/rare-contemporary-record-critically-endangered-ganges-shark-glyphis-gangeticus	
			Species Overview: Largetooth Sawfish <i>Pristis pristis</i> - Report	https://www.nespmarine.edu.au/document/species-overview-largetooth-sawfish-pristis-pristis	
			Recreational fishing impacts on threatened river sharks: A potential conservation issue - Journal Article	https://www.nespmarine.edu.au/document/recreational-fishing-impacts-threatened-river-sharks-potential-conservation-issue	
			Description of the egg cases of Dentiraja polyommata (Rajiformes: Rajidae) and Asymbolus pallidus (Carcharhiniformes: Scyliorhinidae) from Queensland, Australia - Journal Article	https://www.nespmarine.edu.au/document/description-egg-cases-dentiraja-polyommata-rajiformes-rajidae-and-asymbolus-pallidus	
			Sawfishes in Papua New Guinea: a preliminary investigation into their status and level of exploitation - Journal Article	https://www.nespmarine.edu.au/document/sawfishes-papua-new-guinea-preliminary-investigation-their-status-and-level-exploitation	
			Inferring contemporary and historical genetic connectivity from juveniles - Journal Article	https://www.nespmarine.edu.au/document/inferring-contemporary-and-historical-genetic-connectivity-juveniles	
			Reproductive parameters of rhinobatid and urolophid batoids taken as bycatch in the Queensland (Australia) East Coast Otter Trawl Fishery - Journal Article	https://www.nespmarine.edu.au/document/reproductive-parameters-rhinobatid-and-urolophid-batoids-taken-bycatch-queensland-australia	
			Urogymnus acanthobothrium sp. nov., a new euryhaline whipray (Myliobatiformes: Dasyatidae) from Australia and Papua New Guinea - Journal Article	https://www.nespmarine.edu.au/document/urogymnus-acanthobothrium-sp-nov-new-euryhaline-whipray-myliobatiformes-dasyatidae	
			A new species of wedgefish, <i>Rhynchobatus cooki</i> (Rhinopristiformes, Rhinidae), from the Western Pacific - Journal Article	https://www.nespmarine.edu.au/document/new-species-wedgefish-rhynchobatus-cooki-rhinopristiformes-rhinidae-western-pacific	
			Malak Malak Sawfish Patrol and Relocation Protocol	https://www.nespmarine.edu.au/document/malak-malak-sawfish-patrol-relocation-protocol	
			Genetic sequencing of threatened euryhaline species	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=f7d3a11e-bd2b-4d8d-af3d-d2fc3a058339	
			Acoustic telemetry tracking data	http://metadata.imas.utas.edu.au/geonetwork/srv/eng/metadata.show?uuid=8e9746ed-20f8-4c1b-9437-1fa0d5e53264	
			Euryhaline elasmobranch fishing database (including images)	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=a0cf8cc5-67cd-49bb-bcaa-dedf21ed3287	
			Euryhaline Elasmobranchs community communications outputs	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=2b1ebdbb-e6c5-4673-b230-d7d2b5eba819	
			Every Sawfish Counts - Sawfish Rescue, Daly River, September 2017	https://www.youtube.com/watch?v=fKkvHRptWww	
			Every Sawfish Counts - Sawfish Rescue, Daly River, September 2017	https://www.youtube.com/watch?v=fKkvHRptWww&t=10s	
			Save a Sawfish (Kriol)	https://www.youtube.com/watch?v=u22S1zVwiLE&t=5s	
			Save a Sawfish (English Angelina Joshua)	https://www.youtube.com/watch?v=dESDV9A7gFs	
			Tyemirerriny: looking after Daly River Sawfish	https://www.youtube.com/watch?v=o5oN7xu1mI0&t=10s	
			Sawfish territory - Malak Malak rangers	https://www.youtube.com/watch?v=QxRgiRqth0	
A2	Quantification of National Ship Strike Risk	See Project C5	See project C5		See project C5

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Project Number/ID	Project Name/Title	Project Summary	Outputs	Link to Output ²	Outcomes
A3	A national assessment of population status of white sharks	White sharks are listed as Vulnerable under the EPBC Act and the subject of a national recovery plan, yet there is still no effective way to assess their population status and thus no way of determining the efficacy of conservation actions. Recent debate due to various human-shark interactions has highlighted the need for further information. This project will provide a national assessment of population size and status in order to establish the efficacy of existing recovery actions and provide a scientifically sound and rational basis from which to develop policies that balance conservation objectives and public safety.	Estimating growth in juvenile white sharks using stereo baited remote underwater video systems (stereo-BRUVs) - Final report	https://www.nespmarine.edu.au/document/estimating-growth-juvenile-white-sharks-using-stereo-baited-remote-underwater-video-systems	The project has significantly improved shared understanding about the status (provision of population estimates for the eastern and western populations in Australia) and habitat use of white sharks in Australia. This new shared understanding provides evidence to inform decision making about the status of this vulnerable/migratory species listed under EPBC Act and referrals and assessments under the EPBC Act. It also provides scientific evidence to inform decisions to manage human-shark interactions in multiple state jurisdictions in southern Australia.
			Genetic relatedness reveals total population size of white sharks in eastern Australia and New Zealand - Journal Article	https://www.nespmarine.edu.au/document/genetic-relatedness-reveals-total-population-size-white-sharks-eastern-australia-and-new	
			Assessing the size of Australia's white shark populations - Fact sheets	https://www.nespmarine.edu.au/document/assessing-size-australias-white-shark-populations	
			A national assessment of the status of white sharks - Report	https://www.nespmarine.edu.au/document/national-assessment-status-white-sharks	
			Broad-scale coastal movements of white sharks off Western Australia described by passive acoustic telemetry data - Journal Article	https://www.nespmarine.edu.au/document/broad-scale-coastal-movements-white-sharks-western-australia-described-passive-acoustic	
			Juvenile white sharks Carcharodon carcharias utilise estuarine environments in south-eastern Australia - Journal Article	https://www.nespmarine.edu.au/document/juvenile-white-sharks-carcharodon-carcharias-utilise-estuarine-environments-south-eastern	
			Use of stereo baited remote underwater video systems to estimate the presence and size of white sharks (<i>Carcharodon carcharias</i>) - Journal Article	https://www.nespmarine.edu.au/document/use-stereo-baited-remote-underwater-video-systems-estimate-presence-and-size-white-sharks	
			Towards a national population assessment for white sharks - Fact sheet	https://www.nespmarine.edu.au/document/towards-national-population-assessment-white-sharks-fact-sheet	
			White shark acoustic tracking movement data 2015, 2016, 2017	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.s how?uuid=d4cfbedf-6a0f-44ef-b736-08974c14bbcc	
			Sequence IDs for archived white shark genetics data	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.s how?uuid=de2cb27d-ae90-476d-b609-3fd1a2f52871	
A4	The Status of Human-Shark Interactions and Initiatives to Mitigate Risk in Australia	Considerable political, public and media attention have recently been focused on human-shark interactions, specifically surrounding shark attack and ways to mitigate this risk. Finding the most appropriate policy balance between conservation of sharks, maximising public safety and understanding the broader social and economic ramifications/drivers for doing so is a continuing challenge for Government. To deliver this need the project has reviewed the status of human-shark interactions in Australia, provided a synthesis of current initiatives to reduce risk, reviewed recent international efforts to address these issues and identified knowledge gaps to provide an informed base to determine the most appropriate future research and policy support.	The status of human-shark interactions and initiatives to mitigate risk in Australian waters	https://www.nespmarine.edu.au/document/status-human-shark-interactions-and-initiatives-mitigate-risk-australian-waters	The project has improved shared understanding among government agencies, researchers and politicians about the status of 3 species of sharks involved in human-shark interactions and initiatives to mitigate risk in Australia. The report collates existing information to provides managers and other stakeholders with evidence to inform decision making about a species that interacts with humans - a vulnerable/migratory species listed under EPBC Act.
A5	Defining Connectivity of Australia's hammerhead sharks	Hammerhead sharks are the focus of conservation management through recent listing on CITES and CMS. The clear data gap for DOE and GBRMPA is connectivity of populations across national and international jurisdictions. This project applies genetic and satellite telemetry to examine the movement and connectivity of hammerhead sharks. This will help refine use of CMRs and the GBRMP, and define BIAs where possible. These data will be assimilated with current research to provide a more comprehensive understanding of the status of hammerhead shark populations to inform species listing and assist management and conservation policies at national and international levels.	Northern Australia Hammerhead Shark Tagging Program - Fact Sheet (Update January 2019)	https://www.nespmarine.edu.au/document/northern-australia-hammerhead-shark-tagging-program-fact-sheet-update-january-2019	The project is designed to improved shared understanding about the connectivity of populations of hammerhead sharks in Australian waters. This new understanding delivers on actions about status of CITES/CMS listed species and conservation dependent species listed under EPBC Act. The project has also build understanding and capacity of Indigenous ranger groups for monitoring sharks.
			Description of <i>Piscicapillaria bursata</i> sp. nov. (Capillariidae) and Redescription of <i>Parascarophis sphyrnae</i> Campana-Rouget, 1955 (Cystidicolidae), Two Nematode Parasites of Hammerhead Sharks (<i>Sphyrna</i> spp.) off Australia	https://www.nespmarine.edu.au/document/description-piscicapillaria-bursata-sp-nov-capillariidae-and-redescription-parascarophis	
			Acanthocephalans from Australian elasmobranchs (Chondrichthyes) with a description of a new species in the genus <i>Gorgorhynchus</i> Chandler, 1934 (Rhadinorhynchidae)	https://www.nespmarine.edu.au/document/acanthocephalans-australian-elasmobranchs-chondrichthyes-description-new-species-genus	
			Indigenous knowledge and cultural values of hammerhead sharks in Northern Australia	https://www.nespmarine.edu.au/document/indigenous-knowledge-and-cultural-values-hammerhead-sharks-northern-australia	
			Crossing lines: a multidisciplinary framework for assessing connectivity of hammerhead sharks across jurisdictional boundaries - Journal Article	https://www.nespmarine.edu.au/document/crossing-lines-multidisciplinary-framework-assessing-connectivity-hammerhead-sharks-across	
			Northern Australia Hammerhead Shark Tagging Program - Fact Sheet	https://www.nespmarine.edu.au/document/northern-australia-hammerhead-shark-tagging-program-fact-sheet	
			Exploring the status of Australia's hammerhead sharks - Report	https://www.nespmarine.edu.au/document/exploring-status-australia%E2%80%99s-hammerhead-sharks	
			Defining the connectivity of Australia's hammerhead sharks - Fact Sheet	https://www.nespmarine.edu.au/document/defining-connectivity-australia%E2%80%99s-hammerhead-sharks-fact-sheet	

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Project Number/ID	Project Name/Title	Project Summary	Outputs	Link to Output	Outcomes
			Hammerhead connectivity metadata from tagged sharks	https://catalogue.aodn.org.au/geonetwork/srv/en/metadata.show?uuid=0b1796db-6686-4577-95fe-770e1e8ffb46	
			Hammerhead connectivity movement kmz files (for mapping)	https://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=9a767302-742f-447c-a060-a23d9f12197c	
			Description and characterisation of Terranova pectinolabiata n. sp. (Nematoda: Anisakidae) in great hammerhead shark, Sphyrna mokarran (Rüppell, 1837), in Australia	https://www.nespmarine.edu.au/document/description-and-characterisation-terranova-pectinolabiata-n-sp-nematoda-anisakidae-great	
			Final report on hammerhead shark population connectivity completed including revised stock structure estimates		
A6	Prioritisation of research and management needs for Australian elasmobranch species	NERP successfully demonstrated new ways to get the raw ingredients for evidence-based management of previously intractable species: abundance, survival, connectivity. But there is still a need to explore/demonstrate how management can use these tools (e.g. adaptive control of bycatch, or deciding if more monitoring is needed), and which species are suitable. This project comprised (i) a workshop to re-assess Australian shark and ray species in terms of degree-of-concern, state-of-knowledge-for-management, and feasibility-of-filling-knowledge-gaps; and (ii) a desk study exemplifying one pathway to management use. In 2016, we have worked with DoEE to prioritise species for research and explore more management pathways.	Close-Kin Mark-Recapture - Journal Article	https://www.nespmarine.edu.au/document/close-kin-mark-recapture	The project has generated a shared understanding among shark researchers, and participating policy makers, about priorities for Australia's shark and rays species that require further research, many of which are listed under CITES, CMS and threatened under the EPBC. Shared understanding will extend to a broader group of stakeholders in the second half of 2018. The project outcomes also provide a key input to project A11 - the Shark Action Plan.
			Prioritisation of research and management needs for Australian elasmobranch species - Final Report	https://www.nespmarine.edu.au/system/files/FINAL%20Heupel%20A6%20report%20Prioritisation%20of%20research%20and%20management%20needs%20of%20Aust%20elasmobranch%20species_mh.pdf	
A7	Monitoring population dynamics of ‘Western’ right whales off southern Australia	Continuation (since 1993) of annual aerial surveys, to include counts and identification photographs, of Southern Right Whales between Cape Leeuwin (WA) and Ceduna (SA), where wintering animals come close to the coast – adult females to calve, at approximately three-year intervals, other adults and juveniles less regularly. The area is the main wintering ground of a major ‘western’ subpopulation of ‘Australian’ right whales, differing in number and extent of recovery (from 19th century hunting) from an ‘eastern’ subpopulation which so far shows little if any recovery. Counts allow estimation of population trend and current numbers; identification photographs allow estimation of life history parameters.	Monitoring Population Dynamics of "Western" Right Whales off Southern Australia 2018-2021 - Progress Report on activities for 2018	https://www.nespmarine.edu.au/document/monitoring-population-dynamics-%E2%80%98western%E2%80%99-right-whales-southern-australia-2018-2021-progress	The project, continuing to 2021, has provided shared understanding among researchers, policy makers and other stakeholders on an annual basis about the status and trends of southern right whales in southern Australia to inform decision making about recovery efforts for and endangered/migratory species listed under EPBC Act. Understanding about status and trends of southern right whales is also shared through reporting mechanisms with the International Whaling Commission.
			Monitoring population dynamics of Western right whales - Final Report on activities for 2017	https://www.nespmarine.edu.au/document/monitoring-population-dynamics-%E2%80%98western%E2%80%99-right-whales-southern-australia-final-report-0	
			Monitoring population dynamics of Western right whales - Progress Report on activities for 2017	https://www.nespmarine.edu.au/document/monitoring-population-dynamics-western-right-whales-progress-report-activities-2017	
			Monitoring Population Dynamics of "Western" Right Whales off Southern Australia - final report on activities March 2017 - Report	https://www.nespmarine.edu.au/document/monitoring-population-dynamics-%E2%80%98western%E2%80%99-right-whales-southern-australia-final-report	
			Monitoring population dynamics of Western right whales - Progress report on activities for 2016 - Report	https://www.nespmarine.edu.au/document/monitoring-population-dynamics-western-right-whales-progress-report-activities-2016	
			Population trend in right whales off southern Australia 1993-2015 - International Whaling Commission June 2016 - Report	https://www.nespmarine.edu.au/document/population-trend-right-whales-southern-australia-1993-2015-international-whaling-commission	
			Monitoring population dynamics of Western right whales - Final report on activities 30 March 2016 - Report	https://www.nespmarine.edu.au/document/monitoring-population-dynamics-western-right-whales-final-report-activities-30-march-2016	
			Monitoring Population Dynamics of "Western" Right Whales off Southern Australia Milestone Report - Report	https://www.nespmarine.edu.au/document/monitoring-population-dynamics-%E2%80%98western%E2%80%99-right-whales-southern-australia-milestone-report	
			Aerial survey monitors right whales off southern Australia - Fact Sheet	https://www.nespmarine.edu.au/document/aerial-survey-monitors-right-whales-southern-australia-fact-sheet	
			2015 Aerial survey data of southern right whales (<i>Eubalaena australis</i>) off southern Australia	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=0c8cf643-8111-4872-9ece-7672c2ef460b	
			2019 Progress report		
			2016 Aerial survey data of southern right whales (<i>Eubalaena australis</i>) off southern Australia	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=881d2cde-26af-44e9-b695-6c3b458fafc2	
A8	Exploring the status of Western Australia's sea snakes	All sea snakes are listed marine species under the EPBC Act and three Australian endemic species are listed as Critically Endangered or Endangered, and as such are a national conservation priority. This project examines sea snake abundance and diversity from broad-scale and targeted surveys at reef and coastal sites to update Conservation Advices, refine status within CMRs and inform policies of DoEE, DPaW, PA and others. This research will improve our understanding of population status to guide on-ground conservation to reduce population declines.	Future directions in the research and management of marine snakes	https://www.nespmarine.edu.au/document/future-directions-research-and-management-marine-snakes	The project, continuing until the end of 2019, collated existing information to generate a shared understanding among researchers, policy makers and other stakeholders about the status of sea snakes in NW Australia, species listed under EPBC Act as either threatened or a marine species. Researchers have also used existing information to predict the distributions of seasnakes in NW Australia and collected new information to improve the evidence base about distribution of seasnakes in NNW Australia, this
			Report on surveys and analyses of data		
			Spatial and temporal patterns in sea snake populations on the North West Shelf - Progress Report	https://www.nespmarine.edu.au/document/spatial-and-temporal-patterns-sea-snake-populations-north-west-shelf-progress-report	

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Project Number/ID	Project Name/Title	Project Summary	Outputs	Link to Output ²	Outcomes
			Exploring the status of Western Australia's sea snakes - Report	https://www.nespmarine.edu.au/document/exploring-status-western-australia%E2%80%99s-sea-snakes	information will be used to inform decisions making for EPBC referrals and assessments and to manage Australian Marine Parks and those in State waters.
			Spatial distribution map of sea snake species occurrence	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=8114ec84-7907-4ad8-8453-e0b255dc2bd7	
A9	Grey Nurse Shark Ck-MR Population Estimate - East Coast	A review of the 2002 National Recovery Plan for Grey Nurse Shark (DEWHA 2009) concluded it was not possible to determine if the east coast population had shown any signs of recovery (DoE 2014). Action 1.1 of the new recovery plan (DoE 2014) is to resurvey Grey Nurse Shark populations to assess population trends and dynamics. This project will resample the east coast population and use genetic SNP data to inform close kin-mark recapture analysis to estimate population size and trend, and provide guidance on future monitoring strategies for the east coast population of Grey Nurse Shark.	Sizing up Australia's eastern Grey Nurse Shark population	https://www.nespmarine.edu.au/document/sizing-australia%E2%80%99s-eastern-grey-nurse-shark-population	The project will provide a population estimate to generate a new shared understanding about the status of grey nurse sharks in eastern Australia. This new understanding delivers on actions in the existing EPBC Act Recovery Plan for grey nurse shark and provides evidence to inform referrals and assessments under the EPBC Act and equivalent threatened species legislation in state government jurisdictions
			A close-kin mark-recapture estimate of the population size and trend of east coast grey nurse shark	https://www.nespmarine.edu.au/document/close-kin-mark-recapture-estimate-population-size-and-trend-east-coast-grey-nurse-shark	
			Grey Nurse Shark Tissue Sample Collection	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=fc5edda0-cd1e-462e-a610-d45106111db4	
A10	Conservation of spotted handfish and their habitat	Spotted handfish are critically endangered and in accordance with the signed recovery plan we will conserve them through various direct conservation actions guided by research. This includes replanting of the degraded plastic artificial spawning habitats (ASH) with a re-designed array of ceramic units, assessment of taut eco-friendly moorings in critical spotted handfish habitat, genetic and capture mark recapture studies, a population viability analysis (PVA) and performance assessment of management actions. We will also continue our captive breeding project with industry and engagement with the broader community through talks, outreach and publications and re-establishment of the handfish recovery team.	Conservation of handfish and their habitats – annual report (milestone 4, 2018)	https://www.nespmarine.edu.au/document/conservation-handfish-and-their-habitats-%E2%80%93annual-report	The project has significantly improved shared understanding about the population status and trends of spotted handfish in Tasmanian estuaries. This new understanding delivers on actions in the existing EPBC Act Recovery Plan for spotted handfish and provides evidence to inform referrals and assessments under the EPBC Act and State government environmental legislation. The project is also testing the effectiveness of practical approaches to recover the population of spotted handfish, including use of artificial spawning habitat and eco-moorings. The project also includes a captive breeding component, involving a broad range of stakeholders and industry partners, and efforts to date have been very successful.
			Conservation of handfish and their habitats – annual report (milestone 10, 2019)		
			Conserving the Critically Endangered Red Handfish - Fact Sheet	https://www.nespmarine.edu.au/document/conserving-critically-endangered-red-handfish-fact-sheet	
			Procedures and methods for establishment of captive breeding populations of spotted handfish	https://www.nespmarine.edu.au/document/procedures-and-methods-establishment-captive-breeding-populations-spotted-handfish	
			Local densities and habitat preference of the critically endangered spotted handfish (<i>Brachionichthys hirsutus</i>): Large scale field trial of GPS parameterised underwater visual census and diver attached camera	https://www.nespmarine.edu.au/document/local-densities-and-habitat-preference-critically-endangered-spotted-handfish	
			Conserving Critically Endangered spotted handfish - Fact Sheet	https://www.nespmarine.edu.au/document/conserving-critically-endangered-spotted-handfish-fact-sheet	
			Monitoring of Spotted Handfish (<i>Brachionichthys hirsutus</i>) populations and on ground conservation actions - Report	https://www.nespmarine.edu.au/document/monitoring-spotted-handfish-brachionichthys-hirsutus-populations-and-ground-conservation	
			Density estimates of Spotted Handfish (<i>Brachionichthys hirsutus</i>) - GPS Underwater Visual Census. 2015-2016	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=b0c79329-a480-4762-a943-a902a74fc13e	
			Spotted Handfish (<i>Brachionichthys hirsutus</i>) - GPS Underwater Visual Census - 2017 resurveys of baseline sites	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=51702b57-d4e4-4477-b199-b3485675f66c	
A11	Shark action plan	Conservation of elasmobranch species (sharks and rays) is an increasing priority globally, including Australia, as evidence of overexploitation of some species becomes apparent. Common issues and threats among elasmobranch species may improve management if considered holistically. This project will produce a Shark Action Plan assessing requirements for improved management including a summary of current status across the taxa, guidelines for reducing impacts and improving management, and identification of key knowledge gaps impeding conservation and management. This Plan will help guide policy for Australian elasmobranchs developed by DoEE and fishery managers. On-ground conservation will be developed from recommendations in this plan.	Shark Action Plan Policy Report - milestone 11, Rpv3 2017	https://www.nespmarine.edu.au/document/shark-action-plan-policy-report	The project, continuing until the end of 2018, will generate the key scientific elements of a conservation plan for Australia's sharks and rays.
			The extinction risk of New Zealand chondrichthyans	https://www.nespmarine.edu.au/document/extinction-risk-new-zealand-chondrichthyans	
			Shark Action Plan species assessments report		
A12	Australia's Northern Seascape: assessing status of threatened and migratory marine species	Northern Australia has a relatively untouched natural environment and is the current focus of substantial economic development, which has the potential to impact biodiversity and cultural values. The Northern Seascapes Project Phase 2 will map the distributions of several <i>EPBC</i> -listed threatened and migratory marine species at a broad-scale, and develop and trial a cost-effective rapid assessment approach ('SeaBlitzes') to gather finer-scale spatial data on priority marine species of the northern seascape, including the critical habitats they depend on. SeaBlitzes will survey selected hotspots determined through scoping undertaken in Phase 1 of the Northern Seascapes Project (to be delivered end 2017). The data and knowledge generated by the rapid	Lost before found: A new species of whaler shark <i>Carcharhinus obsolerus</i> from the Western Central Pacific known only from historic records	https://www.nespmarine.edu.au/document/lost-found-new-species-whaler-shark-carcharhinus-obsolerus-western-central-pacific-known	The project, with delivery of the scoping report for phase 1 and follow-up workshop with stakeholders, will generate new shared understanding about existing information on EPBC listed threatened and migratory marine species and potential for interaction with human activities/pressures in the North Marine Region. The scoping report from phase one will provide the basis to prioritise locations (i.e. Seablitz locations) for the collection of new data on multiple species. Early outputs from Phase one have generated new shared understanding about Indigenous
			Garig Gunak Barlu Cobourg Marine Park Green Sawfish Project: Scoping Trip Report	https://www.nespmarine.edu.au/document/garig-gunak-barlu-cobourg-marine-park-green-sawfish-project-scoping-trip-report	
			The phylogenomic position of the Critically Endangered Largetooth Sawfish <i>Pristis pristis</i> (Rhinopristiformes, Pristidae), inferred from the complete mitochondrial genome	https://www.nespmarine.edu.au/document/phylogenomic-position-critically-endangered-largetooth-sawfish-pristis-pristis	

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		assessments will establish baselines, and grow the information base for decision-making on proposed activities under Commonwealth and Territory environmental regulations. This approach will deliver on actions in threatened species Recovery Plans, Sea Country Plans, and management plans for protected areas (e.g. Indigenous Protected Areas and Marine Reserves), and will develop capacity for continued data collection through a community-based participatory approach.	Scoping a seascape approach to managing and recovering northern Australian threatened and migratory marine species Desktop review of Indigenous research and management priorities for threatened and migratory species Characterising northern estuaries using the Digital Earth Australia Northern Australia threatened species Northern Australia pressures mapping Northern Australia changes in key coastal habitats	https://www.nespmarine.edu.au/document/scoping-seascape-approach-managing-and-recovering-northern-australian-threatened-and https://www.nespmarine.edu.au/document/desktop-review-indigenous-research-and-management-priorities-threatened-and-migratory https://www.nespmarine.edu.au/document/characterising-northern-estuaries-using-digital-earth-australia http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=47042e1d-8940-4186-8644-e6f5402574f4 http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=ecb15d97-8deb-454e-bca8-0db634d9e29a http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=1ab541b2-01ce-4062-8b1d-8b5d24f7d346	interests in threatened and migratory marine species Northern Australia and also changes to intertidal habitats in northern Australia over a 30 year time frame. The project is designed to improve understanding about status of threatened and migratory marine species in northern Australia to inform decision making about referral and assessments under the EPBC Act and recovery of listed species
A13	Estimation of population abundance and mixing of 'Southern' right whales in the Australian and New Zealand regions	This project will provide, for the first time, an abundance estimate of the total Australian population of southern right whales. It will also investigate the movement and connectedness of whales that utilise breeding areas on the eastern, southern and western coasts of Australia. Information on the population abundance and movements of southern right whales provided by this project will allow the Australian government to better evaluate progress made against the Conservation Management Plan for the species and ensure conservation efforts for the species are effectively coordinated at the regional level.	International Whaling Commission paper on southern right whales		The project, continuing until December 2020, will provide a new shared understanding about the to the abundance of southern right whales in Australia and connectivity with the populations found in the New Zealand region. This new understanding will be used to inform decision making for implementing and reviewing the conservation management plan under the EPBC Act.
A14	Identification of near-shore habitats of juvenile white sharks in Southwestern Australia	There is credible evidence that juvenile white sharks are present in a relatively restricted region between the head of the Great Australia Bight (GAB) and Ceduna, which encompasses the boundaries of State and Commonwealth managed marine parks and reserves, some of which are accessed via Indigenous Protected Areas. This pilot project is to undertake visual surveys (using Unmanned Aerial Vehicle – UAV) for juvenile white sharks during spring and summer. The on-land surveillance approach outlined in this proposed pilot project will inform decision makers on the efficacy of supporting subsequent on-water activity to capture and electronically tag juvenile white sharks to assess habitat use in the Great Australian Bight Marine Park (Commonwealth waters) and Far West Coast Marine Park (State waters).	Story for Marine Park Science Atlas: Hunting for white sharks in South Australia		The project, continuing until March 2020, will provide evidence to support reports of a juvenile aggregation area for white sharks in South Australia. These insights are important for understand opportunities to improve our understanding of western populations of white shark and connectivity with the eastern population. Understanding population dynamics and connectivity is critical for assessing the effectiveness of conservation measures for species listed as threatened under the EPBC Act.
A15	Conservation Status of Tropical Inshore Dolphins	The Conservation Status of Tropical Inshore Dolphins project will entail the compilation and review of the results of numerous research projects completed under the Whale and Dolphin Protection Plan, as well as monitoring and offset programs associated with port developments. The aim is to determine the conservation status and address the listing criteria of the: Australian snubfin dolphin, Orcaella heinsohni; Australian humpback dolphin, Sousa sahulensis; and Indo-Pacific bottlenose dolphin, Tursiops aduncus.			The outputs of this project will be used by the TSSC to assess whether or not the Australian Humpback Dolphin qualifies for listing as Vulnerable under the EPBC Act
B1	Road testing decision support tools via case study applications	This project will deploy tools from economics and decision science to identify sound investments within constrained budgets for: 1. Ecological monitoring of Commonwealth Marine Reserves 2. Management actions for threatened and migratory species or threatened communities, and 3. Restoration of saltmarsh and shellfish habitats. The three case studies involve coherent integration of ecological understanding, social and organisational value judgements, and economic analysis.	Review of decision support tools and their potential application in the management of Australian Marine Parks Benefit-cost analysis of the Windara shellfish reef restoration project Benefit-cost analysis for marine habitat restoration: a framework for estimating the viability of shellfish reef repair projects An assessment of alternative management interventions for treatment of Tropical Fire Ants on Ashmore Reef - Report	https://www.nespmarine.edu.au/document/review-decision-support-tools-and-their-potential-application-management-australian-marine https://www.nespmarine.edu.au/document/benefit-cost-analysis-windara-shellfish-reef-restoration-project https://www.nespmarine.edu.au/document/benefit-cost-analysis-marine-habitat-restoration-framework-estimating-viability-shellfish https://www.nespmarine.edu.au/document/assessment-alternative-management-interventions-treatment-tropical-fire-ants-ashmore-reef-0	The project, continuing until December 2019 is designed to improved shared understanding about the use of decision support tools in Parks Australia and other interested stakeholders. This new understanding will be used to improve decision making processes by improving efficiency of process, transparency in decision making and increased effectiveness in use of resources.

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B2	Analysis and elicitation to support State of the Environment reporting for the full spectrum of data availability	<p>The availability and quality of observation data that may be used to support State of the Environment reporting lies on a spectrum from: (i) high quality (e.g. Reef Life Survey, Long term reef monitoring programme, Temperate Reef Monitoring programme, state-based MPA monitoring programmes); (ii) moderate quality (e.g. continuous plankton recorder, occasional by catch surveys); (iii) low quality (anecdotal information) to (iv) expert beliefs but no empirical observations.</p> <p>The project has been completed, and provided direct input to the marine chapter of the 2016 State of the Environment report, by providing expert assessment of environmental status indicators defined for the 2011 State of the Environment report.</p>			
B3	Enhancing access to relevant marine information – developing a service for searching, aggregating and filtering collections of linked open marine data	This project aims to improve the searchability and delivery of sources of linked open data, and to provide the ability to forward collections of discovered data to web services for subsequent processing through the development of a linked open data search tool. The work will improve access to existing data collections , and facilitate the development of new applications by acting as an aggregator of links to streams of marine data. The work will benefit managers (i.e. Department of the Environment staff) by providing fast and simple access to a wide range of marine information products, and offering a means of quickly synthesizing and aggregating multiple sources of information.	Enhancing access to relevant marine information - developing a service for searching, aggregating and filtering collections of linked open marine data - final report - Report	https://www.nespmarine.edu.au/document/enhancing-access-relevant-marine-information-%E2%80%93-developing-service-searching-aggregating-and	The project provided proof of concept for a novel approach to searching, aggregating and filtering collections of linked open marine data informing decision making to enhance access to marine data. The developed concept was shared with DoEE and other stakeholders and opportunities for applying the concept where discussed and are being considered.
			Enhancing access to relevant marine information: Developing a service for searching, aggregating and filtering collections of linked open marine data - Scoping study - Report	https://www.nespmarine.edu.au/document/enhancing-access-relevant-marine-information-developing-service-searching-aggregating-and	
B4	Underpinning the repair & conservation of Australia’s threatened coastal-marine habitats – phase II.	The objective of this research is to support the scaling-up of repair efforts for two threatened nearshore marine ecological communities, shellfish reefs and salt marshes. Both habitats harbour significant marine biodiversity and play a critical role in supporting healthy estuarine and nearshore systems. The research synthesis will be used to guide the development of more effective policy on coastal-marine repair, improve community education on the importance of habitats to estuary health and develop a detailed business case to support investment in marine repair activities for private industry stakeholders.	Estimating the value of tropical coastal wetland habitats to fisheries: Caveats and assumptions	https://www.nespmarine.edu.au/document/estimating-value-tropical-coastal-wetland-habitats-fisheries-caveats-and-assumptions	The project has generated a shared understanding among researchers, policy makers and stakeholders about the ecological, social and economic importance of shellfish reefs in Australia and how to recover these imperilled habitats to ensure we can once again benefit from them. New information on the benefits of shellfish reefs has been used to inform the development of business cases and proposals to restore shellfish reefs in Australia. Resources were also used to build connections between various restoration efforts operating in different parts of Australia and included convening events like the Inaugural Australian Coastal Restoration Symposium and a workshop of Indigenous communities with an interest to shellfish reef restoration. Collectively the project has provided the evidence base and network to support a national approach to shellfish reef restoration in Australia.
			Prospects for seascape repair: three case studies from eastern Australia	https://www.nespmarine.edu.au/document/prospects-seascape-repair-three-case-studies-eastern-australia	
			Habitat value of Sydney rock oyster (<i>Saccostrea glomerata</i>) reefs on soft sediments	https://www.nespmarine.edu.au/document/habitat-value-sydney-rock-oyster-saccostrea-glomerata-reefs-soft-sediments	
			Expanding fish productivity in Tasmanian saltmarsh wetlands through tidal reconnection and habitat repair	https://www.nespmarine.edu.au/document/expanding-fish-productivity-tasmanian-saltmarsh-wetlands-through-tidal-reconnection-and	
			Seven pearls of wisdom: advice from Traditional Owners to improve engagement of local Indigenous people in shellfish ecosystem restoration	https://www.nespmarine.edu.au/document/seven-pearls-wisdom-advice-traditional-owners-improve-engagement-local-indigenous-people	
			Australian shellfish ecosystems: Past distribution, current status and future direction	https://www.nespmarine.edu.au/document/australian-shellfish-ecosystems-past-distribution-current-status-and-future-direction	
			Underpinning the repair and conservation of Australia’s threatened coastal-marine habitats: Shellfish restoration research - Mid-project update - Report	https://www.nespmarine.edu.au/document/underpinning-repair-and-conservation-australia%E2%80%99s-threatened-coastal-marine-habitats	
			Repairing and conserving Australia's saltmarshes and seascapes - Report	https://www.nespmarine.edu.au/document/repairing-and-conserving-australia%E2%80%99s-saltmarshes-and-seascapes	
			Sustainable management of Australia's coastal seascapes: a case for collecting and communicating quantitative evidence to inform decision-making - Journal Article	https://www.nespmarine.edu.au/document/sustainable-management-australia%E2%80%99s-coastal-seascapes-case-collecting-and-communicating	
			Shellfish reef habitats: a synopsis to underpin the repair and conservation of Australia’s environmental, social and economically important bays and estuaries - Report	https://www.nespmarine.edu.au/document/shellfish-reef-habitats-synopsis-underpin-repair-and-conservation-australias-environmental	
			Australia's saltmarshes: a synopsis to underpin the repair and conservation of Australia's environmentally, socially and economically important bays and estuaries - Report	https://www.nespmarine.edu.au/document/australias-saltmarshes-synopsis-underpin-repair-and-conservation-australias-environmentally	
			Fostering the repair of Australia's saltmarshes and shellfish reefs - Fact Sheet	https://www.nespmarine.edu.au/document/fostering-repair-australia%E2%80%99s-saltmarshes-and-shellfish-reefs-fact-sheet	
			Symposium report: Inaugural Australian Coastal Restoration Symposium	https://www.nespmarine.edu.au/document/symposium-report-inaugural-australian-coastal-restoration-symposium	

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			Restoring Angasi oyster reefs: What is the endpoint ecosystem we are aiming for and how do we get there?	https://www.nespmarine.edu.au/document/restoring-angasi-oyster-reefs-what-endpoint-ecosystem-we-are-aiming-and-how-do-we-get-there	
			Australian shellfish reef images	http://catalogue.aodn.org.au/geonetwork/srv/en/metadata.show?uuid=2ddd5dbc-cc54-4777-aa14-56c461d180f0	
			Shellfish reef locations	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=8677fd3f-c640-460c-b5a9-34177884a076	
			Biodiversity supported by shellfish reefs	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=5acb935b-c8da-4b2e-af38-63ac1da126be	
			Saltmarsh prawn and fish species composition and production data	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=a15a9349-e357-4e0a-a8c0-8e6fcb306279	
			Shellfish water filtration data	https://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=13682e14-1d4d-46d5-839d-8c40a3713ce6	
			Restoring Shellfish Reefs (Ocean brief)	https://www.youtube.com/watch?v=nl-CzovK5pA	
C1	Improving our understanding of pressures on the marine environment	The marine environment in Australia is impacted by a wide range of different pressures. This project aims to assist DoE, and other research users, to improve understanding of the potential impacts of anthropogenic disturbance to marine conservation values by providing up-to-date data and analyses on the spatial distribution of pressures and trends. The research is designed to inform decision making under the EPBC Act (acceptability of proposed activities, evaluation of effectiveness of mitigation measures) on NMES (including Key Ecological Features), implementation of multiple strategies in four Marine Bioregional Plans management of Commonwealth Marine Reserves and State of the Environment reporting.	Challenges for global ocean observation: the need for increased human capacity	https://www.nespmarine.edu.au/document/challenges-global-ocean-observation-need-increased-human-capacity	The project has developed a shared understanding about status and trends of human pressures in Australia's marine environment. Information was used to inform a broad range of human pressures indicators in the 2016 State of the Environment - Marine Chapter. Collectively the project provides policy makers and stakeholders with an understanding about options for assessing risks to the environment from human pressure, the importance of understanding how perception of 'values' influences and shapes assessment of risks and options for assessing risks. The project provides a platform for understanding how to approach assessment of human risks to the marine environment and will inform implementation of projects A12 and E1.
			Options for assessing risks to environmental values in Matters of National Environmental Significance and Commonwealth Marine Reserves – report to be uploaded to website	https://www.nespmarine.edu.au/document/options-assessing-cumulative-impact-and-risk-environmental-values-matters-national	
			Essential ocean variables for global sustained observations of biodiversity and ecosystem changes	https://www.nespmarine.edu.au/document/essential-ocean-variables-global-sustained-observations-biodiversity-and-ecosystem-changes	
			Rethinking Approaches to Valuation in Marine Systems – report to be uploaded to website	https://www.nespmarine.edu.au/document/rethinking-approaches-valuation-marine-systems	
			Towards a value based approach to cumulative risk and impact analysis - Fact sheet	https://www.nespmarine.edu.au/document/towards-value-based-approach-cumulative-risk-and-impact-analysis	
			Changes in pressures on the Marine Environment over three decades	https://www.nespmarine.edu.au/document/changes-pressures-marine-environment-over-three-decades	
			Australian Ship Reporting System and Automatic Identification System - Shipping Summaries - 1999-2015	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=b8135966-33c6-4a1c-bcbc-d797c2a1155f	
			Cyclone Summaries 1900-2015	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=9fb32adf-f8e8-4b38-8e23-1c6e847b6a91	
			Maritime Cables	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=b8824a13-8e0b-4172-9678-dabccdedeeb7	
			Petroleum and Gas Production Facilities, Australia 2016	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=2eddbe26-0276-4468-a210-0c00ada8bf39	
			Petroleum pipelines	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=19d8f59a-b918-442f-8e2c-d80125600868	
			Petroleum Titles, Australia 2016	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=836b1a1d-19d8-4f66-b12f-88e4ce9ba19c	
			Plastic Pollution in the World's Oceans (2007-2013)	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=DA83B0E3-2B75-48A2-8FDD-874EDD9DBDBF	
			Pollution Events Summary, Australia 1970-2015 (AMSA)	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=2ff40822-a773-4788-aedd-232639142cde	
			Population Density, Australia 2011 (ABS)	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=c8b09cef-c645-48aa-8658-22ece782365f	
			Seismic Surveys, Australia (2015)	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=17249677-2be0-43a0-a9b5-da01e0be3fa7	

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			Summaries of AFMA log book data on effort distribution for Commonwealth fisheries in the Australian Exclusive Economic Zone	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=aa53a4df-7fe6-46d1-93b7-2d3732f4883e	
			Twenty years of high-resolution sea surface temperature imagery around Australia: inter-annual and annual variability	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=b8f48127-495e-42e6-8d53-db3c56ee3a7f	
			State fisheries data		
C2	Continental-scale tracking of threats to shallow Australian reef ecosystems	The project will integrate Australia’s largest, most detailed datasets of shallow-water tropical and temperate marine biodiversity, and assess how pollution, fishing, rising sea temperatures and introduced species are impacting associated natural values. An initial outcome will be the identification of state-of-the-environment indicators for inclusion in the 2016 State of the Environment report, with subsequent activities aimed at contributing additional data products needed for other NESP projects, Parks Australia, and the Essential Environmental Measures initiative. The project will also describe a national shallow-water baseline of biodiversity in Commonwealth Marine Reserves for assessment of change through the long term.	A global assessment of the direct and indirect benefits of marine protected areas for coral reef conservation	https://www.nespmarine.edu.au/document/global-assessment-direct-and-indirect-benefits-marine-protected-areas-coral-reef	The project has generated a shared understanding among researchers, policy makers and other stakeholders about the effects of human activities/pressures on biodiversity of shallow-water shallow reefs in Australia. Information was used to inform status and trends of reefs in the 2016 State of the Environment - Marine Chapter and to inform management of Australian Marine Parks and identification of essential environmental measures for DoEE. The project informs understanding about the thermal limits shallow-water marine species informing risk assessment for conservation of marine biodiversity. It also provides data evidence-based insights about ecological indicators for shallow reef systems in Australia's marine environment.
			Moving beyond trophic groups: evaluating fishing-induced changes to temperate reef food webs	https://www.nespmarine.edu.au/document/moving-beyond-trophic-groups-evaluating-fishing-induced-changes-temperate-reef-food-webs	
			Continental-scale tracking of threats to shallow Australian reef ecosystems - Indicator report	https://www.nespmarine.edu.au/document/continental-scale-tracking-threats-shallow-australian-reef-ecosystems-indicator-report	
			Thermal limits to the geographic distributions of shallow-water marine species - Journal Article	https://www.nespmarine.edu.au/document/thermal-limits-geographic-distributions-shallow-water-marine-species	
			Abundance and local-scale processes contribute to multi-phyla gradients in global marine diversity - Journal Article	https://www.nespmarine.edu.au/document/abundance-and-local-scale-processes-contribute-multi-phyla-gradients-global-marine	
			Translating local benthic community structure to national biogenic reef habitat types - Journal Article	https://www.nespmarine.edu.au/document/translating-local-benthic-community-structure-national-biogenic-reef-habitat-types	
			Ubiquity of microplastics in coastal seafloor sediments - Journal Article	https://www.nespmarine.edu.au/document/ubiquity-microplastics-coastal-seafloor-sediments	
			Colours of the Coral Sea - Poster	https://www.nespmarine.edu.au/document/colours-coral-sea	
			Assessing national biodiversity trends for rocky and coral reefs through the Integration of citizen science and scientific monitoring programs - Journal Article	https://www.nespmarine.edu.au/document/assessing-national-biodiversity-trends-rocky-and-coral-reefs-through-integration-citizen	
			Biodiversity enhances reef fish biomass and resistance to climate change - Journal Article	https://www.nespmarine.edu.au/document/biodiversity-enhances-reef-fish-biomass-and-resistance-climate-change	
			Bright spots among the world's coral reefs - Journal Article	https://www.nespmarine.edu.au/document/bright-spots-among-world%E2%80%99s-coral-reefs	
			Thermal biases and vulnerability to warming in the world's marine fauna	https://www.nespmarine.edu.au/document/thermal-biases-and-vulnerability-warming-worlds-marine-fauna	
			Pollution markers at ecological monitoring sites	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=11075fdf-e53e-4d8c-8999-0b239a742243	
			Integration of marine biodiversity datasets and derived indicators	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=084e90fe-ef03-4b41-8991-832116db2ffb	
C3	Change detection and monitoring of key marine and coastal environments – application of the Australian Geoscience Data Cube	This project aims to leverage the extensive time-series of earth observation image data in the Australian Geoscience Data Cube (AGDC) by developing change detection algorithms to analyse key environmental parameters in the coastal and marine zone. Spatial information produced by this project can inform management decisions, and assist in evaluating management action outcomes, by providing a quantifiable measure of historical change and ongoing monitoring and change detection capabilities. Phase 1 of this project aimed to demonstrate the capability of using the AGDC through the development of an inter-tidal zone change detection algorithm and data set, with a view to developing and implementing an expanded range of stakeholder targeted algorithms to inform decision making processes in Phase 2.	Coastal change detection tools utilising 28 years of Earth Observation data in the Australian Geoscience Data Cube (AGDC) - Report	https://www.nespmarine.edu.au/document/coastal-change-detection-tools-utilising-28-years-earth-observation-data-australian	The project provides stakeholders with a proof of concept for use of satellite data to monitoring coastal change informing decisions for coastal management and State or the Environment reporting. The concept demonstrated here has since been used in project A12 to demonstrate status and trends on intertidal habitat change in northern Australia.
			AGDC Time Series Video - Murray Mouth and Lower Lakes	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=a0bf5d29-0986-443a-a9e2-a9d7523c9a3c	
			AGDC Time Series Video - Southern Moreton Island	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=90f1121e-b973-46d4-9a51-5f750d954319	
			AGDC Time Series Video - Southern Stradbroke Island	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=67fef6b1-1540-445f-a995-71abcefeb99b	
C4	The National Outfall Database project (Clean Ocean Foundation)	NOD addresses the need of government and community to understand the impacts on health and the ocean environment that occur from sewerage outfalls around Australia. The project will be delivered over a three year time frame and will provide: 1) A publically accessible national outfall database and reports.	Australian coastal sewage outfalls and data transparency - Public access to government information	https://www.nespmarine.edu.au/document/australian-coastal-sewage-outfalls-and-data-transparency-public-access-government	The project, continuing to June 2020, has generated a shared understanding about the volume and content of sewage outfalls to the marine environment in Australia. This information will be used to objectively rate Australia's sewage outfalls and provide evidence to inform
			National Outfall Database - Prospectus Report 2019	https://www.nespmarine.edu.au/document/national-outfall-database-prospectus-report-2019	

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		2) A ranking of the outfalls (and sewerage treatment systems) according to health and impact criteria with peer review of the ranking system and resulting ranking outcomes. 3) Comparison of geographical regions in sewerage volume and pollution impact. 4) Mapping of the database. 5)Community engagement in conduct of this research and consumption of the outcomes.	Perceptions and information disclosure of water quality issues in Australia 2019 National Outfall Database - Community Report for August 2018 National Outfall Database Ranking Report 2017-2018 2017 Data Analysis Report Warriewood Monitoring Summary - Report National Outfall Database https://www.nod.org.au/	https://www.nespmarine.edu.au/document/perceptions-and-information-disclosure-water-quality-issues-australia-2019 https://www.nespmarine.edu.au/document/national-outfall-database-community-report-august-2018 https://www.nespmarine.edu.au/document/national-outfall-database-ranking-report-2017-2018 https://www.nespmarine.edu.au/document/national-outfall-database-ranking-report-2017-2018 https://www.nespmarine.edu.au/document/warriewood-monitoring-summary http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=21448123-0170-4aff-9b56-2b6aa21c73ed	government decisions about investments to improvement to sewage treatment facilities. The project team is also working with citizen scientists to promote participation in data collection that will inform decision making about management of sewage systems and notification of bypass events.
C5	Quantification of risk from shipping to large marine fauna across Australia	Given the substantial and ongoing increases in coastal and port development along the Australian coastline, and an associated increase in recreational and commercial shipping, there is an increasing potential for adverse interactions with marine species. Two risks associated with these activities for large marine fauna are ship collisions (particularly relevant for marine mammals, turtles and whale sharks) and the impact of chronic ocean noise (across a wide range of species). This project aims to provide directed and robust science (species- and area-specific) to inform management and administrative decision-making by the Department of Environment in its application of the EPBC Act.	Quantification of risk from shipping to large marine fauna across Australia: Final Report, Milestone 3.5, RPv3 2017 Avoiding the collision course Report from workshop on characterising underwater shipping noise in Australia - Report Historical Data on Australian Whale Vessel Strikes - International Whaling Commission June 2016 - Report Scoping of potential species for ship strike risk analysis - Report Historical Australian vessel strike data Distribution map for Western Australian Humpback whale Migration Relative vessel strike risk for Southern Right Whales Relative vessel strike risk for Eastern Australian Humpback whales Relative vessel strike risk for Western Australian Humpback whales Relative vessel strike risk for Green Turtles	https://www.nespmarine.edu.au/document/quantification-risk-shipping-large-marine-fauna-across-australia-final-report https://www.nespmarine.edu.au/document/avoiding-collision-course https://www.nespmarine.edu.au/document/report-workshop-characterising-underwater-shipping-noise-australia https://www.nespmarine.edu.au/document/historical-data-australian-whale-vessel-strikes-international-whaling-commission-june-2016 https://www.nespmarine.edu.au/document/scoping-potential-species-ship-strike-risk-analysis http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=78cfb62c-e8ec-4437-9113-1e1fdc523f95 https://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=40e7e293-e5e2-4d46-9611-c2db22182b24 https://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=40e7e293-e5e2-4d46-9611-c2db22182b24 https://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=40e7e293-e5e2-4d46-9611-c2db22182b24 https://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=40e7e293-e5e2-4d46-9611-c2db22182b24	The project has generated a shared understanding among researchers, policy makers and stakeholders about the risks of vessel strike to targeted threatened and migratory marine species at a national-scale. This new understanding delivers on actions in the existing EPBC Act Recovery Plans for turtles, dugong and whales and provides evidence to inform referrals and assessments under the EPBC Act and State and Territory environmental legislation. The project has also informed the review of the Australian Government's National Strategy for Reducing Vessel Strike on Cetaceans and other Marine Megafauna 2017 and discussions at the International Whaling Commission. The project demonstrated proof of concept for a national-scale shipping noise map, currently being progressed by project E2, to inform decision making about avoidance and mitigation of potential biodiversity impacts from shipping noise.
D1	National Data Collation, Synthesis and Visualisation to Support Sustainable Use, Management and Monitoring of Marine Assets	Effective management of marine assets requires an understanding of ecosystems and the processes that influence patterns of biodiversity. Through collaboration and synthesis of existing data this project will improve access to, and usability of, marine data to better inform management and improve public understanding of biodiversity in the marine estate. End-users and stakeholders will benefit from improved regional and national descriptions of biodiversity assets for the Commonwealth marine estate, including Commonwealth Marine Reserve network and other high-priority marine areas. In turn, this will inform prioritisation of future investments in monitoring marine ecosystems and State of the Environment reporting.	Eco-narrative of Bonaparte Gulf Marine - Milestone 17, RPv4 2018 Eco-narrative of Kimberley Marine Park - Milestone 17, RPv4 2018 An eco-narrative of Huon Marine Park - South-east marine region An eco-narrative of Geographe Marine Park - South-west marine region An eco-narrative of Gifford Marine Park - Temperate East marine region An eco-narrative of Perth Canyon Marine Park - South-west marine region Origin of high density seabed pockmark fields and their use in inferring bottom currents	https://www.nespmarine.edu.au/document/eco-narrative-joseph-bonaparte-gulf-marine-park-%E2%80%93-north-marine-region https://www.nespmarine.edu.au/document/eco-narrative-kimberley-marine-park-north-west-marine-region https://www.nespmarine.edu.au/document/eco-narrative-huon-marine-park-south-east-marine-region https://www.nespmarine.edu.au/document/eco-narrative-geographe-marine-park-south-west-marine-region https://www.nespmarine.edu.au/document/eco-narrative-gifford-marine-park-temperate-east-marine-region https://www.nespmarine.edu.au/document/eco-narrative-perth-canyon-marine-park-south-west-marine-region https://www.nespmarine.edu.au/document/origin-high-density-seabed-pockmark-fields-and-their-use-inferring-bottom-currents	The project has generated a shared understanding among researchers, policy makers, AMP managers and other stakeholders about what we know about marine biodiversity in Australia's north and north-west marine regions. This new understanding targeted Australian Marine Parks and key ecological features to provide clarity about what we know and the information gaps. This new understanding will be used to inform decisions on referrals and assessments under EPBC Act and also in AMP management, for example to prioritise future investments in targeted information collection for marine parks. Collated information has been synthesised to form targeted information products that communicate the values of marine parks meeting the specific needs of Parks Australia and its stakeholders

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			Transferring biodiversity models for conservation: Opportunities and challenges	https://www.nespmarine.edu.au/document/transferring-biodiversity-models-conservation-opportunities-and-challenges	
			Ecosystem Understanding to Support Sustainable Use, Management and Monitoring of Marine Assets in the North and North-West Regions: Final Report 2016 - Report	https://www.nespmarine.edu.au/document/ecosystem-understanding-support-sustainable-use-management-and-monitoring-marine-assets-0	
			Environmental predictors of foraging and transit behaviour in flatback turtles (Natator depressus) - Journal Article	https://www.nespmarine.edu.au/document/environmental-predictors-foraging-and-transit-behaviour-flatback-turtles-natator-depressus	
			Palaeoshorelines on the Australian continental shelf: morphology, sea-level relationship and applications to environmental management and archaeology - Journal Article	https://www.nespmarine.edu.au/document/palaeoshorelines-australian-continental-shelf-morphology-sea-level-relationship-and	
			Ecosystem understanding to support sustainable use, management and monitoring of marine assets in the North and North-west regions - Stakeholder workshop report April 2016 - Report	https://www.nespmarine.edu.au/document/ecosystem-understanding-support-sustainable-use-management-and-monitoring-marine-assets	
			Developing a toolbox of predictive models for the monitoring and management of KEFs and CMRs in the North and North-west regions - Scientific Workshop Report - Report	https://www.nespmarine.edu.au/document/developing-toolbox-predictive-models-monitoring-and-management-kefs-and-cmr-north-and	
			Sea Around Us Project - Relative pelagic fish abundance inferred from commercial catch data, Western Australia (1997-2006)	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=16501b1f-4b29-4b52-82d1-2e5c4d536acc	
			Sea Around Us Project - Relative demersal fish abundance inferred from commercial catch data, northwestern Australia (1997-2006)	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=e90f84bd-a1c8-4943-ac6a-dbfec0cc313e	
			Juvenile shark occurrence inferred from baited remote underwater video surveys Northwest Australia (2003-2013)	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=5af57072-c4c2-4a5a-bc72-62486dc6d73e	
			Oceanic Shoals Commonwealth Marine Reserve - Pelagic baited camera surveys (stereo-BRUVS)	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=ef452136-c42c-4f0a-98b3-f38a000a3752	
			Oceanic Shoals Commonwealth Marine Reserve - Opportunistic visual surveys of marine megafauna	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=99208235-d68e-4039-bf77-362549a7aa48	
			Oceanic Shoals Commonwealth Marine Reserve - Predicted pelagic diversity	http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=99208235-d68e-4039-bf77-362549a7aa48	
			Chlorophyll-a and ocean productivity	http://northwestatlas.org/node/27500	
			Sea Surface Temperature (SST)	http://northwestatlas.org/node/27499	
			Petroleum leases and offshore titles near the Oceanic Shoals as of 2016	http://northwestatlas.org/node/1651	
			Biologically important areas (BIAs)	http://northwestatlas.org/node/27496	
			Species richness	http://northwestatlas.org/node/27495	
			RAMSAR wetlands	http://northwestatlas.org/node/27494	
			World Heritage Areas	http://northwestatlas.org/node/27492	
			IMCRA provincial bioregions	http://northwestatlas.org/node/27490	
			IMCRA mesoscale bioregions	http://northwestatlas.org/node/27489	
			Key Ecological Features	http://northwestatlas.org/node/27488	
			Bathomes	http://northwestatlas.org/node/27486	
			Oceanic Shoals/Wessel Islands Sponge species ids		
			Oceanic Shoals Polychaete species ids	http://www.ga.gov.au/metadata-gateway/metadata/record/102241	
			Interactive map gallery 'What research has been done in the North and NorthWest regions to document megafauna, benthos, demersal and pelagic fish and megafauna?'	http://northwestatlas.org/nwa/map/gallery	
			Interactive map gallery 'Benthic habitat model outputs for the Oceanic Shoals CMR'	http://northwestatlas.org/node/1710	
			Most likely benthic class habitat model for the Oceanic Shoals CMR	http://northwestatlas.org/node/1710	

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			Combined benthic class habitat model for the Oceanic Shoals CMR	http://northwestatlas.org/node/5449#indeterminant	
			Hard coral probability habitat model for the Oceanic Shoals CMR	http://northwestatlas.org/node/5449#hard_coral	
			Soft coral probability habitat model for the Oceanic Shoals CMR	http://northwestatlas.org/node/5449#soft_coral	
			Filterer probability habitat model for the Oceanic Shoals CMR	http://northwestatlas.org/node/5449#filterer	
			Gorgonian probability habitat model for the Oceanic Shoals CMR	http://northwestatlas.org/node/5449#gorgonians	
			Alcyon probability habitat model for the Oceanic Shoals CMR	http://northwestatlas.org/node/5449#alcyon	
			Whips probability habitat model for the Oceanic Shoals CMR	http://northwestatlas.org/node/5449#whips	
			Sponge coral probability habitat model for the Oceanic Shoals CMR	http://northwestatlas.org/node/5449#sponge	
			Burrowers probability habitat model for the Oceanic Shoals CMR	http://northwestatlas.org/node/5449#burrowers	
			Macroalgae probability habitat model for the Oceanic Shoals CMR	http://northwestatlas.org/node/5449#macro-algae	
			Seagrass probability habitat model for the Oceanic Shoals CMR	http://northwestatlas.org/node/5449#seagrass	
			Halimeda probability habitat model for the Oceanic Shoals CMR	http://northwestatlas.org/node/5449#halimeda	
			The 25%, 50%, 75% and 95% kernel utilisation distribution of telemetry data from 11 flatback sea turtles from the Lacepede Islands for each of the main turtle phases of turtle life history; inter-nesting, transit to foraging grounds and foraging	http://northwestatlas.org/node/27491	
			Count of research effort across the N and NW regions: high resolution bathymetry; by (1) CMR, and (2) KEF	http://northwestatlas.org/node/1684 http://northwestatlas.org/node/1689	
			Count of research effort across the N and NW regions: all bathymetry; by (1) CMR, and (2) KEF	http://northwestatlas.org/node/1685 , http://northwestatlas.org/node/1688	
			Count of research effort across the N and NW regions: oceanic data; by (1) CMR, and (2) KEF	http://northwestatlas.org/node/1686 , http://northwestatlas.org/node/1687	
			Count of research effort across the N and NW regions: hard corals; by (1) CMR, and (2) KEF	http://northwestatlas.org/node/1674 , http://northwestatlas.org/node/1690	
			Count of research effort across the N and NW regions: soft corals; by (1) CMR, and (2) KEF	http://northwestatlas.org/node/1682 , http://northwestatlas.org/node/1691	
			Count of research effort across the N and NW regions: sponges; by (1) CMR, and (2) KEF	http://northwestatlas.org/node/1683 , http://northwestatlas.org/node/1692	
			Count of research effort across the N and NW regions: brittle stars; by (1) CMR, and (2) KEF	http://northwestatlas.org/node/1671 , http://northwestatlas.org/node/1693	
			Count of research effort across the N and NW regions: marine mammals; by (1) CMR, and (2) KEF	http://northwestatlas.org/node/1675 , http://northwestatlas.org/node/1696	
			Count of research effort across the N and NW regions: polychaetes; by (1) CMR, and (2) KEF	http://northwestatlas.org/node/1679 , http://northwestatlas.org/node/1694	
			Count of research effort across the N and NW regions: molluscs; by (1) CMR, and (2) KEF	http://northwestatlas.org/node/1676 , http://northwestatlas.org/node/1695	
			Count of research effort across the N and NW regions: seabirds; by (1) CMR, and (2) KEF	http://northwestatlas.org/node/1681 , http://northwestatlas.org/node/1698	
			Count of research effort across the N and NW regions: sea turtles; by (1) CMR, and (2) KEF	http://northwestatlas.org/node/1680 , http://northwestatlas.org/node/1697	
			Count of research effort across the N and NW regions: demersal sharks and rays; by (1) CMR, and (2) KEF	http://northwestatlas.org/node/1673 , http://northwestatlas.org/node/1700	
			Count of research effort across the N and NW regions: pelagic sharks and rays; by (1) CMR, and (2) KEF	http://northwestatlas.org/node/1678 , http://northwestatlas.org/node/1701	

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			Count of research effort across the N and NW regions: demersal fish; by (1) CMR, and (2) KEF	http://northwestatlas.org/node/1699 , http://northwestatlas.org/node/1672	
			Count of research effort across the N and NW regions: pelagic fish; by (1) CMR, and (2) KEF	http://northwestatlas.org/node/1677 , http://northwestatlas.org/node/1702	
			Bathymetry of Bremer Commonwealth Marine Reserve	https://www.youtube.com/watch?v=AgbuMT2QIRg	
D2	Standard Operating Procedures (SOP) for survey design, condition assessment and trend detection	Understanding of the status and trends of indicators in Australia's marine environment requires standardised monitoring. This project will develop Standard Operating Procedures (SOP) in the planning, collection, analysis, and reporting of monitoring data. In particular, the project will: 1) provide guidance on what kind of monitoring is required (and where and when), 2) provide a simple yet powerful survey design tool, 3) provide two worked SOP examples (one benthic and one pelagic), 4) develop field manuals for some high priority sampling platforms (e.g. underwater video) with prioritisation stemming from a comparative analysis, and 5) assess approaches for monitoring pelagic ecosystems.	Scoping of new field manuals for marine sampling in Australian waters - Milestone 29, Rpv4 2018 Coral reef monitoring, reef assessment technologies, and ecosystem-based management A response to scientific and societal needs for marine biological observations A suite of field manuals for marine sampling to monitor Australian waters Infographic showing web portals, online data services and data discovery tools Workshop report on data discoverability and accessibility Data discoverability and accessibility: report from workshops on marine imagery and biological specimen data Report manuscript describing the impact of ignoring survey information and inclusion probabilities Scoping report on potential applications of satellite imagery (e.g. Digital Earth Australia) to marine monitoring if Commonwealth waters Version 2 of Standard Operating Procedures for collecting marine biodiversity data An Introduction to MBHdesign - a tutorial for R-package. Milestone 30, Rpv4 2018 Advancing marine biological observations and data requirements of the complementary essential ocean variables (EOVs) and essential biodiversity variables (EBVs) frameworks Linking capacity development to GOOS monitoring networks to achieve sustained ocean observation Comparative assessment of seafloor sampling platforms Comparative assessment of pelagic sampling methods used in marine monitoring Poster - Gear Up: Field manuals for marine sampling Field manuals for marine sampling to monitor Australian waters - Report Flyer - Field manuals for marine sampling to monitor Australian waters - Fact sheets Spatially balanced designs that incorporate legacy sites - Journal Article Scoping report: Comparative assessment of benthic sampling platforms - Report Scoping report: Comparative assessment of pelagic sampling platforms - Report	https://www.nespmarine.edu.au/document/scoping-new-field-manuals-marine-sampling-australian-waters https://www.nespmarine.edu.au/document/coral-reef-monitoring-reef-assessment-technologies-and-ecosystem-based-management https://www.nespmarine.edu.au/document/response-scientific-and-societal-needs-marine-biological-observations https://www.nespmarine.edu.au/document/suite-field-manuals-marine-sampling-monitor-australian-waters https://www.nespmarine.edu.au/document/data-discoverability-and-accessibility-report-july-2019-workshop-marine-imagery https://www.nespmarine.edu.au/document/data-discoverability-and-accessibility-report-workshops-marine-imagery-and-biological https://www.nespmarine.edu.au/document/introduction-mbhdesign https://www.nespmarine.edu.au/document/advancing-marine-biological-observations-and-data-requirements-complementary-essential https://www.nespmarine.edu.au/document/linking-capacity-development-goos-monitoring-networks-achieve-sustained-ocean-observation https://www.nespmarine.edu.au/document/comparative-assessment-seafloor-sampling-platforms https://www.nespmarine.edu.au/document/comparative-assessment-pelagic-sampling-methods-used-marine-monitoring https://www.nespmarine.edu.au/document/gear-field-manuals-marine-sampling https://www.nespmarine.edu.au/document/field-manuals-marine-sampling-monitor-australian-waters https://www.nespmarine.edu.au/document/flyer-field-manuals-marine-sampling-monitor-australian-waters https://www.nespmarine.edu.au/document/spatially-balanced-designs-incorporate-legacy-sites https://www.nespmarine.edu.au/document/scoping-report-comparative-assessment-benthic-sampling-platforms https://www.nespmarine.edu.au/document/scoping-report-comparative-assessment-pelagic-sampling-platforms	This project has developed national standards for the collection and management of biodiversity data on Australia's continental shelf. National standards for data collection are a critical requirement for regional and national reporting on status and trends of marine biodiversity. The project team is promoting and extending use of the national standards for surveys conducted by the Marine Biodiversity Hub and also by others operating outside the Hub. The extension and use of national standards will user in a new phase of environmental reporting, where anecdotal evidence in reports is progressively replaced by data. Extension to the project in 2019 provided additional resources to significantly enhance the delivery of fit-for-purpose marine biodiversity data products to decision makers.
D3	Implementing monitoring of AMPS and the status of marine biodiversity assets on the continental shelf	New [RPv3] - There is a significant need to support Parks Australia in the establishment of a baseline inventory and monitoring program for CMR networks, and ensure it is integrated within a broader national monitoring	A systematic review of remotely operated vehicle surveys for visually assessing fish assemblages	https://www.nespmarine.edu.au/document/systematic-review-remotely-operated-vehicle-surveys-visually-assessing-fish-assemblages	The project has generated a shared understanding among researchers, policy makers, AMP managers and other stakeholders about what we know about shelf reefs on

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		framework. This project will provide the science support for program development, and a prioritisation framework for implementation. By facilitating national approaches, including a standards-based approach to collecting new marine data, project outcomes will include key steps to assist Parks Australia to implement and initiate a CMR monitoring program, new knowledge to inform CMR management, a national integrated framework for SOE reporting, and collaboration between State-based and Commonwealth-based programs.	Taking a deeper look: Quantifying the differences in fish assemblages between shallow and mesophotic temperate rocky reefs Fish assemblages on reefs in the Hunter Marine Park and adjacent waters Spatial properties of sessile benthic organisms and the design of repeat visual survey transects Trialling suitable indicator metrics of change for baited remote underwater video station datasets - progress report Theme D Project showcase and future research prioritisation workshop report - Report ARMADA: A marine data aggregator and visualisation tool to support management of Australia's Commonwealth Marine Area - Report Sensitivity of fine-scale species distribution models to locational uncertainty in occurrence data across multiple sample sizes - Journal Article Changes in deep reef benthic community composition across a latitudinal and environmental gradient in temperate Eastern Australia - Journal Article Collation of existing shelf reef mapping data and gap identification - Phase 1 Final Report Shelf reef key ecological features - Report Identification and collation of Australia's shelf mapping datasets and development of a national geomorphological classification scheme for reef systems - Phase 1 Workshop Report - Report Mapping shelf rocky reef habitats in the Hunter Commonwealth Marine Reserve - Report Geomorphological classification of reefs: draft framework for an Australian standard - Report Spatial scale and geographic context in benthic habitat mapping: review and future directions - Journal Article Biological and habitat feature descriptions for the continental shelves of Australia's temperate-water marine parks- including collation of existing mapping in all AMPs Workshop report from the inaugural National MPA Science/Management Network meeting Workshop report from the National BRUV Forum – Perth, 18-19 July 2017 Reefs on the Australian Continental Shelf Hydrographic Survey of the Boags Commonwealth Marine Reserve in Southwestern Bass Strait First look at deep rocky reefs in Beagle Commonwealth Marine Reserve Discovering black corals in Freycinet Commonwealth Marine Reserve Oceans of the Unknown Exhibition - mapping the oceans RV Investigator Voyage - Blogging the Seamounts voyage	https://www.nespmarine.edu.au/document/taking-deeper-look-quantifying-differences-fish-assemblages-between-shallow-and-mesophotic https://www.nespmarine.edu.au/document/fish-assemblages-reefs-hunter-marine-park-and-adjacent-waters https://www.nespmarine.edu.au/document/spatial-properties-sessile-benthic-organisms-and-design-repeat-visual-survey-transects https://www.nespmarine.edu.au/document/trialling-suitable-indicator-metrics-change-baited-remote-underwater-video-station-datasets https://www.nespmarine.edu.au/document/theme-d-project-showcase-and-future-research-prioritisation-workshop-report https://www.nespmarine.edu.au/document/armada-marine-data-aggregator-and-visualisation-tool-support-management-australia%E2%80%99s https://www.nespmarine.edu.au/document/sensitivity-fine-scale-species-distribution-models-locational-uncertainty-occurrence-data https://www.nespmarine.edu.au/document/changes-deep-reef-benthic-community-composition-across-latitudinal-and-environmental https://www.nespmarine.edu.au/document/collation-existing-shelf-reef-mapping-data-and-gap-identification-phase-1-final-report https://www.nespmarine.edu.au/document/identification-and-collation-australia%E2%80%99s-shelf-mapping-datasets-and-development-national https://www.nespmarine.edu.au/document/mapping-shelf-rocky-reef-habitats-hunter-commonwealth-marine-reserve https://www.nespmarine.edu.au/document/geomorphological-classification-reefs-draft-framework-australian-standard https://www.nespmarine.edu.au/document/spatial-scale-and-geographic-context-benthic-habitat-mapping-review-and-future-directions https://www.nespmarine.edu.au/document/biological-and-habitat-feature-descriptions-continental-shelves-australia%E2%80%99s-temperate-water https://www.nespmarine.edu.au/document/workshop-report-inaugural-national-mpa-sciencemanagement-network-meeting-Q https://www.nespmarine.edu.au/document/workshop-report-national-bruv-forum-%E2%80%93-perth-18-19-july-2017 http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=2ffb37a5-5c58-4ea9-a47d-5d526be31346 http://catalogue.aodn.org.au/geonetwork/srv/eng/metadata.show?uuid=fd47612a-fb21-4459-9e3a-adf66ed8ca59 https://www.youtube.com/watch?v=i2JCGR2SEAc&t=15s https://www.youtube.com/watch?v=kgKgNgx4UP4&t=83s https://www.youtube.com/watch?v=vzYATX64Lng https://www.nespmarine.edu.au/seamounts/landing-page	Australia's continental shelf. This new understanding informs the management of Australian Marine Parks and decision making on referrals and assessments under the EPBC Act where proposed activities may interact with shelf reefs (e.g. offshore petroleum development). Collated information has been synthesised in a comprehensive report for managers of Australian Marine Parks to provide an information base for communicating conservation values are prioritising investments in the collection of new information in marine parks. Extensions to the project in 2018 shifted the focus of the project to collecting new marine biodiversity data in prioritised areas, in particular to inform decision making for management of Australian Marine Parks.

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			RV Investigator Voyage - Videos from the Seamounts voyage (23 Nov - 19 Dec 2018)	https://www.youtube.com/user/NERPMarineHub/feed	
D4	Expanding our spatial knowledge of marine biodiversity to support future best-practice reviews	This project will fill data gaps and evaluate methods relevant to the ongoing spatial management of seafloor biota across the Australian marine domain. The objective is to prepare Australian, State and Territory governments for future best-practice reviews of Australia's marine bioregionalisation that can be used to improve marine spatial planning and management initiatives (e.g. marine bioregional plan and marine protected area reviews, environmental impact and natural heritage assessments). The project will incorporate results from field trips to unexplored offshore areas of Australia's marine domain and communicate biodiversity values of the CMR network to the Australian public.	Post-survey report for Wessel AMP		The project, continuing to mid 2018, is developing shared understanding among researchers about new approaches to bioregionalisation in the ocean. This new understanding will inform future versions of IMCRA - a fundamental spatial layer than underpins marine bioregional planning and marine reserve planning and review in Australia. The project generated shared understanding about marine biodiversity in the deep eastern abyss off Australia's east coast developing a new model for communicating insights from marine science surveys with the managers, stakeholders and the public. The survey will provide AMP managers with new insights about benthic biodiversity for 7 deep water marine parks and compare the findings to deep water environments in the Great Australian Bight.
			Post-survey report for Coral Sea AMP		
			Contrasting processes drive ophiuroid phylodiversity across shallow and deep seafloors	https://www.nespmarine.edu.au/document/contrasting-processes-drive-ophiuroid-phylodiversity-across-shallow-and-deep-seafloors	
			The eastern Australian Marine Parks: biodiversity, assemblage structure, diversity and origin	https://www.nespmarine.edu.au/document/eastern-australian-marine-parks-biodiversity-assemblage-structure-diversity-and-origin	
			Regional-scale patterns of deep seafloor biodiversity for conservation assessment	https://www.nespmarine.edu.au/document/regional-scale-patterns-deep-seafloor-biodiversity-conservation-assessment	
			Expanding our knowledge of marine biodiversity to support future best practice reviews		
			Polychaetes from Australia's Eastern Abyss	https://www.nespmarine.edu.au/document/polychaetes-australia%E2%80%99s-eastern-abyss	
			Towards an IMCRA 5	https://www.nespmarine.edu.au/document/towards-imcra-5	
			RV Investigator voyage - Blogging the Abyss (15 May - 16 June 2017)	https://www.nespmarine.edu.au/abyss-landing-page	
			RV Investigator Voyage - Videos from the Abyss voyage (15 May - 16 June 2017)	https://www.youtube.com/user/NERPMarineHub/feed	
D5	A standardised national assessment of the state of coral and rocky reef biodiversity	This project will involve integration of a national suite of reef biota Underwater Visual Census (UVC) monitoring datasets (Reef Life Survey, UTas, AIMS, Parks Victoria, SA DEWNR) to provide a comprehensive update to the state of Australian Reefs report for the next national State of the Environment Report. Maps and indicator trends will show changes in the health of rocky and coral reefs nationally from 2005 to 2020. The update will include addition of a new index which summarises the population trajectories for 600-1000 reef species nationally. Individual species trajectories will provide the only threat status information for the majority of these species, assisting future listing of previously unassessed species if significant declines are detected.			This project, extending to the end of 2020, is designed to develop a standardised approach to assessing status and trends of marine biodiversity on coral and rocky reefs around Australia. Central to its objective is establishment of documented procedures and outputs to enable assessments to be systematically repeated over time to inform for state of the environment and other environmental reporting initiatives. The project will collate an unprecedented array of data and established a new database to inform the future reporting.

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D6	Socioeconomic benchmarks	Social and economic values are key drivers for marine science and marine policy but are too rarely integrated with marine biodiversity monitoring programs. In close consultation with PA we will review existing metrics used to survey social and economic values associated with marine parks. This review will include consulting with national and international expertise and actively consulting with State and other Commonwealth agencies, some of whom are currently conducting reviews or have existing frameworks for surveying social and economic values (e.g GBRMPA, NSW DPI and Vic Parks). In collaboration with national partners and PA we will organise a national methods workshops to discuss and refine metrics and methods to quantify social and economic benchmarks for State and Australian Marine Parks (AMPs) and produce an SOP relevant to AMPs taking into consideration the DoEE’s environmental accounting processes and PA’s Monitoring, Evaluation, Reporting and Improvement (MERI) framework.	Measures for social and economic monitoring of the Australian Marine Parks		This project, extending to the end of 2020, is designed to establish a clear pathway forward for establishing social and economic metrics for measuring the costs and benefits of Australian Marine Parks. The pathway forward will include the identification of targeted metrics, a costed plan for establishing a benchmark and demonstrate the procedures for collecting, analysing and reporting on an agreed set of metrics for Parks Australia.
D7	Support for PA MERI Implementation	This application is to facilitate Hub engagement with Parks Australia during development and initiation of their Monitoring, Evaluation, Reporting and Improvement (MERI) System for Australian Marine Parks. A key priority for the Marine Parks Branch in the 2019-20 financial year is finalising the Australian Marine Park MERI system. The Marine Biodiversity Hub will play an important role in development and implementation of this system. Hub partners have had previous experience in developing the integrated monitoring framework for the Great Barrier Reef, developing a process for identifying indicators for monitoring Key Ecological Features, and also have collected much of the ecological data that exists within Australian Marine Parks.			This project directly targets the specific needs of Parks Australia. It will successfully incorporate relevant scientific advice/evidence and best practice approaches into the Australian Marine Park MERI System; and uptake of Hub expertise in MERI application into the overall development of adaptive management approaches by Parks Australia for Australian Marine Parks (including experience in developing such frameworks for GBRMPA and NSW DPI). The major environmental benefits that flow from this project are conservation of marine biodiversity and sustainable use of marine resources in Australia’s Exclusive Economic Zone (via the establishment of a MERI System for Australian Marine Parks that is effectively informed by robust scientific advice and evidence on environmental values and the effect of pressures and management responses).
D8	SOI Gascoyne Marine Park	The approved survey to the Gascoyne canyons aims to map the surrounding marine park using multibeam sonar and to characterise the biodiversity of North-West canyon fauna, using an ROV to undertake a comprehensive taxon inventory and eDNA analyses to provide a methodological comparison. The proposed project will extend the survey’s capability and increase its relevance to marine park management, particularly in deep-sea and canyon habitats. The proposed project will yield communication products such as a fly-through, eco-narrative, and image library, as well as products consistent with previous NESP reporting such as a voyage plan and post-survey report.			The survey is the first biological survey of Cape Range and Cloates canyons providing information for the management of the canyon as part of the North-west Marine Park Network. North-western Australian deep sea environments are used by oil and natural gas industries, but an overall lack of understanding of these environments inhibits environmental impact assessments and appropriate mitigation or conservation actions. The project will contribute important baseline information critical in the event of an industrial spill/accident. Establishing faunal knowledge in marine parks is prudent for monitoring activities and to assess effectiveness of zoning. Given that the tropical deep Indian Ocean is vastly understudied, the outlook for important discoveries is extremely high. We will provide new understanding of poorly known deep marine biodiversity in Australia and inform the future prioritisation for invest to expand the environmental baseline in this area.
E1	Guidelines for analysis of cumulative impacts and risks to the Great Barrier Reef	Existing guidance and standards for assessing impacts and risk (e.g. ISO 31000) are specified at a high-level allowing for considerable variation in approach, cost and outcomes from assessments and no guidance on direct or cumulative impacts. We will develop a national standard to support analysis of impacts and risks to the environmental, social and economic values required by the EPBC Act. The standard will be compatible with and support the process outlined in the Significant Impact guidelines for MNES and for Australian Marine Parks (AMP), including the means to calculate the impact and risk of upstream, downstream, facilitated and indirect impacts that will be presented in clear tabular and graphic formats, including maps as appropriate.	Ecosystem restructuring along the Great Barrier Reef following mass coral bleaching	https://www.nespmarine.edu.au/document/ecosystem-restructuring-along-great-barrier-reef-following-mass-coral-bleaching	This project, extending to the end of 2020, will develop practical guidance for advancing the analysis of cumulative impacts and risk for the GBRWHA. The Guidance will provide directions about how to undertake analysis and point users to important existing information sources and tools for use in analysis. The guidance will be developed in a way that allows for use on other environments in Australia, including Australia Marine Parks, NSW and Queensland.
			Final report - guidance for analysis of cumulative impacts and risk for GBRWHA		
			Plain English summary - guidance for analysis of cumulative impacts and risk for GBRWHA		
			A new wave of marine evidence-based management: emerging challenges and solutions to transform monitoring, evaluating, and reporting	https://www.nespmarine.edu.au/document/new-wave-marine-evidence-based-management-emerging-challenges-and-solutions-transform	

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E2	Characterising anthropogenic underwater noise to improve understanding and management of acoustic impacts to marine wildlife	Shipping noise is a marine pollutant that contributes significantly to the marine soundscape and is a stressor of marine animals, particularly marine mammals. In Australia, the characterisation and actual impacts of shipping noise on species behaviour are not clearly understood and information is needed. This research will provide quantitative spatial and temporal maps of vessel noise exposure and impacts to MNES. The outputs will provide key information to marine regulators and management agencies such as DoEE, AMSA and GBRMPA, and their counterparts in state and territory governments, to help them meet responsibilities and obligations under international and national law and policy to minimise the impacts of the shipping noise on MNES.	Database of ship source spectra for predominant large vessels		This project, extending until the end of 2019, will advance our capacity to understand the relative contribution and distribution of different sources of noise in the marine environment. The focus is on better understanding the potential effects of anthropogenic noise on marine wildlife, particularly wildlife listed as threatened or migratory under the EPBC Act. It will also provide insights to options for mitigating the potential effects of anthropogenic noise on marine wildlife.
			Finescale shipping noise map for a smaller area (e.g. GBR) to demonstrate improved methods/data		
			Paper on improved methods of ambient noise estimation		
			Short report summarising the results of the initial investigation into incorporating other sound sources and cumulative mapping and a roadmap to accomplish aims in year 2 of the project		
E3	Marine Plastics	The project will inform national policy and action to reduce the release and impacts of microplastics on our environment and oceans: 1) A literature review will firstly identify key marine microplastics research and policy development internationally, with a focus on research that is contextual to microplastics in the Australian marine environment; 2. From this literature review, an options paper will be developed to explore the most feasible and impactful policy approaches for the Australian context and that can be used to form the basis for discussions at a workshop; 3) A one day workshop will draw together policy-makers, researchers and relevant industry peak bodies to discuss and recommend policy and other options to limit microplastics release into the environment. A workshop report will be drafted to summarise findings, recommendations, and next steps. The report will provide evidence to underpin the development of national policy aimed at reducing microplastic pollution, including by identifying priority actions to deliver Australia's 2018 National Waste Policy.			This research will be used to inform policy options and actions in implementing Australia's 2018 National Waste Policy, including the phase out of intentionally added microplastics such as microbeads. It will provide a communicative and collaborative platform for policy-makers and researchers and potentially other relevant stakeholders to inform national policy and action on microplastic pollution in the marine environment. It provides a systems approach to identifying and prioritising potential actions, to ensure that all possible (known) impacts and actions are considered.
E4	Recreational fishing in Commonwealth waters	Australia's recreational fishing sector is moving further offshore in pursuit of fishing opportunities, which places them in areas managed by the Australian Government. Most recreational fisheries research is state based and at two case study sites - Hunter Australian Marine Park (AMP) and the Ningaloo AMP this data will be assessed for its usefulness to quantify offshore fishing. New data will also be collected using creel, socio-economic and remote sensing techniques to better understand fisher's effort, harvest and motivations. As well, the response by fish communities to harvest and the fishery to climate change will be assessed at larger scales. As recreational fishers are key stakeholders in marine management and regulation, a better understanding of their values is required to effectively inform administration of the EPBC Act (e.g. effects of Matters of National Environmental Significance), use of Australian Marine Parks and Commonwealth managed commercial fisheries.	Recreational fishing in Commonwealth waters - Milestone Report, milestone 6 Rpv4 2018	https://www.nespmarine.edu.au/document/recreational-fishing-commonwealth-waters	This project, extending until the end of 2019, is designed to provide greater insights to how recreational fishers are using Australian Marine Parks. Research predominantly focuses on recreational fishing in AMPs in Western Australia and NSW. Insights from the project will provide an improved understanding among researchers, AMP managers and state marine reserve and fisheries managers. The research findings will be used to inform decision making for sustainable use of resources in AMPs.
			A cross continental scale comparison of Australian offshore charter boat and tournament recreational fisheries research and its applications to Marine Park and fisheries management		
			A cross continental scale comparison of Australian offshore recreational fisheries research and its applications to Marine Park and fisheries management	https://www.nespmarine.edu.au/document/cross-continental-scale-comparison-australian-offshore-recreational-fisheries-research-and	
E5	The role of restoration in conserving MNES	Restoration of marine ecosystems offers the prospect of effective conservation in the face of chronic degradation and climate change. But techniques for restoration are generally in their infancy. In 2018 this project will review the capacity for recent advances in restoration of <ul style="list-style-type: none"> • giant kelp forests, • coral reefs, • seagrass communities, • saltmarsh communities, and • shellfish communities, to reduce conservation risks associated with matters of national environmental significance (MNES) listed under the Cth EPBC Act. In subsequent years we will trial and extend restoration techniques in the more promising habitats and develop a restoration decision framework to guide future investments.	The role of restoration in conserving matters of national environmental significance in marine and coastal environments	https://www.nespmarine.edu.au/document/role-restoration-conserving-matters-national-environmental-significance-marine-and-coastal	This project, extending until the end of 2020, was designed to promote and develop a shared understanding about the national importance of coastal habitat restoration and how it relates to the EPBC Act. It will also provide advice on the relative cost-effectiveness of coastal restoration given there are a range of habitat types that can be targeted. The first year of the project instigated two new research projects designed to advance capacity for restoration of seagrass and giant kelp habitats - both these habitats support matters of national environmental significance under the EPBC Act.
			Can bivalve habitat restoration improve degraded estuaries?	https://www.nespmarine.edu.au/document/can-bivalve-habitat-restoration-improve-degraded-estuaries	
			Successful communication for shellfish reef restoration projects	https://www.nespmarine.edu.au/document/successful-communication-shellfish-reef-restoration-projects	
			Report on cost-effectiveness of alternative restoration projects	https://www.nespmarine.edu.au/document/benefit-cost-analysis-marine-habitat-restoration-framework-estimating-viability-shellfish	

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E6	Assisting restoration of ecosystem engineers through seed-based and shoot-based programs in the Shark Bay WHS	<p>This project will develop community-based seeding and shoot planting restoration practices in the Shark Bay World Heritage Site (WHS). The goal is to scale up the existing restoration research to practice and assist recovery of the dominant seagrasses, <i>Amphibolis antarctica</i> and <i>Posidonia australis</i> following the 2011 marine heat wave. The Shark Bay WHS is unique globally for its natural values, including stromatolites, extensive seagrass meadow that have constructed sills and banks over 1,000s of years resulting in restricted exchange with the ocean, unique and abundant marine megafauna including 1/8th of the worlds population of dugongs, large populations of sharks and turtles, and one of the longest studied populations of dolphins in the world. The inshore waters of the WHS provides connectivity to the deeper waters of the adjacent Commonwealth Shark Bay Marine Park.</p> <p>Shark Bay seagrasses have recently been devastated by the marine heatwave of 2010-2011 and these events are predicted to increase in frequency and intensity with global warming. The loss of 23% of seagrass cover in the bay (860 km2) had a flow on effect to mega herbivores, fish, tourism and the commercial aquaculture and fisheries industries dependent of the ecosystem. There is a critical need to develop management actions to respond to such events and to prepare for predicted future events. Seagrass restoration has been explored at Useless Loop and on both sides of the Peron Peninsula near Denham and Monkey Mia over the past 6-8 years (3 ARC Linkage, 1 ARC Discovery Grant), resulting in an increased understanding of the factors required for successful seagrass restoration along the extreme salinity gradient found in Shark Bay.</p> <p>The Malgana people have responsibilities for sea country in Shark Bay and a strong tie to the land and inshore seas that make up the Shark Bay WHS. This project is a collaboration between scientists and the Mulgana community whereby methods will be jointly developed to assist natural recovery in preparation for future devastating impacts of climate change.</p>			<p>This project , extending until early 2020, was designed to advance our understanding and capacity for restoring seagrass habitats in Australia. The project focuses on restoration of seagrass habitat in Shark Bay World Heritage Area. The project seeks to restore seagrass habitat that was significantly degraded from the effects of a recent heatwave. The project will establish a collaborative capacity for seagrass restoration in Shark Bay including the partnership and training of the Malgana Indigenous Rangers. Shark Bay seagrass communities are an outstanding universal value of the world heritage area and they are critical to the survival of EPBC listed threatened and migratory species, such as dugong and turtles.</p>
E7	Assessing the feasibility of restoring giant kelp beds in eastern Tasmania	<p>The proposed research will extend on externally funded work commencing in 2018 to select for thermally tolerant and low-nutrient-tolerant giant kelp (<i>Macrocystis pyrifera</i>) genotypes, and which will examine effects of acclimation of selected genotypes by pre-exposure to warm, nutrient poor conditions. The project will outplant pre-exposed selected genotypes of giant kelp as micro-sporophytes in experiment providing / not providing an added source of nutrient. The work is designed to assess the feasibility of this approach as a means to develop minimum patch sizes for giant kelp that can be self-replacing and self-expanding.</p>			<p>This project, extending until the end of 2020, was designed to advance our understanding and capacity for restoring giant kelp habitat in temperate Australia. The project will develop understanding about the feasibility of restoring diminishing populations of giant kelp with genotypes that have been selected for their tolerance to warm, nutrient poor conditions. Giant kelp is an EPBC listed threatened community and restoration research is identified as a priority in DoEE's approved conservation advice.</p>
SS1	Synthesis Project 1: Cross-Hub Integrated Assessment - Northern Australia	<p>This project is a cross-hub research collaboration that draws on the considerable experience, regional knowledge, data and networks in the NESP Hubs to explore the potential application, and benefits, of integrated environmental assessments (IEA), focusing on Northern Australia. The project will develop a process framework to guide IEA, identifying available information and critical knowledge gaps, methods for synthesis and analysis, and participatory approaches and governance settings. The project will review the existing tools and systems to support IEA and identify opportunities and potential location/s to test implementation in Northern Australia. The project will provide decision-makers in the Department (and State and Territory regulatory and planning agencies) with pathways for undertaking IEA approaches in Northern Australia, to underpin sustainable regional development and, avoid environmental harm to internationally important biodiversity assets and cultural heritage values.</p>			<p>This project will enhance the protection of environmental and cultural values and provide identifiable opportunities for sustainable development in northern Australia, through identifying pathways for undertaking an Integrated Knowledge Building and Assessment approach. In the long-term, it could support the adoption of integrated knowledge building and assessment approaches more broadly, through articulating and demonstrating their value and providing an assessment of options for undertaking such work, including identifying tools, data, and approaches to prioritisation</p>
SS2	Synthesis Project 2: Interpreting pressure profiles	<p>This project has three objectives: (i) to provide a geo-spatial analysis of the relative risks posed to Matters of National Environmental Significance (MNES) by pressures that operate within Australia’s Exclusive Economic Zone and state/territory waters (a “hotspots” analysis). This relative risk assessment will provide interval-scale risk estimates – also known as semi-quantitative risk estimates - that are meaningful when compared within a study, e.g. between locations within the study’s geographic scope, but are not calibrated to observable outcomes in nature; (ii) provide a proof of concept of an adaptive, probabilistic assessment of the cumulative risks posed to MNES in the North Marine Bioregion in a manner that is consistent with the seascape-scale cumulative assessment described in the “Guidelines for analysis of cumulative impacts and risks to the Great Barrier Reef” (developed and tested with Commonwealth, State and Industry stakeholders). This will provide a proof of concept of a fully quantitative risk assessment, providing risk estimates on a ratio scale that are calibrated with, and hence can be compared to, observed outcomes in nature; and (iii) provide additional support to the Marine Biodiversity Hub’s contribution to the NESP cross-hub Northern Integrated Knowledge project.</p>			<p>A national map of relative risk to environmental benefits in Australian commonwealth waters, together with a demonstration of a probabilistic assessment of the cumulative risks faced by natural values due to the multiple pressures that operate at selected sites in selected AMPs.</p>

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SS3	Synthesis Project 3: National trends in coral species following heatwaves	This project will engage coral taxonomic experts to annotate existing Reef Life Survey photoquadrats taken across northern Australia before and after major disturbances, to allow: 1) Quantification of the spatial and species-level responses of Australian corals to the 2016 and 2017 marine heatwave and mass bleaching events (and cyclones that occurred during this period); 2) Identification of the species most threatened by warming and cyclones, and species likely to respond best to restoration efforts; and 3)Contribution to a coral-specific analysis to the next national State of the Environment report, through project D5.			The project will provide new insights at the national-scale about the effect of heatwaves on Australia's coral species. The scientific evidence provided by this project will inform risk assessments and decision making on prioritisation for investments in coral reef conservation, restoration and protection. It will provide a valuable resource National State of the Environment reporting for the status and trends of corals and coral reefs.