## Concept Plan SP 2020-002

# Primary productivity and energy transfer between marine ecosystems.

### Marine Science

## Project Core Team

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|---|---|
| **Supervising Scientist** | Richard Evans |
| **Data Custodian** | Richard Evans |
| **Site Custodian** | |

## Project status as of April 6, 2020, 1:23 p.m.

New project, pending concept plan approval

## Document endorsements and approvals as of April 6, 2020, 1:23 p.m.

| | |
|---|---|
| **Project Team** | granted |
| **Program Leader** | granted |
| **Directorate** | required |

# Primary productivity and energy transfer between marine ecosystems.

## Biodiversity and Conservation Science Program

Marine Science

## Departmental Service

Service 6: Conserving Habitats, Species and Communities

## Background

Primary productivity provides energy that fuels food webs and is recognised as an important driver of local diversity and secondary production. Hence conservation planning often aims to identify where primary production is high, what systems, including their spatial arrangement, are most productive and how efficiently productivity from these producers is transferred to other systems or consumers. While marine productivity is largely attributable to oceanic phytoplankton (Sigman & Hain 2012), productivity from benthic macrophytes becomes increasingly important in coastal food webs (Wyatt et al. 2010, Davis et al. 2014). However, the link between benthic productivity by vascular plants and algae and secondary production remains equivocal (Saenger et al. 2013). Moreover, local variations in hydrology are likely to influence the supply of nutrients, temperature and (turbidity) light, all of which are fundamental determinants of primary productivity.

## Aims

This research will (1) measure primary productivity among coastal marine systems (mangroves, seagrass, macroalgae and coral reef) assessing how rates vary among locations in the Dampier Archipelago, (2) Compare primary productivity to fish and benthic communities to assess how spatial variation in primary productivity effects local abundance, diversity and growth within associated communities, (3) Quantify the transfer of energy from primary producers to consumers, thus directly investigating the influence of local primary producers on secondary production.

## Expected outcome

The project will identify ecological processes that drive abundance and diversity of key marine communities which will inform future management of Dampier Archipelago waters as a proposed world heritage area and marine conservation reserve. More broadly, the research will increase knowledge and awareness of energy transfer as a key ecological process and highlight the need for marine planning, policy and management to focus on ecosystems and not individual habitats to achieve effective conservation outcomes. Findings from this project will identify ecological important areas based on primary productivity that may; inform environmental management of current and future industrial development in the Archipelago and along the Pilbara coastline, enhance our understanding of climate related impacts, enable better design and management of existing and proposed marine protected areas, assist fisheries and marine fauna management within Pilbara waters. General principals from the research will also benefit other tropical regions in Western Australia, Australia and globally.

## Strategic context

This project will deliver the final component of Pluto environmental offset Project 2: *Patterns and distribution of major marine communities (incl. key functional groups) and large marine fauna in the Dampier Archipelago/Cape Preston Region.* Project 2 is being delivered in six components, the other five being:

1. Ecology of rare coral communities in the Dampier Archipelago.
2. Extension of marine genetic connectivity research into the Dampier Archipelago region.
3. Habitat use, distribution and abundance of coastal dolphin species in the Pilbara.
4. Association of seagrass and dugong communities of the inshore Pilbara.
5. Survey of turtle nesting habitat in the Dampier Archipelago

The project addresses strategies in the *Department Strategic Directions (2018 – 2021*), to "Undertake world-recognised science to build and share biodiversity knowledge to support evidence-based decision making and management." and the *Science Strategic Plan (2018-2021)*, to "Conserve, restore and manage flora and fauna, ecosystems and landscapes using world-recognised science and best practice management". More explicitly the project aligns with following approaches to address strategic goals in the Marine Science Program Plan 2018-2021:

- Document marine biodiversity at appropriate spatial, temporal and taxonomic scales to support the management of marine reserves.
- Research and monitoring focus on clearly identified priorities for management.
- Knowledge derived from research and monitoring is effectively communicated to managers to support decision-making and adaptive management.
- Provide best-practise advice on marine habitat restoration.
- Foster good working relationships with marine science providers and end users.

## Expected collaborations

This project will be undertaken in collaboration with Prof. Gary Kendrick (UWA) and Prof. Glenn Hyndes and Paul Lavery, both from ECU. These scientists all work on primary productivity and energy transfer in coastal habitats. Both universities have facilities that will enable the processing of stable isotopes, fish gut contents and otoliths. Macroalgae is proving to be an important habitat in the seascape, we are also collaborating with Dr Chris Fulton, who is a world leader on the importance of macroalgae for tropical seascapes.

Collaborations are expected to be developed with other State (e.g. Department of Primary Industries and Regional Development) and Commonwealth Government (e.g. AIMS, CSIRO) marine research agencies, the Pilbara Ports Authority, Australian universities (UWA, ECU and ANU), locally based resource companies and local stakeholder groups, including the Murujuga Aboriginal Corporation. We are also working closely with the DBCA Pilbara Region staff in Karratha.

## Proposed period of the project

July 1, 2019 – Dec. 31, 2023

## Staff time allocation

| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Senior Research Scientist (REV) | 0.5 | 1 | 1 | 1 | 0.5 |
| Research Scientist (MMO) | - | 0.1 | 0.1 | 0.1 | 0.1 |
| Technical Officer | - | 0.1 | 0.1 | 0.1 | 0.05 |
| | | | | None | None |

## Indicative operating budget

| Source | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 |
|---|---|---|---|---|---|
| Consolidated Funds (DBCA) | 0 | 0 | 0 | 0 | 0 |
| External Funding | 150 | 300 | 300 | 300 | 100 |