



PLAN FOR OUR PARKS

SECURING 5 MILLION HECTARES OVER 5 YEARS

Bardi Jawi Gaarra Marine Park

Joint management plan 2022

Management plan 99



Department of Biodiversity, Conservation and Attractions
Conservation and Parks Commission



Parks and Wildlife Service
Department of Biodiversity, Conservation and Attractions
17 Dick Perry Avenue
Technology Park, Western Precinct
KENSINGTON WA 6151

Phone (08) 9219 9000

Fax (08) 9334 0498

dbca.wa.gov.au

© State of Western Australia 2022

July 2022

ISBN 978-1-925978-48-3 (print)

ISBN 978-1-925978-47-6 (online)

Warning: This plan shows photographs of, mentions names, and/or refers to quotations from Aboriginal people who may have passed away.

This work is copyright. All traditional and cultural knowledge in this joint management plan is the cultural and intellectual property of the Bardi and Jawi traditional owners and is published with the consent of Bardi and Jawi Niimidiman Aboriginal Corporation RNTBC on their behalf. Written consent from Bardi and Jawi Niimidiman Aboriginal Corporation RNTBC must be obtained for use or reproduction of any such materials. Any unauthorised dealing may be in breach the Commonwealth *Copyright Act 1968*.

NB: The spelling of some of the language words for country and species of plants and animals may vary.

Questions regarding this plan should be directed to:

Marine Planning Unit,
Aboriginal Engagement, Planning and Lands Branch
Parks and Wildlife Service
Department of Biodiversity, Conservation and Attractions
Locked Bag 104
Bentley Delivery Centre WA 6983

The recommended reference for this publication is:

Department of Biodiversity, Conservation and Attractions (2022). *Bardi Jawi Gaarra Marine Park joint management plan 2022*. Parks and Wildlife Service, Department of Biodiversity, Conservation and Attractions, Perth, Western Australia.

Front cover artwork

Miinimbi (Whale), Ashley Hunter.

This document is available in alternative formats on request.



Russell 'Wossy' Davey

Russell 'Wossy' Davey is a proud Bardi man, with many connections, but only identifies himself as a Traditional Custodian of the Ardi'ol clan group.

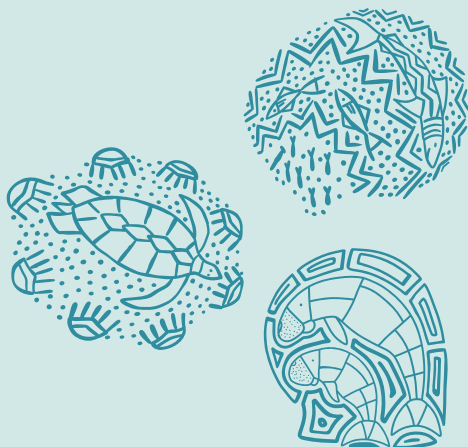
He lives in Ardyaloon Community on the Dampier Peninsula.

Wossy's art is inspired by Bardi culture creating designs that incorporate Dreamtime stories of his saltwater people, continuing to tell these stories through many art forms, using colours, animals and shapes that depict his natural environment.

He also carves pearl shells, boab nuts and traditional artefacts, whilst advocating that young people are taught the old ways, keeping law, language and culture alive, so the knowledge is not lost.

The artwork used throughout this document has been taken from Wossy's art pieces described below.

- *Joomoo* (honey sucker tree) flowering.
- *Joorroo* (shark) and *aarli* (fish) calving on shell.
- *Goorlil* (turtle) carving on shell.
- *Garralgoon garralgoon* (Mother & Calf Dugong) carving on shell.



Ashley Hunter

Ashley Hunter is a proud Bardi man, with many connections, but only identifies himself as a Traditional Custodian of the Ardi'ol clan group.

He lives in Ardyaloon Community on the Dampier Peninsula.

Ashley was inspired by his grandmother's art. Growing up listening to traditional stories and making artefacts with his father and uncles, he discovered he was a naturally gifted artist.

Being self-taught he began sketching, that soon led to painting about his Bardi Culture, animals and dreamtime stories.



Front Cover Artwork: *Miinimbi* (Whale)

Artwork story: When the *Miinimbi* start travelling to warm waters, we know the season is changing and the married *goorlil* (turtle) start to mate. The *odorr* (dugongs) start to move on ready to migrate further north.



Rocky outcrops at Kooljaman. Photo- Michael Higgins, DBCA

Amboorin amboonoo angallala jard booroo

People, together let's look after Country good

All people are welcome to Bardi and Jawi Country. We ask that you help us to look after Country by respecting the environment and our culture.

We have used, relied on, enjoyed and protected Country over thousands of years and continue to do so today. Bardi and Jawi Sea Country has always been, and continues to be, an essential part of Bardi and Jawi spiritual, social and physical existence. The Law created religiously significant features in the sea that the *madjamadjin* (Law bosses) are required to protect. Traditional stories explain the creation of the salt water and certain sea creatures. Supernatural sea creatures such as the shark *Loolooloo* have always existed to protect Bardi and Jawi people in their sea-faring life. Bardi and Jawi people have always and continue to engage in shore fishing, collecting sea food from the intertidal zone, hunting *odorr* (dugong) and *goorlil* (turtle) in the shallows and from rafts (with the *goorlil* and *odorr* being shared in accordance with traditional Law). Pearl shell has also always been collected and used as a resource for ceremony and trade.

We would like to pay tribute to past generations of Bardi and Jawi Elders. Their knowledge of language, Law and culture has been handed down to the Elders of today, who are trying to pass on that knowledge to younger generations. This plan recognises that Bardi and Jawi have ownership of their land and islands because of the old people who fought for recognition of country and their people. The knowledge they passed on is essential to the way Elders want their country to be seen and they want their cultural practices retained now and forever. This plan recognises cultural knowledge and aims to maintain it through looking after Law and Country. By looking after Country the right way, we continue to look after Bardi and Jawi Law, language and culture.



Bardi Jawi Dancer. Photo - Samille Mitchell, DBCA

Kevin George and Brendan 'Bundy' Chaquebor. Photo - Catriona Webster, KLC

Rosanna Angus. Photo - Roanna Goater, DBCA

Contents

1. The management plan	8
1.1 Purpose of the plan.....	8
1.2 Development of the plan.....	9
1.3 Structure of the plan.....	10
1.4 Term of the plan	10
2. Introduction.....	11
3. Bardi and Jawi Country.....	15
3.1 Bardi and Jawi people and Country.....	15
3.2 Bioregional setting.....	18
3.3 Definition of area and tenure	21
4. Management Setting.....	23
4.1 Legislative context	23
4.2 Joint management	24
4.3 Connectivity and holistic management.....	25
4.4 Management context.....	26
5. Aspirations.....	29
5.1 Vision.....	29
5.2 Strategic objectives	29
6. Caring for Culture	30
6.1 Relationship to Country (KPI)	31
6.2 Looking after Country (KPI)	34
6.3 Language and traditional knowledge (KPI).....	39
6.4 Enjoyment of Country and customary activities (KPI)	41
7. Caring for Country (biocultural and ecological values)	45
7.1 <i>Marrgoorr</i> (coral) and <i>marnany</i> (reef) communities (KPI)	45
7.2 Mangroves, creeks and saltmarsh communities (KPI)	48
7.3 <i>Noomool</i> (seagrass) and <i>laanyji</i> (macroalgae) communities (KPI)	51
7.4 Water and sediment quality (KPI)	53
7.5 Geomorphology including beaches	56
7.6 Subtidal filter-feeding communities	57
7.7 Intertidal sand and mud flat communities and oombans (freshwater soaks)	59
7.8 <i>Goorlil</i> (marine turtles) (KPI).....	61
7.9 <i>Aarli</i> (fish) including <i>joorroo</i> (sharks) and <i>barnamb</i> (rays) (KPI).....	64
7.10 <i>Odorr</i> (dugongs) (KPI)	68
7.11 <i>Miinimbi</i> (whales) and <i>bayalbarr</i> (dolphins).....	70
7.12 <i>Linygurra</i> (estuarine crocodiles).....	73
7.13 Sea and shore <i>garrabal</i> (birds)	74
7.14 Invertebrates.....	76
8. Swan Island Nature Reserve.....	78
9. People on-Country (social and economic values).....	80
9.1 Bardi and Jawi economic development opportunities.....	80

9.2 Visitation, tourism and visitor safety	81
9.3 Recreational fishing	86
9.4 Commercial fishing	88
9.5 Aquaculture	89
9.6 Pearling	90
9.7 Maritime heritage	92
9.8 Industry, resources and development.....	93
10. Understanding Country.....	95
10.1 Research.....	95
10.2 Monitoring.....	97
11. Climate Change	100
12. Plan implementation and operation.....	102
12.1 Administration and governance	102
12.2 Zoning and permitted activities	104
12.3 Community stewardship and compliance	122
13. Assessing management effectiveness	123
References.....	125
Appendix 1 – Design Principles.....	131
Appendix 2 – Bardi language glossary	132

Figures

Figure 1: Structure of the management plan	10
Figure 2: The location of the seven clan areas in Bardi and Jawi Country.	15
Figure 3: Bardi Jawi seasonal calendar.....	19

Table

Table 1: Summary of permitted uses for the Bardi Jawi Gaarra Marine Park	120
--	-----

Maps

Map 1: Locality of Bardi Jawi Marine Park	13
Map 2: Native title determination areas within and adjacent to Bardi Jawi Gaarra Marine Park	14
Map 3: Marine bioregions and Bardi Jawi Gaarra Marine Park.....	20
Map 4: Tenure within and adjacent to Bardi Jawi Gaarra Marine Park.....	22
Map 5: Swan Island Nature Reserve locality and tenure.....	79
Map 6: Overview map of zoning for marine parks in the Buccaneer Archipelago	105
Map 7: Zoning for Bardi Jawi Gaarra Marine Park.....	107
Map 8: Zoning for Bardi Jawi Gaarra Marine Park - Goorrbalagoon (Pender Bay) area.....	109
Map 9: Zoning for Bardi Jawi Gaarra Marine Park - Thomas Bay area.....	110
Map 10: Zoning for Bardi Jawi Gaarra Marine Park - Iwany (Sunday Island) area.....	111
Map 11: Zoning for Bardi Jawi Gaarra Marine Park - Cygnet Bay area	112





Bardi Jawi Rangers on-Country. Photos – Roanna Goater.

1 The management plan

1.1 Purpose of the plan

This joint management plan details how the Bardi Jawi Gaarra Marine Park will be jointly managed by Bardi and Jawi Traditional Owners and the Department of Biodiversity, Conservation and Attractions (DBCA) to enhance nature conservation, preserve and promote culture and heritage, and support compatible recreational and commercial use for future generations. This plan takes into account the values, aspirations and management objectives articulated in the [Bardi Jawi Indigenous Protected Area Management Plan 2013-2023](#) (Bardi Jawi IPA Plan).

The main outcomes of this joint management plan are listed below.

- The establishment of a marine park as a Class A reserve over the subtidal and intertidal areas of Bardi and Jawi Sea Country.
- The establishment of a Joint Management Body (JMB).
- The establishment of a joint management framework for the marine park between DBCA and Bardi and Jawi Niimidiman Aboriginal Corporation RNTBC (BJNAC) in accordance with the requirements of a Section 56A Joint Management Agreement (JMA) under the *Conservation and Land Management Act 1984* (CALM Act) for Bardi and Jawi Conservation Estate.
- Promotion and support for the continued exercise of Bardi and Jawi peoples' native title rights recognising their ongoing connection to, and responsibility for, Bardi and Jawi Sea Country.
- Preservation and promotion of Bardi and Jawi culture and heritage values of the marine park.
- The establishment of a framework to allow for ongoing sustainable multiple use.
- Promotion and support to build the capacity of Bardi and Jawi people and BJNAC to progressively take on greater responsibility and accountability for management of the marine park.
- The establishment of seven management programs (management frameworks, education and

interpretation, public participation, patrol and enforcement, management intervention and visitor services, research and monitoring) with prioritised strategies to help achieve management objectives for the marine park.

- A conservation framework built on both western science and traditional knowledge and practice to help ensure the critical ecological components and processes of the marine environment in the Bardi Jawi Gaarra Marine Park are conserved and the existing and potential pressures on the values are appropriately managed.
- Contribution to the fulfilment, support and promotion of Australia's responsibilities under several international conventions, such as the Convention on Biological Diversity, the International Union for the Conservation of Nature's Protected Areas Program and the United Nations Declaration on the Rights of Indigenous Peoples.
- Contribution to the National Representative System of Marine Protected Areas.
- The continuation and enhancement of cultural, recreational and commercial uses for the benefit and enjoyment of Bardi and Jawi Traditional Owners, the community and visitors.

1.2 Development of the plan

This joint management plan has been prepared by Bardi and Jawi Traditional Owners and DBCA, in consultation with Mayala and Dambeemangarddee (formerly Dambimangari) Traditional Owners, the Kimberley Land Council (KLC) and incorporating input from stakeholders. To achieve a successful co-design process, Bardi and Jawi Traditional Owners nominated representatives to form a negotiation committee to work closely with DBCA and KLC to develop this plan. Many Bardi and Jawi Traditional Owners have contributed to this plan by sharing cultural knowledge, traditional ecological knowledge and generously giving their time. Decision making for the management arrangements in this plan has been shared and underpinned by traditional knowledge in conjunction with the latest research on the area and information from stakeholders. The plan has been designed to support the values, aspirations and management objectives articulated in the Bardi and Jawi Indigenous Protection Area (IPA) management plan, where applicable.



1.3 Structure of the plan

This plan sets a vision for the area and identifies key cultural, ecological, social and economic values and the pressures and potential pressures acting on them. It provides strategic direction and applies seven management programs to be implemented through management strategies (see section 4.4). It is an outcome-based plan that provides a robust framework to support adaptive management which sets targets and performance measures to track progress against the stated management objectives over the life of the management plan. The key components of the management plan are shown in Figure 1.

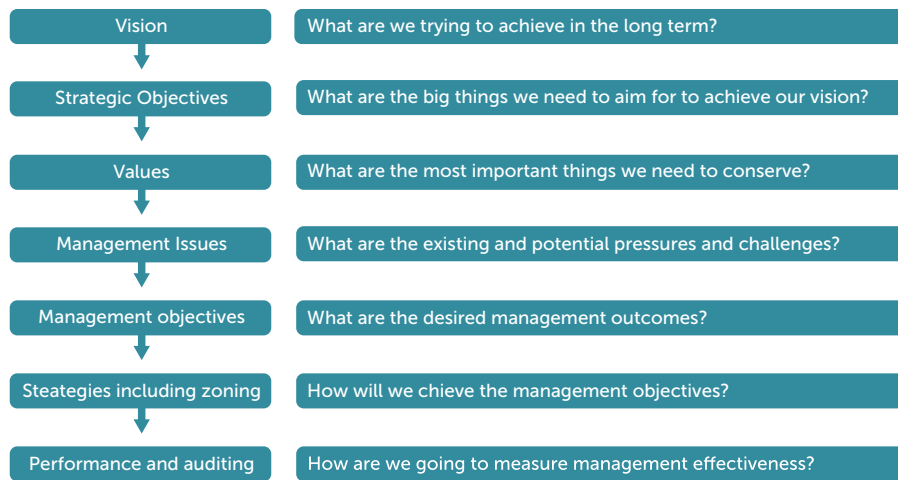


Figure 1: Structure of the management plan

1.4 Term of the plan

This joint management plan will guide management of the marine park for 10 years, or until a new joint management plan is prepared under the CALM Act. Any amendments required during the life of the plan require a statutory public comment period and approvals from the Minister for Environment, Minister for Fisheries and Minister for Mines and Petroleum.

2. Introduction

The Bardi Jawi Gaarra Marine Park is located in the west Kimberley region of Western Australia surrounding the northern part of the Dampier Peninsula and the western islands of the Buccaneer Archipelago (Map 1). It falls within the boundaries of the Bardi and Jawi native title determination¹, covering Bardi and Jawi Sea Country up to the mean high tide mark (Map 2). For tens of thousands of years Bardi and Jawi people have depended on and looked after their Country and it remains a place of exceptional value. Bardi Jawi and Bardi and Jawi are used interchangeably in this plan depending on the context.

The establishment of the Bardi Jawi Gaarra Marine Park is part of the Plan for Our Parks initiative which will create five million hectares of new national and marine reserves across Western Australia. The Bardi Jawi Gaarra Marine Park adds a further 204,000 hectares to the Kimberley marine reserves, contributing to the National Representative System of Marine Protected Areas. Bardi and Jawi Traditional Owners and the State Government are committed to the conservation and sustainable use of Bardi and Jawi Sea Country and the marine park is jointly managed and proposed to be jointly vested with the BJNIAC and Conservation and Parks Commission (Commission). Management of the marine park will complement the existing and on-going management of Bardi and Jawi Country by Bardi and Jawi Traditional Owners and the Bardi Jawi Rangers.

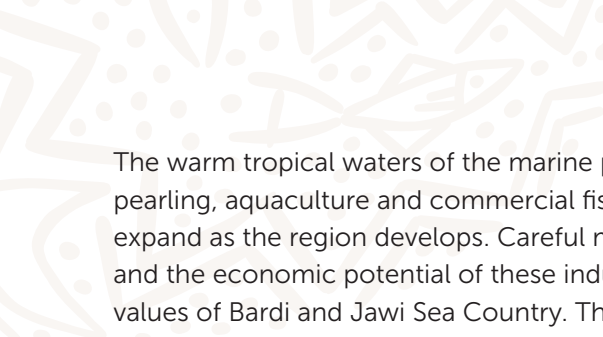
Bardi and Jawi people are *gaarra* (saltwater) people. Bardi people are from the mainland of the Dampier Peninsula and islands immediately offshore from *Ardyaloon* (One Arm Point). Jawi people are from the islands further east, including *Iwany* (Sunday Island). Both Bardi and Jawi people share and practise the same Law. The whole of Bardi and Jawi Country is culturally significant, from the different plants and animals that live there, to the many significant sites and places which are interconnected through songlines and stories that refer to mythological beings and places far afield. Bardi and Jawi Sea Country is used consistently by Bardi and Jawi people for hunting and fishing for food, cultural activities and business.

Bardi and Jawi Sea Country is home to a diverse range of marine life. Fringing *marnany* (reefs) have formed around the coast and between the many islands of the Buccaneer Archipelago, withstanding a tidal range exceeding 11m, the highest in Australia. The wide intertidal areas are home to vast numbers of plants and animals, all adapted to the unique coastal environment of the Kimberley. Mangrove-lined creeks and *noomool* (seagrass) meadows create important nursery areas for *aarli* (fish), and *goorlil* (turtles) are regularly seen foraging and nesting in the area. Sea Country is forever changing with the seasons and tides. From June to November each year *miinimbi* (humpback whales, *Megaptera novaeangliae*) migrate from Antarctic feeding grounds to Bardi and Jawi Sea Country and beyond to give birth to their young and *odorr* (dugongs) visit the marine park in the cooler months from May to July.

The natural values of the Dampier Peninsula and Buccaneer Archipelago coupled with the vibrant Aboriginal culture in the region is attracting an increasing number of local and international visitors. Popular activities include fishing, boating, cultural tours and wildlife watching. Visitation to the region is predicted to rise by at least 76 percent in the first 10 years following the sealing of the Broome-Cape Leveque Road which was completed in 2021 (KPP Business Development 2018). The establishment of the marine park is important to ensure the exceptional natural and cultural values which visitors seek are protected for current and future generations to enjoy.

1 - Native Title Tribunal file number WCD2005/003. See http://www.nntt.gov.au/searchRegApps/NativeTitleRegisters/Pages/NNTR_details.aspx?NNTT_FileNo=WCD2005/003





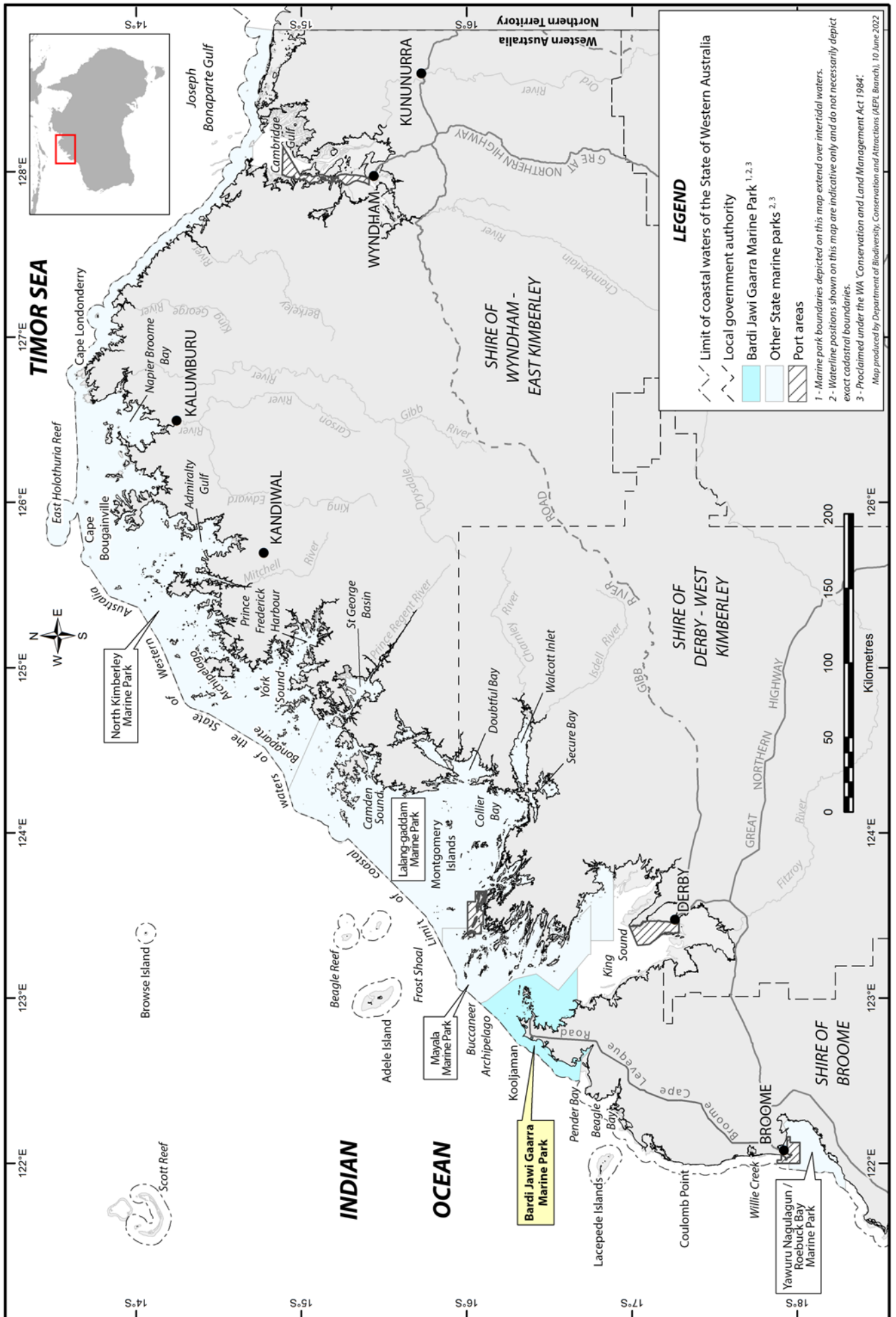
The warm tropical waters of the marine park provide optimal conditions for commercial activities such as pearling, aquaculture and commercial fishing. It is likely that these industries will continue to develop and expand as the region develops. Careful management is required to ensure activities remain sustainable and the economic potential of these industries is realised without significantly affecting the exceptional values of Bardi and Jawi Sea Country. The marine park will provide important social and economic outcomes for Bardi and Jawi people by providing enhanced opportunities for Bardi and Jawi involvement and employment in land and sea management. Bardi Jawi involved in commercial activities in the marine park will be encouraged particularly in eco and culture-based tourism.

This management plan takes into account the values, aspirations and management objectives articulated in the Bardi Jawi IPA management plan and has been prepared alongside the Mayala Marine Park joint management plan and the Lalang-gaddam Marine Park joint management plan to ensure consistency of management arrangements across the adjacent marine parks.

The establishment of the marine park will contribute to the conservation and enhancement of the outstanding cultural and ecological values of Bardi and Jawi Country whilst supporting sustainable recreational and commercial use for the benefit of present and future generations as development and visitation in the region continues to grow.

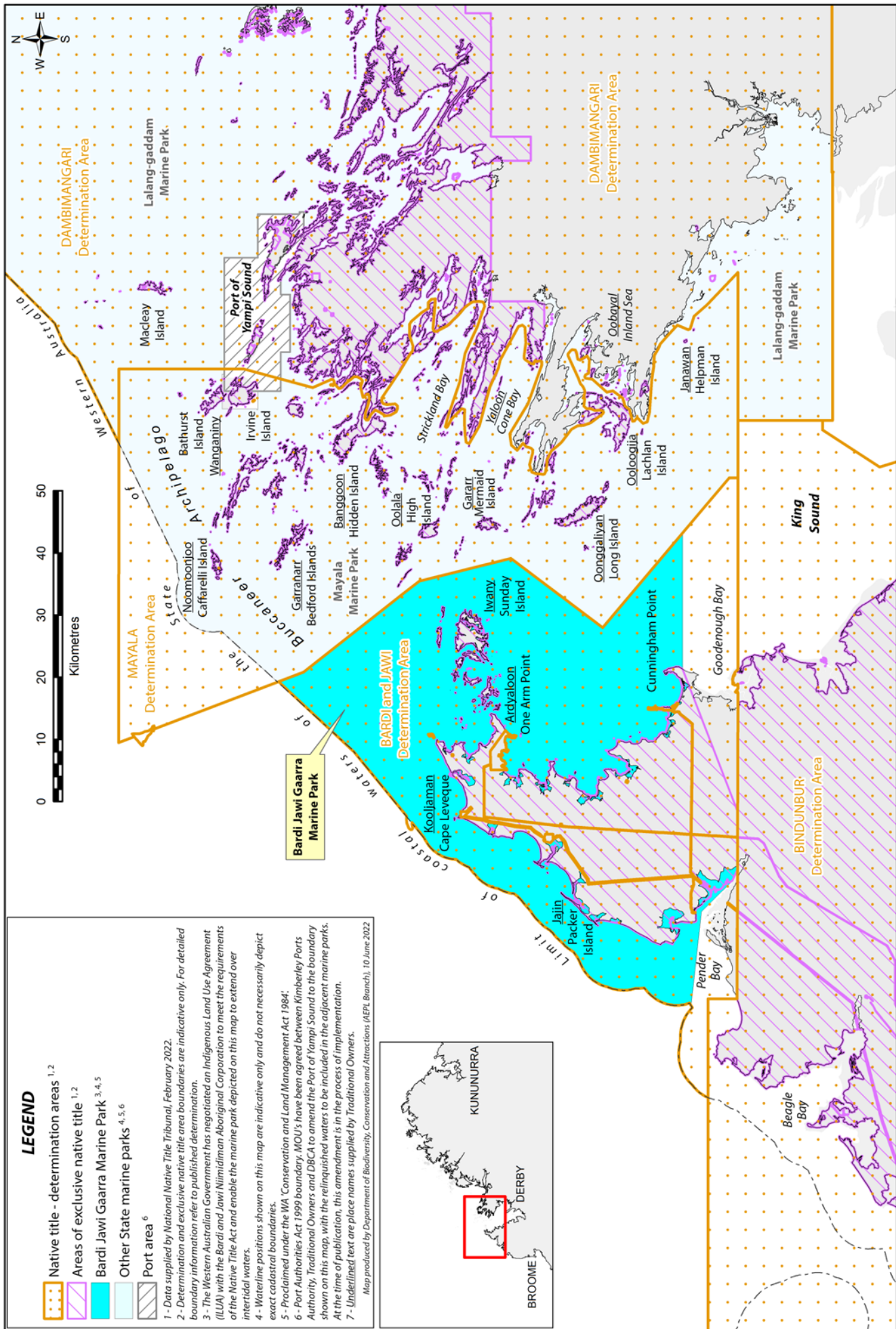
The name for the marine park 'Bardi Jawi Gaarra' means the saltwater in Bardi and Jawi Sea Country.





Map 1: Locality of Bardi Jawi Marine Park





Map 2: Native title determination areas within and adjacent to Bardi Jawi Gaarra Marine Park

3. Bardi and Jawi Country

3.1 Bardi and Jawi people and Country

The Bardi Jawi Native Title Claim was determined in 2005, granting Bardi and Jawi people exclusive possession over 1,037 km² of Aboriginal Reserve and Unallocated Crown Land. Non-exclusive possession was granted over the intertidal zones and nearby reefs. The original native title determination in 2005 was followed by an appeal, won in 2010, which saw an increase in land and intertidal areas held by Bardi and Jawi people, to approximately 3,047 km² including *Iwany* (Sunday Island) and some adjacent islands. The latter decision also grants native title rights to 2m below the mean low water mark.

Originally, Bardi and Jawi speaking people lived on different areas of Country. Jawi were islander people while Bardi lived on the mainland. They share the same kinship system, social organisation, and the same Law. Bardi and Jawi Country is divided into seven clan areas (figure 2) and within each area a number of *booroo* (campground, home, place) which refers to areas handed down through the father's line (Bowern 2012).

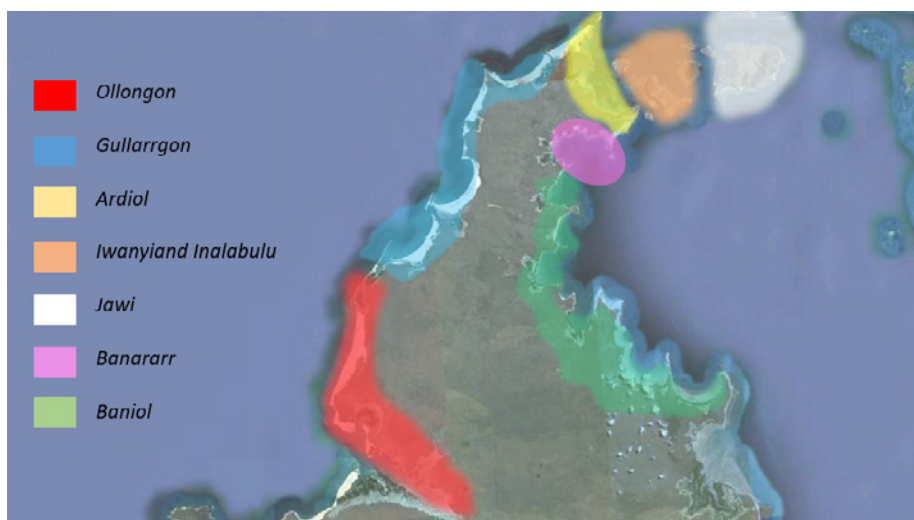


Figure 2. The location of the seven clan areas in Bardi and Jawi Country.

Bardi and Jawi people's identity and existence is intimately connected to the sea. For Bardi and Jawi people, their Country is more than a simple geographic location, it includes all living things, incorporating people, plants, animals, seasons, stories, and spirits. It is both a place of belonging and a way of believing. In Bardi and Jawi belief, powerful and creative ancestral beings roamed the sea, creating islands, reefs, sandbanks and marine species which are recalled in songs and stories (Willing 2011). This creative period is generally referred to as the Dreaming or Dreamtime among English speakers. Once their creations were completed, these Dreamtime beings moved into the sky-world or became features of this world, remaining a permanent presence on Earth within special places along with the stories and evidence of their deeds. Many Bardi and Jawi creation stories involve the cultural hero *Galalooong*, who travelled down the Dampier Peninsula, naming places and giving Law (Bowern 2016). Along with *Galalooong*, there are other ancestral Dreaming beings associated with Bardi and Jawi culture. One of them, *Loolooloo*, associated with saltwater, manifests as a shark that helps guide people if they are in trouble whilst travelling or hunting on Sea Country (Frank Davey, pers. comm. in Vigilante et al. 2013).

Through the actions of ancestral beings in the creative period, *rai* 'spirit beings' were placed in Country (land and sea) at various locations. Bardi and Jawi people hold the belief that before birth, they existed as *rai*. *Rai* are considered to be good or neutral spirits. For Bardi and Jawi people, their Country, inhabited by *rai*, constitutes the physical and the spiritual source of their very identity as human beings (Vigilante et al. 2013). *Rai* spirits can cause trouble for strangers who visit or camp in the wrong place or visit areas without being introduced in the proper way (Vigilante et al. 2013).



The relationship between Bardi and Jawi people and Country is one of reciprocity and respect - Country sustains and provides for the people, and the people sustain and manage Country through culture and ceremony. Despite the many challenges and changes that Bardi and Jawi people have faced, they have maintained their strong connection to Country and their story is one of resilience, adaptation and survival.

In 1899, a mission was established on *Iwany* (Sunday Island) in Jawi Country. Jawi people had lived on *Iwany* and other islands in their Country for thousands of years and although they were still able to live on-Country, the mission significantly changed their way of life. The Sunday Island Mission was sustained by shelling work. Aboriginal people from Sunday Island Mission spent several weeks camped on various islands during the holiday times collecting *alngir* (trochus) shell throughout the Buccaneer Archipelago (Vigilante *et al.* 2013). When it closed in the 1960s many Bardi and Jawi people had to move away from their traditional homelands. The majority of people moved to Derby, while some moved to other areas on the mainland following work. Others moved to the Lombadina Mission which ran between 1917 to the 1970s. In the 1970s a strong effort was made by Bardi and Jawi people to establish the community of *Ardyaloon* (One Arm Point) and move from Derby back to Country.

Today, both groups live on the mainland peninsula, where the larger communities and outstations are situated with services provided to the local people. Sea Country remains consistently used by Bardi and Jawi people in what today is very much a hybrid economy. Traditional cultural Laws and protocols are still followed, and customary activities still take place regularly, but Bardi and Jawi people now also depend on their Country for job and business opportunities.

In 2011, the west Kimberley region was included in the Australian National Heritage List for its nationally significant natural, Aboriginal and historical values, including part of Bardi and Jawi Country because of the history of the *gaalwa* (double log raft) and the use of *goowarn* (pearl shell) for ceremonial purposes and trading far afield (Environment 2018). Before motorised vessels were available, Bardi and Jawi people travelled between the coast and islands using *gaalwa*, double log rafts made of mangrove wood. Logs for making these rafts were obtained either directly from the large mangrove swamps located on the eastern shore of King Sound or in trade with Dambeemangarddee and Mayala people. A coastal trading network existed along the Kimberley coast and Jawi people on *Iwany* (Sunday Island) were middle-men in this network, trading rafts and raft poles to Bardi people based on the Dampier Peninsula mainland in exchange for spears (Tindale 1974 in Vigilante *et al.* 2013).



Bardi Jawi Rangers. Photo – Bardi Jawi Rangers.



Kooljaman. Photo – Michael Higgins, DBCA.

3.2 Bioregional setting

The Integrated Marine and Coastal Regionalisation of Australia (IMCRA) is a framework developed using western science to classify Australia's marine environment into ecological bioregions at a scale useful for regional planning. These bioregions are used as the basis for the development of a National Representative System of Marine Protected Areas (NRSMPA). The marine park spans sections of three bioregions; the Kimberley Bioregion, the King Sound Bioregion and the Canning Bioregion (Map 3). The Kimberley Bioregion extends from Cape Leveque within Bardi and Jawi Country to Cape Londonderry in Balanggarra Country. This region is characterised by rocky shores, mudflats, fringing reefs and mangroves. It is a low-energy ria (submerged river valley) coast with deep embayments and many islands. The King Sound Bioregion lies between Point Osborne and Shenton Bluff and comprises an open gulf encompassing the Fitzroy Estuary, Stokes Bay and Cygnet Bay. The Canning Bioregion extends from Cape Leveque to Eighty Mile Beach and generally has moderately clear inshore waters, and wave energy that varies from moderate along some parts of the Dampier Peninsula to low within the broad shelving embayments. The shore principally comprises long beaches between rocky headlands. Mangroves are well developed in the upper parts of the bays and along tidal creeks and subtidal *noomool* (seagrass) beds are extensive in this bioregion (Thackway and Cresswell 1998).

The diverse environmental characteristics of the marine park supports a large array of plants and animals - some endemic to the area and others which are threatened and endangered in other parts of Australia or globally. It is believed that there are many species yet to be discovered by western science. The Kimberley region remains one of the last relatively undeveloped coastal areas left in the world and the scientific and conservation significance of the area is becoming increasingly recognised in a global context (Halpern *et al.* 2008, Richards *et al.* 2015).

The tidal movement in Bardi and Jawi Sea Country is among the largest in the world. There are typically two high and two low tides each day, with a range of exceeding 11 metres. The huge tides and complex currents created between the islands are exceptional and the region is regarded as one of the most difficult marine areas to navigate in Australia. Bardi and Jawi people have a detailed knowledge and classification system of tides that enabled them to navigate the treacherous waters on *gaalwa* and this knowledge continues to assist them today (Vigilante *et al.* 2013). The detailed cultural knowledge of the tides is expressed in *Ilma*, the traditional song and dance practice of Bardi and Jawi people (Vigilante *et al.* 2013). Ocean temperature in the region range from 22-33°C with higher localised temperature in nearshore coastal waters. The average sea surface temperature of coastal waters in the Kimberley is 28.5°C (Wilson 2013).

The Dampier Peninsula has a dry tropical climate with an average annual rainfall of 600–750 mm. Most rain falls during the wet season. Due to the seasonality of the rainfall, it is common to refer to two predominant seasons, these being the 'wet' (lasting through the summer and early autumn months) and 'dry' season (that last for approximately seven months). Bardi and Jawi people have a far more nuanced relationship with the climate and understanding of seasonal patterns, recognising six different seasons (*Mangal*, *Ngaladancy*, *Irralboo*, *Barrgana*, *Jalalay* and *Lalin*) which are distinguished by wind and rainfall direction and intensity, ripening of fruits, and appearance and the disappearance and 'fatness' of *aarli* (fish) and animals.

The main communities on Bardi and Jawi Country are *Djarindjin*, *Lombadina* and *Ardyaloon* (One Arm Point), although people also live in outstations spread along the coastline of the Dampier Peninsula. These communities depend on the surrounding Sea Country for fishing, hunting, cultural, recreational and economic activities. Economic activities which take place in the area are mostly comprised of tourism, pearling, aquaculture and commercial fishing. The Dampier Peninsula has one of the highest concentrations of Aboriginal-owned tourism businesses in Australia and Bardi and Jawi people are keen to further expand on the tourism potential of their Sea Country by establishing Bardi and Jawi owned tourism ventures.

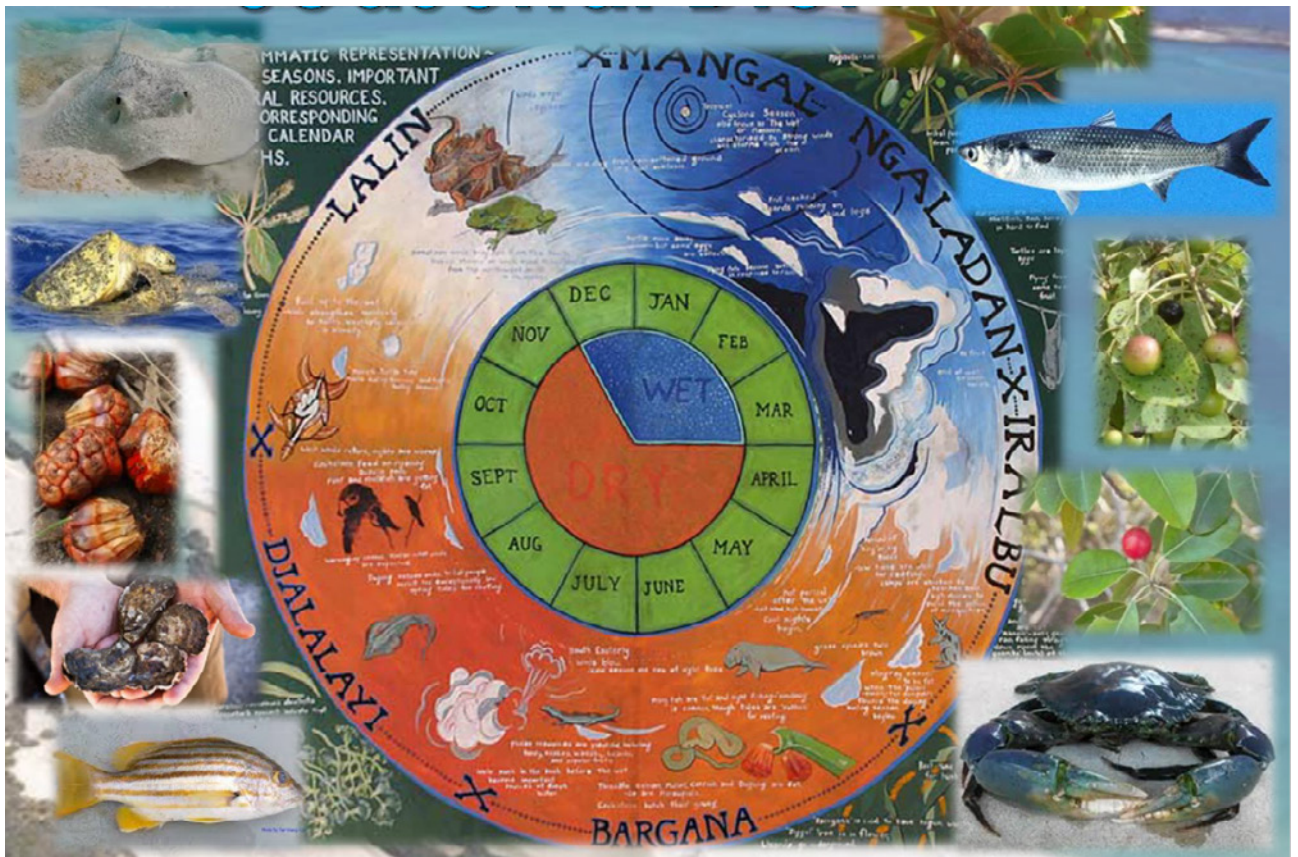
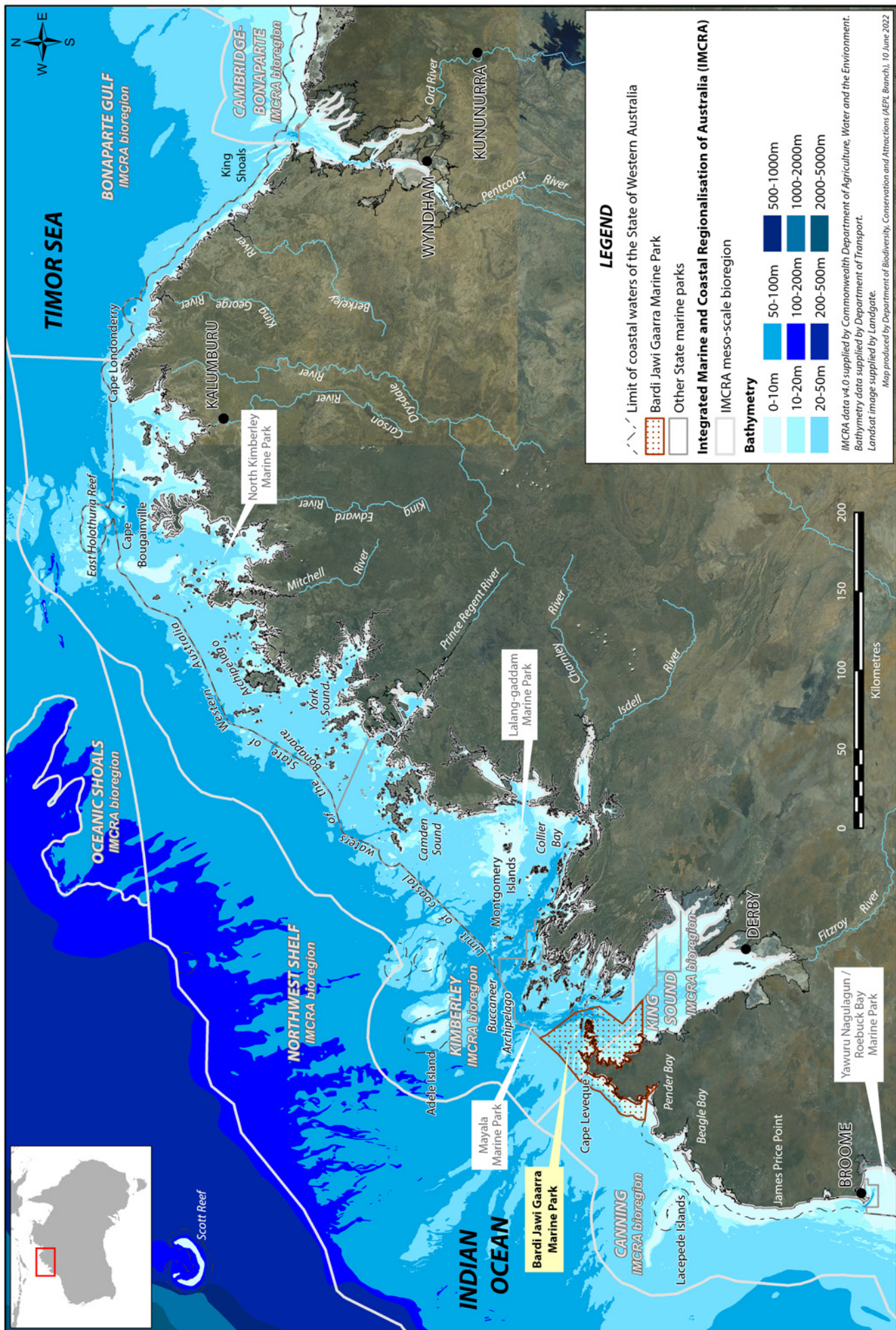


Figure 3. Bardi Jawi seasonal calendar.

The nearest towns to the marine park are Derby and Broome, with populations of approximately 3,300 and 16,000 people, respectively (Australian Bureau of Statistics 2016). Approximately 47% of the residents of Derby are Aboriginal, 28% of the residents of Broome are Aboriginal, and 86% of the residents of the Dampier Peninsula (1,100 people) are Aboriginal (Australian Bureau of Statistics 2016). Both towns experience considerable population fluctuations due to transitional residency and tourism. Broome's population rises significantly in the peak tourist season (May-August) and an estimated 33,000-36,000 visitors a year currently visit the Dampier Peninsula by road (KPP Business Development 2018). Residents of these towns travel to the area to enjoy excellent fishing, to relax and enjoy the spectacular scenery and to visit popular camping spots.

Due to the limited pressures in the area, the ecological values of the marine park are generally considered to be in a good condition. Management will focus on maintaining the condition of the area. Current pressures include the impacts of climate change (see section 11) and unmanaged recreational fishing and tourism activities (see section 9.3 & 9.2). Visitor numbers to the Dampier Peninsula are expected to increase following the sealing of the Broome-Cape Leveque Road, which was completed in 2021. At the lowest growth scenario, there is predicted to be a 76 percent increase in visitors to the Dampier Peninsula in the first 10 years. At the highest growth scenario there will be a 91.5 percent increase in visitor traffic in the first 10 years (KPP Business Development 2018).





Map 3: Marine bioregions and Bardi Jawi Gaarra Marine Park

3.3 Definition of area and tenure

The Bardi Jawi Gaarra Marine Park is located in the Kimberley Region of Western Australia and covers approximately 204,000 hectares within the Bardi Jawi determination area, adjacent to the Shire of Broome. It includes all of Bardi and Jawi Sea Country surrounding the northern part of the Dampier Peninsula and the western islands of the Buccaneer Archipelago, including *Iwany* (Sunday Island). The southern boundary of the marine park is situated approximately 160kms north of Broome. The marine park extends from Pender Bay on the western side of the Dampier Peninsula, around the tip of the Dampier Peninsula to Cunningham Point on the eastern side of the Peninsula. The eastern boundary of the marine park follows the Bardi Jawi determination boundary and borders the Mayala Marine Park. The western boundary of the marine park is aligned with the limit of coastal waters of Western Australia and borders the Commonwealth's Kimberley Marine Park.

The marine park includes intertidal areas to the high-water mark subject to adjacent tenure and addressing native title requirements under the Commonwealth *Native Title Act 1993* (Native Title Act). The outer boundary for the marine park and surrounding tenure is shown in Map 4. The Bardi Jawi IPA, included in the National Reserve System, covers much of the terrestrial area adjacent to the marine park.

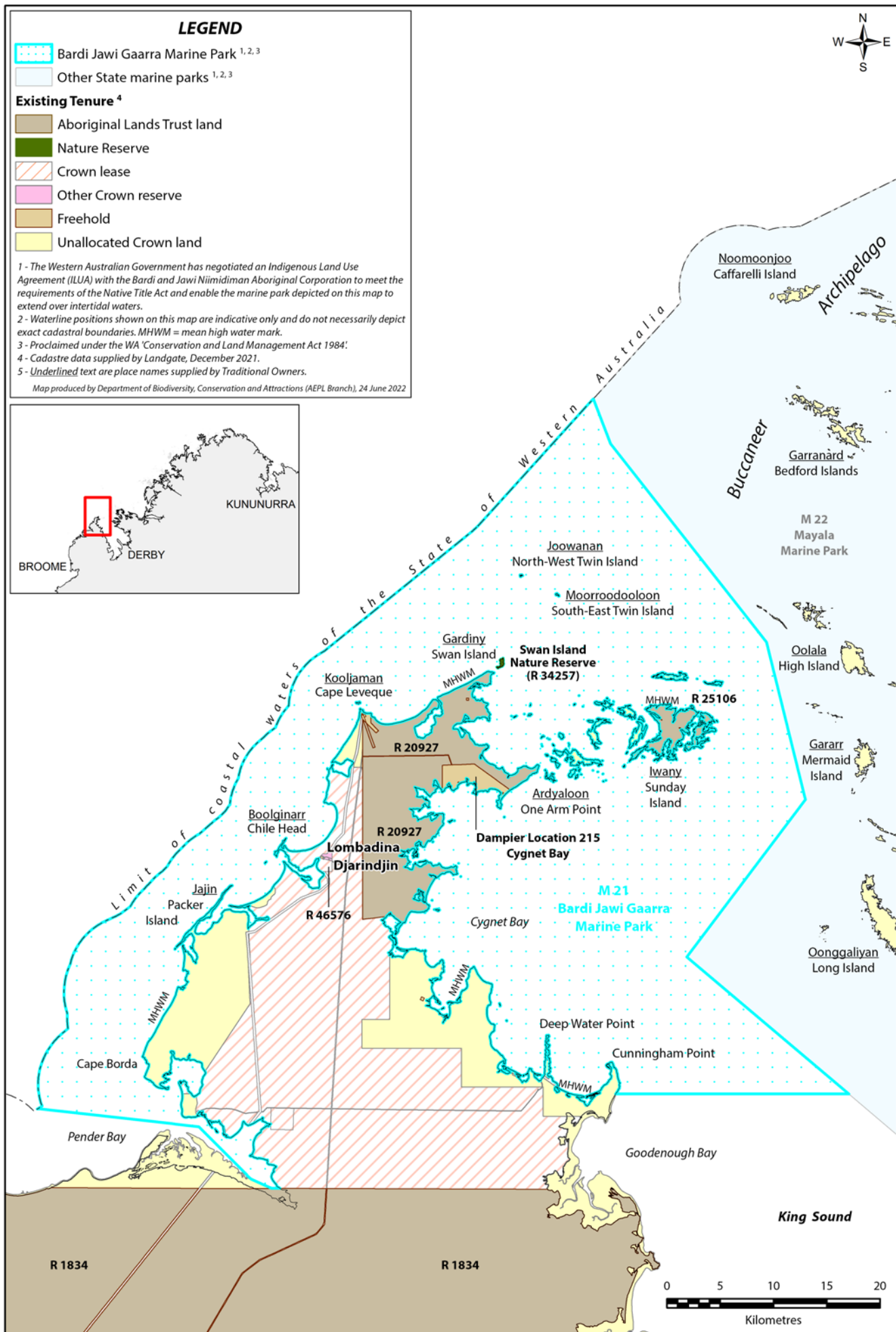
The marine park is gazetted as a Class A marine park and proposed to be jointly vested in the BJNAC and the Commission. Class A reservation provides the highest security of tenure, requiring the approval of Parliament to amend or cancel a reserve's purpose or significantly alter its boundary. By contrast, the zoning scheme and management plan can be amended after a public consultation period with the approval of the Minister for Environment, Minister for Fisheries, and Minister for Mines and Petroleum.

This joint management plan also includes the management arrangements for the Swan Island Nature Reserve which is located on *Gardiny* (Swan Island) to the north of Swan Point off the northern tip of the Dampier Peninsula.



Mangroves. Photo – Ian Meechan.





Map 4: Tenure within and adjacent to Bardi Jawi Gaarra Marine Park

4. Management Setting

4.1 Legislative context

An Indigenous Land Use Agreement (ILUA) between the State Government and Bardi and Jawi native title holders to enable the valid reservation of the jointly managed marine park inclusive of the intertidal areas was registered with the National Native Title Tribunal on 6 June 2021.

Amendments are currently proposed to be made to the CALM Act to allow for joint vesting of marine conservation estate. Subject to enactment of the necessary CALM Act amendments, the marine park will be jointly vested with the Commission and BJNAC. Joint vesting of the marine park means that the BJNAC will not only share the responsibility of making management decisions through the JMB but will also share the overall responsibility with the Commission of making sure the marine park fulfils its purpose. Prior to the joint vesting of the marine park, it will be solely vested in the Commission.

The marine park is managed in accordance with the provisions of the CALM Act, the *Fish Resources Management Act 1994* (FRM Act)², the *Conservation and Land Management Regulations 2002* (CALM Regulations) the *Biodiversity Conservation Act 2016* (BC Act), DBCA policy and other relevant legislation and cultural protocols mentioned throughout this plan.

The marine park helps fulfil Australia's responsibilities under several international conventions, including the Convention on Biological Diversity, and will support the International Union for the Conservation of Nature's Protected Areas Program. The marine park also contributes to the National Representative System of Marine Protected Areas by conserving important marine ecosystems and protecting marine biodiversity through a comprehensive, adequate and representative system of marine reserves. Through Indigenous participation in decision-making, and by maintaining Bardi and Jawi's cultural and spiritual relationship with Country, the establishment of the jointly managed marine park also addresses Bardi and Jawi's rights as stipulated in the United Nations Declaration on the Rights of Indigenous Peoples.

The marine park lies within the west Kimberley region which is included in the Australian National Heritage List for nationally significant natural, Aboriginal and historical values including part of Bardi and Jawi Country because of the history of the *gaalwa* (double log raft) and the use of *goowarn* (pearl shell) for ceremonial purposes and trading far afield (Environment, 2018). National Heritage places and the values they contain are afforded protection under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), including sections 15B and 15C. The associated values will be managed in accordance with the EPBC Act and regulations. Further information on the West Kimberley National Heritage listed place can be found on the Australian Government's Department of Environment website: (www.environment.gov.au/heritage/places/national/west-kimberley).

2 - The Aquatic Resources Management Act 2016 (ARM Act) will replace the Fish Resources Management Act 1994 and the Pearling Act 1990, to become the primary legislation used to manage fishing, aquaculture, pearling and aquatic resources in Western Australia.



4.1.1 Native title and customary activities

The Native Title Act provides a framework for the recognition and protection of rights and interests under traditional Laws and customs. Bardi and Jawi Traditional Owners have determined native title rights and interests based on strong and ongoing cultural connections over their land and saltwater Country. This joint management plan does not provide any additional restrictions on the exercising of native title rights other than those agreed by native title holders and in accordance with the CALM Act, BC Act, FRM Act and CALM Regulations. Determined native title rights within the marine park include the right to:

- enter, travel and remain on the waters;
- hunt, fish, gather and use resources for personal, domestic and communal needs;
- undertake cultural activities; and
- take and use water.

Within the marine park, customary activities such as fishing rights and hunting are also provided for under the management plan. The FRM Act recognises customary fishing rights and the CALM Act and BC Act provide for the undertaking of customary activities.

Exclusive possession native title has been determined in Bardi and Jawi Country across most of the mainland and people wishing to visit these areas will need to obtain permission from Bardi and Jawi Traditional Owners prior to their visit.

4.2 Joint management

In recognition of the significant cultural values and Bardi and Jawi's ongoing connection and responsibilities to the area, the marine park is jointly managed by DBCA and the BJNAC.

Joint management of the marine park is an ongoing and adaptive process which requires Bardi and Jawi people and DBCA to actively work together and share decision making to manage the marine park. Joint management provides the structure to bring appropriate resources together by combining traditional knowledge and practices with western techniques to achieve the cultural, ecological and social management objectives set out in this joint management plan. Traditional knowledge and understanding of saltwater Country will underpin management decisions for the marine park, and Bardi and Jawi Traditional Owners will be actively involved in managing the area.

Joint management is given effect under the CALM Act through the signed section 56A JMA which is attached to this plan. For formal joint management to occur, the final joint management plan requires the Chief Executive Officer of DBCA to jointly manage the park.

The JMA enables the establish a JMB (formed of Bardi and Jawi representatives nominated by BJNAC and staff from DBCA) to manage the marine park in accordance with the agreement and the CALM Act. The JMB will oversee management of the marine park; make management decisions; provide strategic input into how management strategies are implemented; monitor implementation of the plan; and provide advice in accordance with the agreement and the CALM Act. Although a JMA has not been signed with Department of Primary Industries and Regional Development (DPIRD), it is intended that DPIRD will be an informal joint management partner for all matters relating to fisheries, pearling and aquaculture related matters, in accordance with DPIRD's responsibilities under the FRM Act 1994, Pearling Act 1990, and ARM Act 2016 (when implemented).

DBCA recognises the aspiration of Bardi and Jawi Traditional Owners that the day-to-day management of the marine park should be undertaken by Bardi and Jawi people in the future. DBCA will support Bardi and Jawi Traditional Owners and BJNAC to continue to build their capacity to take on greater responsibility and accountability for the management of the marine park through training, employment and succession planning, regular reviews of joint management arrangements and operational procedures, the securing of funding for Sea Country management and supporting collaborative work between BJNAC and other agencies and stakeholders.

4.3 Connectivity and holistic management

This plan has been guided by the values, aspirations and management objectives articulated in the Bardi Jawi IPA Plan, management programs under the IPA and the Bardi Jawi Ranger Program. This plan sets out a strategic approach and priorities for looking after, enjoying and using Bardi and Jawi Country sustainably for future generations. It has been prepared in conjunction with the joint management plan for the Mayala Marine Park and the joint management plan for the Lalang-gaddam Marine Park to ensure consistency and efficiency of management arrangements across the neighbouring marine parks and sea countries. It is intended that the cooperative arrangement between DBCA, Bardi, Jawi, Mayala and Dambeemangarddee Traditional Owner groups will continue through to the implementation and operational stage of the marine parks with annual joint meetings.

This plan forms an integral part of a suite of complementary management mechanisms within and adjacent to the marine park including heritage protection, fisheries management, wildlife protection, industry regulation, pollution control, environmental impact assessment processes, maritime transport and safety measures and community cooperation and participation.

A Memorandum of Understanding has been in place between the Minister for Environment and the Minister for Fisheries since 2018 to establish principles of cooperation and integration between DBCA and the DPIRD in the management of the State's marine parks and reserves.

Consistent with the MoU, DPIRD were involved in the co-design process of the marine park and joint management plan, and it is intended that DPIRD will continue to be involved in the implementation and operation of the joint management of the marine park as an informal partner.

Collaborative operational plans are developed to ensure efficient and effective delivery of a range of programs where there is shared agency responsibility or mutual interests, including education, interpretation and public participation, and patrol and enforcement. The use of formal and informal mechanisms for communication and engagement between park managers and key stakeholders will also be important throughout the life of the plan to ensure effective ongoing and adaptive management.

A Memorandum of Understanding has also been developed between DBCA and Parks Australia for the management of existing State and Commonwealth Marine Parks in Western Australia. It is likely that the collaborative management arrangements which are in place across existing Commonwealth and State marine parks in the Kimberley will be extended to include the Bardi Jawi Marine Park, which abuts a Multiple Use Zone and a small section of a Habitat Protection Zone in the Commonwealth Kimberley Marine Park.

4.3.1 Dampier Peninsula Project

The Dampier Peninsula Project was established to maximise the social and economic opportunities for Aboriginal business and communities arising from the sealing of the Broome-Cape Leveque Road; and to mitigate potential impacts through partnering with the Traditional Owners and community councils to protect the unique social, cultural and environmental values of the area.

The establishment of the Bardi Jawi Gaarra Marine Park in partnership with Bardi and Jawi Traditional Owners has been developed alongside the Dampier Peninsula Project. Management arrangements for the marine park are complementary to those in the Dampier Peninsular planning strategy, to ensure the vision for the peninsula is realised across both land and sea country within Bardi and Jawi Country.



4.4 Management context

To guide management and meet the vision of the marine park, **management objectives** and **management strategies** have been developed for the marine park to address management issues including current and future **pressures on values**, data deficiencies and safety concerns. The use of **key performance indicators**, **performance measures** and **management targets** reflect an outcome-based “best practice” approach from which the effectiveness of management can be better assessed. The DBCA West Kimberley District Office and Bardi and Jawi joint management partners through the JMB have the primary responsibility for coordinating and implementing the management of the marine park by applying prioritised management strategies across seven **management programs**.

The key terms used in the management summary tables in this plan are defined below. Not all the management summary tables relate to a particular value, have pressures associated with them or will be monitored and therefore not all the summary tables will contain all the key terms.

Values: The values of the marine park are defined as the cultural, ecological, biocultural, social and economic features and activities which are important to the area. Many of the values are tightly linked, but for the purpose of this joint management plan they have been addressed under separate headings of Caring for Culture, Caring for Country and People on-Country. The categorisation of the values supports the development of clear management objectives and management strategies and allows for transparent and accountable management audit and review processes. The most significant values will be prioritised for monitoring.

Pressures: A pressure is an activity, whether it be anthropogenic or natural, which affects or has the potential to affect the condition of a value. If not managed correctly, some activities which are considered a value of the marine park can also become a pressure. For the purposes of developing management priorities, pressures on the values are confined to current pressures; pressures likely to occur during the life of the management plan; and pressures considered to be manageable within a marine conservation reserve context. This excludes most global pressures which are largely outside the control of marine park managers. However, given climate change is considered to be the biggest emerging threat to the values of the marine park, strategies to understand, monitor and adapt to climate change impacts are listed in section 11 and contribute to broader regional climate change strategies.

The relative level of risk posed by existing and/or potential pressures on ecological and biocultural values has been assessed by considering the following factors:

- the biological intensity of the pressure - pressures that impact lower trophic levels (i.e. primary producers such as *marrgoorr* (coral) and mangrove communities are often of greater concern than pressures on higher trophic levels;
- the temporal scale of the pressure - ongoing pressures are generally of greater management concern than pressures that are short-lived;
- the spatial scale of the pressure - pressures that occur over a greater spatial extent are often of greater management concern than localised pressures;
- the social consequence - acknowledges that different pressures have different social, economic, cultural and political consequences. A high socio-economic, cultural or political consequence is often of greater management concern; and
- the probability of a pressure occurring now or within the timeframe of the management plan.

The cumulative impacts of pressures are complex to understand and predict. It is important to ensure economic growth across marine sectors is sustainable by recognising the limits which naturally healthy, biodiverse, and biologically productive ecosystems have in sustaining human activities. Whilst one pressure may not have a significant impact on a value alone, if there are multiple pressures acting on a value, the combined pressure can cause a significant detrimental impact. Monitoring will be carried

out to assess the condition of the values in the marine park. If the condition of a value has significantly decreased as a result of human activities in the area, adaptive management will be carried out.

Management objectives: The management objectives identify what the primary aims of management will be and reflect the statutory requirements of the CALM Act and the cultural responsibilities of Bardi and Jawi Traditional Owners. Where a significant pressure/s on an ecological value has been identified, the management objective addresses the specific pressure/s. When there is not an obvious existing pressure or threat, the management objective provides broader direction to management in relation to protecting the value from the most likely future pressures. Management objectives for social values address, where appropriate, the effect of the activity on the other values of the reserves and the complementary interests of other statutory management arrangements or activities that exist in the reserves.

Management strategies: Management strategies provide direction on how the management objectives will be achieved.

The prioritisation of the management strategies is based on the best available information and may change during the life of the plan. To prioritise the management strategies, a joint workshop was held between Bardi, Jawi and Mayala representatives and key DBCA staff. Management strategies considered to be foundational and critical to achieving the strategic objectives of the management plan are presented as high-key management strategies (H-KMS). All other strategies are prioritised as high (H), medium (M) and low (L) to indicate their relative importance. All strategies are intended to be implemented over the life of this plan. High priority strategies are those that need to be started as soon as possible (within the first 5 years), medium priority strategies, are those that need to be started within the first 8 years and low priority strategies are those that should be started when possible but within the 10 year life span of the plan. At the workshop some strategies were considered to be a principle to be considered throughout the implementation of the joint management plan, and do not have a specific timeframe attached to them.

Joint management partners are the lead for all strategies. Other organisations and departments such as DPIRD will also play an integral role in the management of the marine park. Where other organisations are required to support implementation of a management strategy, their name is listed in brackets next to the strategy. Where an agency or body is required to take a lead role in strategy implementation, their name (or acronym) is in bold in the management tables.

- **Management programs:** Management of the marine park will occur across seven marine park management programs. This ensures a coordinated and prioritised approach is taken to implement strategies. The seven management programs are consistent across all marine parks in the State and are the basis for budgeting and annual reporting.
- **Management frameworks:** This includes the legal, administrative, financial, and human resource requirements, the provision of policy, and technical and operational advice.
- **Education and interpretation:** The provision of interpretative material and delivery of community education is critical to ensuring public awareness and understanding of conservation, Bardi and Jawi people and their culture, and management of the marine park.
- **Public participation:** Public participation helps to build and sustain community support that is critical for effective implementation of the management plan.
- **Patrol and enforcement:** There will be a need to monitor the level of compliance and take action to stop inappropriate or illegal behaviour in the marine park.
- **Management intervention and visitor services:** 'Intervention' comprises direct management actions required to achieve conservation outcomes and/or to provide for enjoyable visitor experiences. These can be either proactive (preventative) or reactive (restorative) management actions and include provision of visitor facilities to enable access and/or reduce site disturbance and environmental impacts, rehabilitation of degraded areas and visitor risk management.

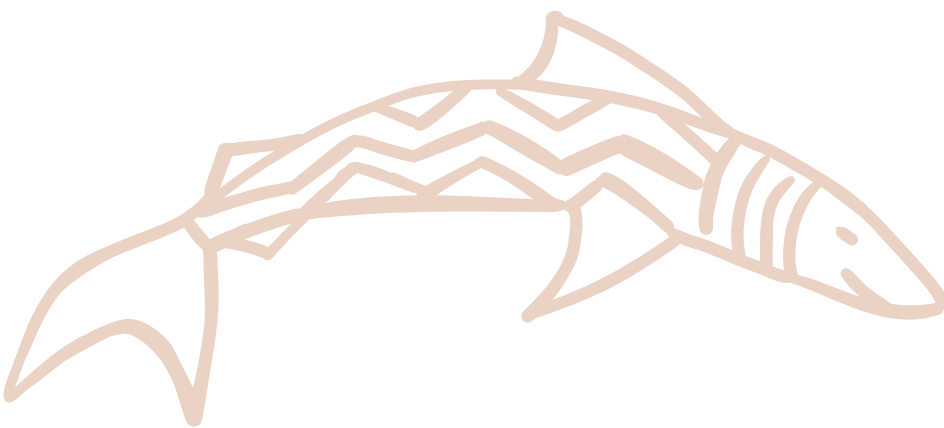


- **Research:** Developing a greater understanding of the cultural, ecological and social values of the marine park is critical to effective management.
- **Monitoring:** Long-term monitoring of the condition of the marine environment (and/or the pressures that may impact on it) are essential to assess the effectiveness of marine reserve management. Monitoring enables the detection of detrimental impacts and provides the trigger for corrective management action (where possible) before cultural, ecological and social values of a marine reserve become significantly degraded. Where changes have occurred and remediation measures are required, a monitoring program should also determine the rate of recovery of an affected area or value.

Key Performance Indicators (KPIs): A set of KPIs have been specified for selected values to measure the overall effectiveness of management in relation to the strategic objectives of the marine park. These key values reflect the highest conservation and management priorities of the Commission, DBCA, Bardi and Jawi Traditional Owners and the community and form an important part of the audit process (see section 13). Each KPI comprises three components; performance measures, targets and reporting requirements. The KPIs are presented at the end of the relevant management summary tables.

Performance measures: Performance measures are indicators of management effectiveness in achieving the marine park’s objectives and targets. They are provided for each of the cultural and ecological values, plus several of the social and economic values. Some of the performance measures listed in this plan will be further developed or revised during the design and implementation of monitoring programs.

Management targets: Management targets represent the end points of management. The long-term targets provide specific benchmarks to assess the success or otherwise of management strategies within the life of the plan. The management targets for the marine park’s ecological values are often set to maintain ecosystem integrity and functioning. The targets for some active social and economic values are qualitative (e.g. visitor satisfaction), whilst others are process-based and stated as ‘Implementation of management strategies within agreed timeframe’. For the purposes of this management plan, ‘significant change’ refers to a statistically significant change beyond the limits of natural variability. Specific limits for each ecological value will be determined as long-term monitoring datasets develop.



5. Aspirations

5.1 Vision

The vision statement represents the aspirations for the conservation and protection of the cultural and ecological values and sustainable use of the marine park and will provide guidance for ongoing management.

Bardi and Jawi people and their partners working together to conserve and maintain healthy Sea Country by using traditional cultural knowledge and practice coupled with contemporary science for the enjoyment and benefit of present and future generations.

5.2 Strategic objectives

The strategic objectives of this plan support the goals of Bardi and Jawi people, as articulated in the Bardi Jawi IPA plan, and provide more specific direction over the long-term to realise the vision for the marine park.

Caring for Culture

To uphold and respect Bardi and Jawi people's culture and knowledge of Sea Country and protect and conserve the value of Sea Country to the culture and heritage of Bardi and Jawi people.

Caring for Country

To protect and conserve biodiversity and ecological health.

People on Country

To support and enhance a sustainable balance between community use, recreation, tourism and other commercial activities within the marine park.

Understanding Country

To encourage collaborative research and monitoring to increase understanding of the values of the marine park through research and monitoring to guide, adapt and improve management.



6. Caring for Culture

Strategic objective: To uphold and respect Bardi and Jawi people's culture and knowledge of Sea Country and protect and conserve the value of Sea Country to the culture and heritage of Bardi and Jawi people.

Bardi and Jawi peoples' traditional Country in the marine park is recognised through determined native title rights and interests based on strong and ongoing cultural connections to the area. Bardi and Jawi people have been practising their culture for thousands of years and to this day they continue to live by the cultural protocols handed down from their ancestors. Bardi and Jawi's continuing practice of culture over thousands of years has created a deep connection to Country which includes belonging to and caring for Country.

Although it is recognised that everything on-Country is interconnected, for the purpose of this joint management plan and ease of management arrangements the management of cultural values are addressed under the separate headings of:

- Relationship to Country
- Looking after Country
- Language and traditional knowledge
- Enjoyment of Country and customary activities.

This section draws from the values described in the Bardi Jawi IPA Plan and management of the marine park will complement the objectives and aspirations of the Bardi Jawi IPA plan.



Mangrove creeks and intertidal sand and mudflat are extensive in Bardi and Jawi Country. Photo – Roanna Goater.

6.1 Relationship to Country (KPI)

Bardi and Jawi people have a deep and spiritual connection to Country and maintain reciprocal and respectful relationships with Country. In Bardi and Jawi belief, ancestral beings once roamed the sea, creating *iinalang* (islands), *marnany* (reefs) and sandbanks and marine species which are recalled in song and stories (Willing 2011). Many Bardi and Jawi creation stories involve the culture hero *Galaloong*, who travelled down the Dampier Peninsula, naming places, and giving Law (Bowern 2016). For Bardi and Jawi people, their Country, inhabited by *rai*, is more than just the physical land to which they belong, it constitutes the physical and the spiritual source of their very identity as human beings (Vigilante et al. 2013).



Traditional Owners on-Country. Photo – Roanna Goater.

It is vital that visitors and workers respect Bardi and Jawi culture and follow cultural protocols. According to traditional Law, Bardi and Jawi have a responsibility to keep visitors on-Country safe as *rai* spirits can cause trouble for strangers who visit or camp in the wrong place or visit areas without being introduced in the proper way (Vigilante et al. 2013). The management strategies in section 9.2 will help ensure the safety of visitors to the Bardi Jawi Marine Park.

Bardi and Jawi people have always shared their cultural lives and continue to practise their culture. Law ceremonies are held and run by the *Majamajin* (Law bosses) and supported by the rest of the community, to keep the Law strong. Ceremonies take place in significant sites such as Law grounds, which are respected by Bardi and Jawi people for that purpose. Bardi and Jawi people want to support and sustain these practices. Some parts of Law are kept secret, but others are public ceremonies in which women and families play a major part (KLC/Bardi Jawi, 2013). Certain family groups have cultural authority to speak for different clan areas. Every Bardi and Jawi person belongs to a piece of Country which they are related to through the kinship system. That person is entrusted with the knowledge and responsibility to care for their land, providing a deep sense of identity, purpose and belonging. There are seven named clan areas within Bardi and Jawi Country (figure 2), and within each area a number of *booroo* (campground, home, place) which refers to areas handed down through the father's line (Bowern 2012). Bardi and Jawi people still live by the cultural protocols handed down from their ancestors. This includes following protocols for sharing of food and resources in accordance with traditional Law.



Summary of management arrangements for relationship to Country (KPI)

Requirements	<ul style="list-style-type: none"> • Recognition and respect of Bardi and Jawi people’s connection to Country. • Governance arrangement for management reflective of Bardi and Jawi cultural governance. • Equal involvement of Bardi and Jawi people in planning and management of the marine park. • Ensuring activities in the marine park do not significantly affect the rights of Bardi and Jawi people to have ongoing cultural connection to Country. • Culturally appropriate visitation and respectful behaviour by all visitors.
Pressures	<ul style="list-style-type: none"> • The inability to access Country. • Erosion of traditional knowledge. • Culturally inappropriate visitation.
Management objectives	<ul style="list-style-type: none"> • To uphold Bardi and Jawi’s connection to Country and ensure activities in the marine park do not adversely affect opportunities for Bardi and Jawi people to have ongoing cultural connection to Country and economic opportunities. • To promote increased understanding and respect for Bardi and Jawi living cultural landscape and concepts of the marine park.

		Management program	Priority
Management strategies	<ol style="list-style-type: none"> 1. Support Bardi and Jawi people to maintain their connection to Country, through on-Country trips, employment and enterprise development. 2. Support Bardi and Jawi people to develop and implement cultural awareness communication tools, emphasising the importance of cultural and heritage values for both Traditional Owners and the wider community. 3. Design and develop management tools to address the impacts of human activities that may prevent cultural fulfilment to uphold Traditional Owner cultural rights and obligations. 4. Support Bardi and Jawi to define a framework to ensure the right cultural processes are used for assessment and approval of proposals in the marine park. 5. Assess and monitor human activities that impact on the continuity of cultural fulfilment and upholding the cultural rights and obligations to continue the enjoyment of Country. 6. Develop cultural awareness training material and implement training for government employees and/or contractors working in the marine park. 7. Support Bardi and Jawi to develop protocols for visitors on Bardi and Jawi Country and educate visitors about appropriate behaviour, respecting privacy and access restrictions where applicable [DPIRD]. 	<p>Management framework</p> <p>Education and interpretation</p> <p>Management framework</p> <p>Management framework</p> <p>Monitoring</p> <p>Education and interpretation</p> <p>Education and interpretation</p>	<p>H-KMS</p> <p>H-KMS</p> <p>H-KMS</p> <p>H-KMS</p> <p>H</p> <p>H</p> <p>H</p>
<p>Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.</p>			

Performance measure	<ul style="list-style-type: none"> • BJNAC level of satisfaction that opportunities for ongoing cultural connection of Bardi and Jawi people are not significantly disrupted because of management activities (or a lack of appropriate activities) in the marine park. • Living cultural landscape information is incorporate into education and interpretation programs for the marine park
Target	<ul style="list-style-type: none"> • BJNAC is satisfied that opportunities for ongoing cultural connection of Bardi and Jawi people to Country are maintained. • BJNAC is satisfied that visitors have been provided with opportunities to increase their understanding that the marine park forms part of the living cultural landscape. • Within five years 50% of surveyed users of the Bardi Jawi Gaarra Marine Park are aware that the area forms part of the living cultural landscape of Bardi Jawi Country.
Reporting	Annual, or as required.



6.2 Looking after Country (KPI)

Bardi and Jawi people carry the responsibilities of their ancestors to manage and speak for Country which has been recognised in Australian Law through a native title determination process.

The interdependence between Bardi and Jawi people and Country is based on respect. Country sustains and provides for Bardi and Jawi people and in return Bardi and Jawi people manage and sustain it through culture and ceremony. This goes to the heart of maintaining good *liyan* (feelings) with Country. It is because of this close connection, that when the land is disrespected, damaged or destroyed, there can be serious consequences for Bardi and Jawi people and their families.



Bardi Jawi Oorany Rangers. Photo – Ian Meechan.

The Bardi Jawi Rangers were established in 2006 to manage Bardi and Jawi Land and Sea Country in such a way as to sustain Traditional Owners' livelihoods and connection to Country. Rangers' work covers cultural and natural resource management, including Sea Country monitoring, fire management, weed control, education and biodiversity monitoring, monsoon vine thicket protection, traditional knowledge transfer, cultural site protection and wildlife surveys. The Bardi Jawi Rangers follow the management objectives and strategies set in the Bardi Jawi IPA plan and management arrangements for the marine park will complement existing management arrangements.

6.2.1 Cultural sites

An important aspect of looking after Country is protecting sacred and significant sites to uphold their cultural integrity. The Bardi Jawi Gaarra Marine Park contains many places of cultural and spiritual importance to Bardi and Jawi people. Many significant sites associated with Law are interconnected through songlines and stories that refer to mythological beings and places far afield (KLC/Bardi Jawi, 2013). Some sites are only for men while others belong to women who, traditionally, would meet to pass on knowledge and gather food (KLC/Bardi Jawi, 2013). The Law grounds are looked after by the *Majamajin* (Law bosses) and are found throughout Bardi and Jawi Country, on different family *booroo* or home places.

Bardi and Jawi people want to make sure that sacred and significant sites are not damaged by visitors and that all Traditional Owners have knowledge about important places (KLC/Bardi Jawi, 2013). Some 'open' sites are important for fishing and camping, or *Lalin* places (where people go hunting for married (breeding) turtles) (KLC/Bardi Jawi, 2013). It is part of cultural responsibility that Traditional Owners visit all important places and regularly check that they have not been disturbed and are still healthy.

Unmanaged visitation is the biggest threat to cultural sites. Most people who visit Bardi and Jawi Country do not intend to do the wrong thing, however, some visitors unknowingly damage cultural sites or go to places where it is not appropriate. It is important for Bardi and Jawi people that Elders who have passed away are not disturbed and their resting places are respected.

The majority of significant cultural sites and places and their associated meaning are poorly known to the wider Australian society. Many occur on land, but many are sea-related. Registered sites include those with artefacts, ceremonial and mythological paintings, *aarli* (fish) traps, burial grounds, man-made structures and middens. There are also likely to be many sites that are not currently registered, as Traditional Owners do not want to draw unwanted attention to the site. All Aboriginal heritage sites, registered and unregistered, are protected under the *Aboriginal Cultural Heritage Act 2021* and it is an offence to alter an Aboriginal site unless permission is granted in accordance with the Act. Cultural values listed in the National Heritage Listing are protected under the EPBC Act.

If management actions may disturb an Aboriginal site, an assessment is required before the operation proceeds. DBCA and Bardi and Jawi joint management partners will work with the Department of Planning, Lands and Heritage and the BJNAC to ensure Aboriginal sites are not damaged. DBCA will comply with the State Government's Cultural Heritage Due Diligence Guidelines when actions are proposed.

Management of this value will focus on promoting the recognition of Bardi and Jawi's cultural responsibilities within the marine park and ensuring cultural sites are maintained and visitors are educated about culturally appropriate visitation. Specific strategies relating to the management of biological resources of cultural significance such as *marnany* (reefs), *goorlil* (turtles) and *odorr* (dugongs) are described in section 7.



Summary of management arrangements for looking after Country (KPI)

Requirements	<ul style="list-style-type: none"> • Recognition and respect of Bardi and Jawi people's rights as native title holder to speak for and look after Country. • Recognition and respect for Bardi and Jawi law and custom and cultural sites. • Ensuring culturally appropriate visitation. • Ensuring information shared by the tourism industry and others is culturally appropriate and factually correct. This includes taking and sharing of photographs and commercial video material.
Pressures	<ul style="list-style-type: none"> • Lack of respect and understanding of culture. • Loss of traditional knowledge. • Lack of resources to manage Country. • Inappropriate and uncontrolled visitation including use of drones and sharing of imagery.
Management objectives	<ul style="list-style-type: none"> • To facilitate and maintain the opportunity for Bardi and Jawi people to care for Country and keep it healthy so that future generations can continue to experience Country. • To conserve and protect sites of cultural significance.

		Management program	Priority
Management strategies Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	1. Ensure marine park management is consistent with cultural Laws and protocols.	Management framework	Principle
	2. Ensure cultural Elders and younger generations are involved in the management of the marine park.	Management framework	Principle
	3. Ensure the management programs for the marine park complement and integrate with those developed and implemented for other areas of Bardi and Jawi Country such as the Bardi Jawi IPA plan.	Management framework	Principle
	4. Develop and implement tools to measure and monitor effects of visitor and management activities on cultural heritage values and sites and implement strategies to address issues where appropriate.	Research	H-KMS
	5. In collaboration with Bardi and Jawi Traditional Owners develop and apply commercial operator licence conditions to ensure culturally sensitive and appropriate visitation in the marine park especially for cultural heritage sites.	Management framework	H-KMS
	6. Implement regulations to restrict or control access to areas within the marine park that Bardi and Jawi Traditional Owners consider unsuitable for visitation (through commercial operator licences, by regulation or other mechanism as relevant) [DPIRD].	Management framework	H
	7. Support BJNAC to explore and implement tailored training, education and mentoring to enable Bardi and Jawi people to fulfil positions of employment relating to the management of the marine park [DPIRD].	Management framework	H
	8. Support BJNAC to build their capacity in the management of the marine park and work collaboratively to develop succession plans, career pathways and support networks.	Management framework	H
	9. Ensure cultural heritage sites in the marine park are protected, particularly significant and sensitive sites at risk.	Management framework	H
	10. Assess the use and condition of cultural sites and implement further strategies to improve the spiritual and physical condition of them where possible.	Research	H
	11. Collaborate with Bardi and Jawi Rangers to patrol, educate and enforce zoning and management arrangements particularly for the special purpose zones (cultural protection) and restricted access areas [DPIRD].	Patrol and enforcement	H

Performance measure	BJNAC level of satisfaction that they have been able to undertake their role as protectors and managers of their Country and culture in the context of jointly managed conservation estate.
Target	BJNAC is satisfied that they have been able to undertake their role as protectors and managers of their Country and culture in the context of jointly managed conservation estate.
Reporting	Annual or as required.





Aarli (fish) trap. Photo – Ian Meechan.



6.3 Language and traditional knowledge (KPI)

Language is more than just a means to communicate, it is an essential characteristic that makes people and communities unique and plays a central role in a sense of identity. Language also carries meaning beyond the words themselves and is an important platform by which much cultural knowledge and heritage is passed on (AIATSIS 2019). If language is lost, then knowledge is lost. Integrating both Indigenous peoples' knowledge and western scientific knowledge is a key element for ensuring the best outcomes for management and conservation (Austin *et al.* 2017).

Originally Bardi and Jawi spoke different languages. Sadly, much of the Jawi language has been lost due to displacement. Recent generations of Jawi Traditional Owners have grown up speaking Bardi and Jawi people have adopted Bardi language which is used in this plan. Bardi language reflects a deep understanding of the land and sea and the plants and animals which inhabit Bardi and Jawi Sea Country. *Booroo* (places) and significant sites have Bardi and Jawi names, and the language is often better suited than English to describing features of Country (KLC/Bardi Jawi, 2013). The *Ardiyooloon Bardi Ngaanka One Arm Point Bardi Dictionary (1999)* has recorded many Bardi words and is a reflection of Bardi people's determination to promote and maintain their language.

Bardi and Jawi Elders hold a wealth of traditional knowledge and when younger Bardi and Jawi people speak for Country they only do so with the authority of the Elders (KLC/Bardi Jawi, 2013). Bardi and Jawi people's knowledge comes from their long association and living relationship with Country as it has changed over thousands of years. As Saltwater people, Bardi and Jawi's traditional knowledge relates to the abundant marine resources that are found in Bardi and Jawi Country. Like other aspects of Bardi and Jawi life and resource harvesting, knowledge of marine resources is underpinned by the six seasons and the life cycles of individual species. Cultural rules and responsibilities established from this knowledge provide guidance on the use of Country, such as when particular species should be harvested.

Management of this value will focus on gaining a better understanding of traditional knowledge applicable to the planning area and investigating opportunities for the integration of knowledge and language with contemporary conservation science and management.



Summary of management arrangements for language and traditional knowledge (KPI)

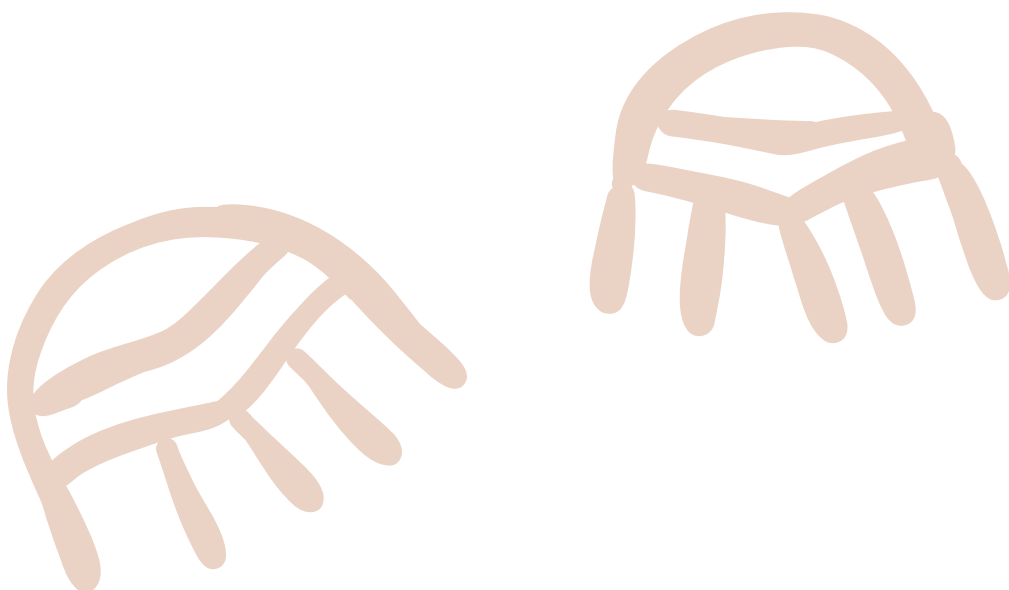
Requirements	<ul style="list-style-type: none"> Increased understanding of and support for Bardi and Jawi's traditional ecological knowledge and its application to park management. The maintenance of knowledge transfer within the Bardi and Jawi community. Recognition of Bardi and Jawi language. 		
Pressures	<ul style="list-style-type: none"> Lack of knowledge transfer to the younger generation. Limited recognition and use of Bardi or Jawi names for places 		
Management objectives	To apply language and traditional knowledge and integrate it with conservation science management in education about the marine park.		
		Management program	Priority
Management strategies Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	<ol style="list-style-type: none"> Where possible, use Bardi and Jawi place names and Bardi and Jawi language in signage, educational material, reporting and naming facilities [DPIRD]. Continue to support the transfer of traditional knowledge through on-Country learning opportunities. Work with Bardi and Jawi to support Bardi and Jawi's language program where relevant to the marine park. Undertake and support research to gain a better understanding of Bardi and Jawi traditional knowledge applicable to the marine park and develop a database to capture this knowledge [DPIRD]. Investigate opportunities and develop a process for integrating Bardi and Jawi's traditional ecological knowledge, and knowledge holders, with conservation science and management applicable to the marine park [DPIRD]. 	Education and interpretation Management framework Management framework Research Research	Principle Principle H-KMS H-KMS H-KMS
Performance measure	BJNAC level of satisfaction that traditional knowledge is being consulted and, where relevant, integrated into the management of the marine park.		
Target	BJNAC is satisfied traditional ecological knowledge is integrated into management of the marine park.		
Reporting	Annual or as required.		

6.4 Enjoyment of Country and customary activities (KPI)

A key aspect of caring for Country and ensuring Bardi and Jawi culture and knowledge is passed on to future generations is the undertaking of customary activities. Customary activities include hunting and fishing for food, visiting important cultural places, gathering bush fruits and making medicines, managing Country through fire at the right time of year, looking after important saltwater species such as *goorlil* (turtles) and *odorr* (dugongs) and engaging in ceremonial events. Following the seasonal calendar to ensure customary activities are carried out at the right time of year is critical to Bardi and Jawi people to ensure their customary activities are sustainable and their Country stays healthy.

As the recognised native title holders of Bardi and Jawi Country, Bardi and Jawi people have the right to enjoy their Country and maintain their customary practices. Providing appropriate areas in the marine park where Bardi and Jawi people can continue to undertake cultural activities and responsibilities for Country in privacy is an important requirement of the marine park. Access restrictions will be used in some areas of the marine park where visitation by marine park users is not culturally appropriate.

Customary activities, including hunting, fishing, gathering and use of resources for personal, domestic and communal needs, will be permitted in all zones of the marine park. Access to marine resources is vital to the health and well-being of Bardi and Jawi people. Hunting and fishing sustain Bardi and Jawi people. A large percentage of their diet still comes from the saltwater due to the nutritional and cost benefit of fishing and hunting on their own Sea Country.



Fish are caught by Bardi and Jawi people from the shore and from boats. Bardi and Jawi people mostly fish with handlines, *goolijarrg* (traditional spears), and modern spear guns. Rods for trolling and bottom fishing are becoming more popular.

Bardi and Jawi people use many plant resources for cultural and everyday purposes. *Banyjoord* and *ilngam* are the two fish poisons available in Bardi Jawi country and are used to teach children and visitors the old ways of fishing. Both types of poison are from tubers which can be dug up when the above-ground plant is present. The tuber is crushed, mixed with wet sand and placed in rock pools, where fish can easily be speared once the poison starts to affect them.

Using and making spears is a feature of saltwater people's lifestyle and choosing the right spear to cut from a standing *wanggay* (pindan wattle tree) to make a *goolajarrg* (small fishing spear) or using the *manawan* tree to make a *jarrar* (turtle and dugong spear) is an important cultural skill. Today these spears are modified with wire and fishing line wrapped around sharpened steel points, but the skill in choosing the tree, straightening the shaft and accurately spearing targets continues to be essential to a saltwater person.



Spearing in the mangroves. Photo – Ian Meechan.

Within the marine park, customary activities such as fishing and hunting are provided for under the management plan. Customary activities are subject to arrangements consistent with the CALM Act and the BC Act and customary fishing is recognised in the FRM Act.

This joint management plan does not provide any additional restrictions on the exercising of native title rights than otherwise agreed by native title holders and in accordance with the CALM Act and CALM Regulations. Customary activities will be managed in accordance with Bardi and Jawi's cultural protocols and [DBCA Policy No. 86 Aboriginal customary activities](#). DPIRD will work with Traditional Owners to co-design customary fishing management arrangements.

Examples of traditional sea resource management practices include seasonal closures, community sharing of food resources to minimise waste, protocols governing who may take and consume particular species from certain areas, and agreements on total allowable catches in an effort to avoid overexploitation (Depczynski *et al.* 2019). The document [Guide to Aboriginal customary activities on Parks and Wildlife managed lands and waters](#) provides guidance to Aboriginal people who wish to practise customary activities in the marine park. Management will focus on providing for, recognising and maintaining the rights of Bardi and Jawi people to enjoy Country and undertake customary practices.



Summary of management arrangements for enjoyment of Country and customary activities (KPI)			
Requirements	<ul style="list-style-type: none"> • Recognition of, and support for, Bardi and Jawi people's rights to enjoy Country and maintain customary practices. • High water quality, healthy biological communities and functioning ecosystems. • Access and privacy for undertaking customary activities (e.g. traditional hunting, visiting/ managing sites etc). • Sharing of marine resources within a sustainable traditional framework. 		
Pressures	<ul style="list-style-type: none"> • Climate change (refer to section 11). • Disturbance and lack of privacy caused by increased visitation. • Commercial activities impacting on Bardi and Jawi people's ability to carry out cultural activities in private or fish/hunt/gather. 		
Management objectives	Recognition of and support for the right of Bard Jawi people to continue customary practices and to benefit from their Country, consistent with the purpose of the marine park.		
		Management program	Priority
Management strategies Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	<ol style="list-style-type: none"> 1. Support Bardi and Jawi people to continue to carry out customary activities, including customary fishing and hunting, in the marine park [DPIRD]. 2. As part of the education and interpretation plan develop mechanisms to inform users of the marine park about Bardi and Jawi rights, as the recognised Traditional Owners, to enjoy Bardi and Jawi Country and maintain their customary practices [DPIRD]. 3. Work with Bardi and Jawi people and other traditional owner groups to develop sustainable management arrangements plan for customary fishing and hunting of marine wildlife (e.g. <i>goorlil</i> (turtles), <i>odorr</i> (dugongs), <i>joorroo</i> (sharks) and <i>barnamb</i> (rays) etc. and develop a customary fishing/ hunting guide [DPIRD]. 4. Develop mechanisms to feedback information to the Bardi and Jawi Community on the condition of customary hunted animals such as green turtles and <i>odorr</i> (dugongs), to support cultural and marine management decisions and facilitate the development and implementation of sustainable management arrangements for customary hunting. 	Management framework Education and interpretation Management framework Management framework	Principle H-KMS H M
Performance measure	BJNAC level of satisfaction that they have been able to continue customary practices and benefit from Country consistent with the purpose of the marine park.		
Target	BJNAC is satisfied that they have been able to continue customary practices and benefit from Country consistent with the purpose of the marine park.		
Reporting	Annual or as required.		

7. Caring for Country (biocultural and ecological values)

Strategic objective:

To protect and conserve biodiversity and ecological health

Ecological values are the intrinsic physical, chemical, geological and biological characteristics of an area. These values can be significant in terms of the biodiversity they represent (i.e. representative, rare or unique) and/or the role they play in maintaining ecosystem integrity. As most plants and animals on-Country are important to Bardi and Jawi people, these values are also referred to as biocultural values. Maintaining the current condition of the ecological and biocultural values, both for their intrinsic value and for the cultural, recreational and commercial benefits they provide, is a key focus for management of the marine park. A knowledge base of biodiversity, key ecological processes and human-induced pressures on these values is required to support effective adaptive management. Research will be a strong focus for the implementation of the management plan and will be designed to fill key knowledge gaps.

7.1 *Marrgoorr* (coral) and *marnany* (reef) communities (KPI)

Marrgoorr (coral) communities are among the most productive and species-rich ecosystems on earth and the Kimberley displays rich coral fauna, in both genera and species (Wilson 2013). More research is required to assess the diversity of *marrgoorr* species in the Kimberley region, but current numbers are likely to be substantial underestimates (Richards *et al.* 2017). Preliminary studies have shown that a significant proportion of near-shore, shallow water filter-feeding species may be new to science.

Inshore *marnany* (reef) communities in the Kimberley are highly divergent from the offshore 'oceanic' *marnany* communities, strongly indicating that these regions are independent in an ecological and evolutionary sense (Richards *et al.* 2017). Radiocarbon dating of *marrgoorr* collected from the Buccaneer Archipelago showed that *marrgoorr* growth commenced in the Kimberley almost immediately after the continental shelf was flooded by rising sea levels at the end of the last ice age some 12 to 15 thousand years ago (Collins *et al.* 2016).

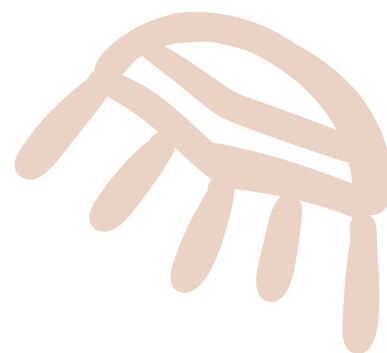
Marnany in the Kimberley region of Australia experience the greatest tidal variation of any tropical location in the world. Despite this fringing *marnany* line the shores of almost all the *iinalang* (islands) in the Kimberley Bioregion (Wilson 2013). Research suggests the main season of spawning on inshore Kimberley reefs is during autumn, but with second multi-specific spawning also occurring during spring (Gilmour *et al.* 2016).

An unusual feature of the *marnany* in the region is the elevation of their *marnany* flats. *Marnany* normally grow vertically until they reach sea level when they then will alternate their growth direction and spread out laterally into deeper water. The *marnany* that have been studied in the area have grown vertically above the mean low water level limit and up to the mean high tide height, by creating terraces of coralline algae. This means they spend half their time exposed above the level of the tide (Richards and O'Leary 2015). This is particularly evident at *Jalan* (Tallon) reef where water can be seen cascading off the reef as the tide falls (Richards and O'Leary 2015). Water that is impounded behind terraces generally forms a shallow, raised lagoon that feeds a series of cascades at low tide.

Marrgoorr and *marnany* communities are very important to Bardi and Jawi people as they provide sustenance and are culturally significant. They are important food gathering places and hunting grounds. The many pools and channels on reefs such as *Jalan* contain fish, oysters and other shellfish which are harvested by Bardi and Jawi people. Bardi and Jawi people continue to use the resources of the *marnany* today, by walking out on the low tide and collecting seafood and medicines and gaining access to rock pools with trapped fish.



Water temperature around these *marnany* ranges from an average 22°C in the dry season to an average 26°C in the wet (KLC/Bardi Jawi 2013). Detailed physiological measurements have shown that *marrgoorr* are highly susceptible to heat stress and bleaching despite being adapted to a naturally extreme temperature environment (McCulloch *et al.* 2017). A bleaching event was recorded on some nearshore *marnany* in the summer of 2016, when temperatures were elevated (McCulloch *et al.* 2017). This was the first time that many Bardi and Jawi people can recall such an event. As the pressure of climate change will be largely outside the control of the managers of the marine park, strategies to better understand, monitor and adapt to climate change are provided separately in section 11.



Summary of management arrangements for <i>marrgoorr</i> (coral) and <i>marnany</i> (reef) communities (KPI)			
Current status	<i>Marrgoorr</i> and <i>marnany</i> are generally in good condition, however bleaching events have been reported in some areas of the Kimberley and may have occurred in the marine park.		
Existing and potential pressures	<ul style="list-style-type: none"> • Climate change impacts including increased severity and frequency of warming events, ocean acidification and increasing cyclone and storm intensity. • Physical disturbance from reef walking and anchoring. • Trophic (knock on) effects to other fauna and flora caused by fishing. • Commercial coral collecting. • Decrease in water quality. • Smothering of corals by sand. 		
Current major pressure	<ul style="list-style-type: none"> • Localised direct damage associated with reef walking. • Climate change impacts (refer to section 11). 		
Management objectives	To ensure that <i>marrgoorr</i> and <i>marnany</i> communities are not significantly impacted by reef walking and other human activities within the marine park.		
		Management program	Priority
Management strategies Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	<ol style="list-style-type: none"> 1. Undertake and/or support research on <i>marrgoorr</i> and <i>marnany</i> communities in the marine park [DPIRD]. 2. Monitor the condition of <i>marrgoorr</i> and <i>marnany</i> communities and the pressures acting on them in the marine park [DPIRD]. 3. Regulate foot access to intertidal <i>marnany</i> and other areas unsuitable for visitation (through commercial operator licences, by regulation or other mechanisms as relevant). 4. Educate users of the marine park about the ecological importance of <i>marrgoorr</i> (coral) and <i>marnany</i> (reef) communities and the potential detrimental effects of indiscriminate <i>marnany</i> (reef) walking, collecting, anchoring and boating activities on communities [DPIRD]. 	Research Monitoring Management framework Education and interpretation	H H H H
Performance measure	Indicators will include: <ul style="list-style-type: none"> • Diversity. • Total <i>marrgoorr</i> (coral) cover. • Community composition. • Colony size distribution. 		
Target	<ul style="list-style-type: none"> • No significant decline in diversity or total <i>marrgoorr</i> (coral) cover as a result of human activity. • No significant change in community composition or colony size distribution as a result of human activity. 		
Reporting	3-5 years.		



7.2 Mangroves, creeks and saltmarsh communities (KPI)

Mangroves are important primary producers of ecological and economic importance. They help to stabilise coasts and control erosion by trapping and binding sediment and provide habitat and refuge areas for a variety of *aarli* (fish), invertebrates and *garrabal* (birds). Mangroves are also important for cultural heritage.

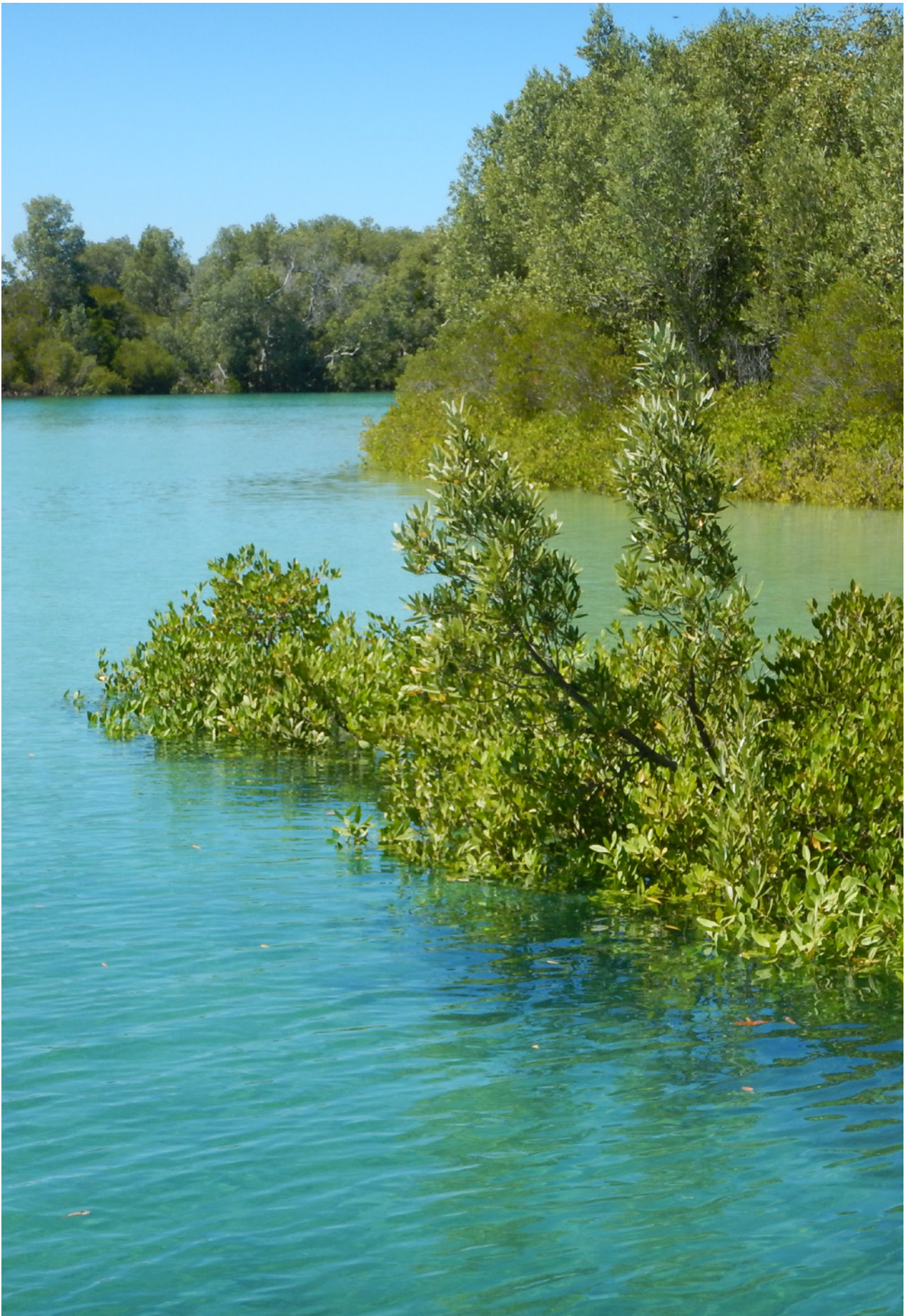
The mangroves of the Kimberley are recognised for being a rare system of mangroves set in a tropical, largely macrotidal environment (Cresswell and Semeniuk 2011). Mangrove lined creeks and bays have formed around many of the islands and coastal headlands in the Bardi Jawi Marine Park. The sheltered embayments along the west coast of Dampier Peninsula, particularly Pender Bay, support extensive mangrove systems (Kenneally *et al.* 1996). These mangroves are typically complex in their zonation and floristic composition although they are less species-rich than those of the north Kimberley where rainfall is higher (Wilson 1994). Of the 18 species of mangroves recorded in the Kimberley, 12 have been recorded from the Dampier Peninsula (Pedretti and Paling 2001, Willing 2011). Bardi and Jawi don't have a collective name for all mangroves, but rather refer to mangroves by the individual species such as *joolboo* (kapok mangrove, *Camptostemon schultzei*), *biindoon* (spotted-leaved red mangrove, *Rhizophora stylosa*), *ngoornngool* (white mangrove, *Avicennia marina*) and *gaarrayoon alarrgarr* (*Osbornia octodonta*).

The mangroves in the proposed marine park have been shown to be important nursery areas for *aarli* (fish). The mangroves studied strongly and almost exclusively provided a nursery habitat for juvenile *marran* (mangrove jack, *Lutjanus argentimaculatus*) and moses perch (*Lutjanus russelli*) (Depczynski *et al.* 2017).

Bardi and Jawi don't have a collective name for all mangroves, but rather refer to mangroves by the individual species such as *joolboo* (kapok mangrove, *Camptostemon schultzei*), *biindoon* (spotted-leaved red mangrove, *Rhizophora stylosa*), *ngoornngool* (white mangrove, *Avicennia marina*) and *gaarrayoon alarrgarr* (*Osbornia octodonta*). Mangrove systems are important customary fishing areas for Bardi and Jawi people for collection of bait, crabs and for fishing. Young Bardi and Jawi men often swim through mangroves with spear guns in search of *joordoo* (mullet), *barbal* (rabbitfish) and *jirral* (trevally). Bardi and Jawi men climb into mangrove trees to await *baboor* (garfish) and *jamalal* (long-tom) which they spear when these *aarli* (fish) swim under shady branches. Wood from mangroves is traditionally used for making harpoons, spears and fishing boomerangs, shields, rafts and shelters (Willing 2011).

Saltmarshes play an important role in binding soil during periods of flood, reducing wind erosion and contributing energy to intertidal ecosystems in the form of organic carbon and phosphorous. Coastal vegetation communities such as saltmarshes play a critical role in regulating atmospheric carbon dioxide concentration by storing carbon in the plants themselves and the sediments below them (McLeod *et al.* 2011). Saltmarsh communities generally fringe the landward side of mangroves in Bardi and Jawi Country. The plants in these marshes can survive extended dry periods when the soil becomes extremely saline.

Mangroves and saltmarsh are protected under the BC Act and native vegetation clearing provisions of the EP Act. Mangroves are particularly vulnerable to oil pollution and these areas should be given a high priority for protection in the event of an oil spill.



Mangrove creek. Photo – Roanna Goater, DBCA.



Summary of management arrangements for mangroves, creeks and saltmarsh communities (KPI)			
Current status	Mangroves are assumed to be in a generally undisturbed condition.		
Existing and potential pressures	<ul style="list-style-type: none"> • Direct (e.g. removal of individuals) and indirect (e.g. changes to community structure) impacts from recreational and commercial fishing (see sections 9.3 & 9.4). • Decrease in water and sediment quality (see section 7.4). • Climate change impacts such as rising sea level, warming of air and sea temperatures, alteration of rainfall patterns and more intense cyclones and storms. • Vehicle damage. 		
Current major pressure	Climate change impacts (refer to section 11).		
Management objectives	To ensure mangrove communities are not significantly impacted by human activities in the marine park.		
		Management program	Priority
Management strategies Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	<ol style="list-style-type: none"> 1. Educate users of the important ecological role and cultural value of mangrove and saltmarsh communities and the potential impacts of human activities, particularly vehicle damage [DPIRD]. 2. Undertake and/or support research to characterise the diversity, density, abundance and distribution of mangrove and saltmarsh communities in the marine park. 3. Monitor the condition of mangrove and saltmarsh communities and the pressures acting on them within the marine park. 	Education and interpretation Research Monitoring	H M M
Performance measure	Indicators will include: <ul style="list-style-type: none"> • Diversity. • Aerial extent. • Canopy density. 		
Target	No significant decline in performance measures as a result of human activity.		
Reporting	3-5 years.		

7.3 Noomool (seagrass) and laanyji (macroalgae) communities (KPI)

Noomool (seagrass) meadows and *laanyji* (macroalgae) are important components of shallow tropical marine environments, providing energy, nutrients and food for a number of endangered and culturally significant fauna, particularly the *odorr* (dugong) and *oondoord* (green turtle, *Chelonia mydas*). They enhance the habitat value of benthic habitats by increasing structural complexity and stabilising soft substrates (Kendrick *et al.* 2016). They vary seasonally in response to water temperature, day length, reproductive cycles, physical disturbance and regrowth. *Noomool* and *laanyji* are protected under the BC Act and FRM Act.

Twelve species of *noomool* have been recorded in the Kimberley. This diversity is considered to be high and comparable to other tropical locations such as Indonesia, Malaysia and the Philippines (Kendrick *et al.* 2017; Huisman and Sampey 2014). They are generally short-lived and dominated by species with fast turnover times and high rates of reproduction, that often disappear during the wet season (Kendrick *et al.* 2018).

Subtidal *noomool* beds are extensive around the western side of the Dampier Peninsular in the Canning Bioregion (Thackway & Cresswell, 1998). The *Iwany* (Sunday Island) Group also stands out as having particularly extensive and diverse *noomool* meadows with eight species being recorded in the raised lagoons of the islands (Kendrick *et al.* 2017). The high rates of growth and consumption of the *noomool* and *laanyji* in the lagoons, show how important the *noomool* beds are for marine herbivores such as green turtles and rabbitfish (*Siganus lineatus*). While *noomool* in the marine park is generally in an undisturbed state, some species such as Pacific turtlegrass (*Thalassia hemprichii*) are growing at the southern limit of their distribution; populations are known to have lower genetic diversity compared to northern populations (Hernawan *et al.* 2016) and are therefore more susceptible to disturbance and environmental change – making them important sentinels of impact (Pederson *et al.* 2016).

Noomool beds are the main focus for Bardi and Jawi men who hunt *goorlil* (turtle) and *odorr* (dugong) as they forage. *Barnamb* (stingrays) and *minimboor* (mullet) are also caught using spears when they become trapped in the *noomool* beds which form shallow lagoons during low tide (Willing, 2011).

More than 270 species of *laanyji* (macroalgae) have been recorded in the Kimberley, most of which are red algae (Huisman & Sampey, 2014). This is fairly typical of the diversity of *laanyji* and many of these species are small, epiphytic algae. Species of the genus *Sargassum* are abundant in inshore habitats and can be important habitat (for example, they shelter juvenile fish) or food (Depczynski *et al.* 2017, Kendrick *et al.* 2016).

Laanyji is affected in the southeast time (*Barrgana*) cold season when the southeast winds blow strongly sometimes for weeks at a time. This can remove a lot of *laanyji* from the reefs in Bardi Jawi Sea Country and cause it to be deposited on the shores during spring tides.

The full distribution of *noomool* and *laanyji* in the marine park is still to be determined. *Noomool* (seagrass) and *laanyji* (macroalgae) are protected under the BC Act.



Summary of management arrangements for <i>noomool</i> (seagrass) and <i>laanyji</i> (macroalgae) communities (KPI)			
Current status	Little known but assumed to be in a generally undisturbed condition.		
Existing and potential pressures	<ul style="list-style-type: none"> • Climate change impacts from warming temperatures and more severe cyclones and storms. • Damage from vessel activity (e.g. anchoring, propeller scour). • Decrease in water and sediment quality (e.g. nutrient and toxicant inputs from development). 		
Current major pressure	Climate change impacts (refer to section 11).		
Management objectives	To ensure the diversity, abundance and condition of <i>noomool</i> and <i>laanyji</i> communities are not significantly impacted by human activities within the marine park.		
		Management program	Priority
Management strategies Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	<ol style="list-style-type: none"> 1. Undertake and/or support research to characterise the diversity, density, abundance and distribution of <i>noomool</i> and <i>laanyji</i> communities in the marine park. 2. Monitor the condition of <i>noomool</i> and <i>laanyji</i> communities and the pressures acting on them within the marine park. 3. Educate users of the important ecological role of <i>noomool</i> and <i>laanyji</i> communities and the potential impacts of human activities, particularly vessel mooring, and nutrient and pollution inputs on these communities [DPIRD]. 	Research Monitoring Education and interpretation	H H M
Performance measure	Indicators to be developed but may include: <ul style="list-style-type: none"> • Total cover. • Diversity. • Community composition. • <i>Noomool</i> biomass. • <i>Laanyji</i> density. • <i>Laanyji</i> canopy height. • Seed bank density 		
Target	<ul style="list-style-type: none"> • No significant decline in total cover, diversity, <i>noomool</i> biomass, <i>laanyji</i> density or <i>laanyji</i> canopy height as a result of human activity. • No significant change in community composition as a result of human activity. 		
Reporting	3-5 years.		

7.4 Water and sediment quality (KPI)

High water and sediment quality are essential to maintain healthy ecosystems. Oceanographic processes, including water temperature, currents, winds, wave action and tidal flow, influence the water and sediment quality by impacting on transport, dispersal and mixing of sediments, biota and pollutants. Marine environmental quality refers to the level of contaminants in water, sediments or biota or to changes in the physical or chemical properties of waters and sediments relative to a natural state (EPA 2016a, 2016b). The relative lack of human population and development in the marine park, combined with strong oceanic mixing and circulation, means that water and sediments are likely to be of high quality, however increased development, shipping and recreational and tourism activities pose a risk to water quality on a local scale if not managed adequately.

Large-scale oceanography in the Kimberley region is highly seasonal and influenced by several ocean processes (Masini *et al.* 2009). Local currents in the proposed marine park are tidal and wind driven. Productivity is driven primarily by tidal movement and terrestrial runoff (DEWHA 2007). The ubiquitous impacts of climate change will increasingly influence the temperature and current flow of Kimberley waters.

Nearshore waters in the Kimberley region are generally turbid, with increasing water clarity further from the coast. The turbid zone can extend out as far as the 100m depth contour but varies depending on the season and location. The boundary between turbid and clear water generally occurs around the 60m depth contour (DEWHA 2007).

Poor water and sediment quality are the most serious known pollution issues affecting Australia's coastal and marine environments (Department of Agriculture, Water and Environment 2020). Most pollutants come from land-based activities (WWF 2018). In addition to degrading habitats, pollution can directly threaten marine fauna. Due to the limited amount of anthropogenic land use adjacent to the marine park, marine pollution is considered to be a low risk to the values of the marine park.

The Environmental Protection Authority (EPA) has a responsibility to protect the quality of the marine environment in Western Australia. The framework for fulfilling this role is set out in the *Environmental Assessment Guideline for Protecting the Quality of Western Australia's Marine Environment* (EPA, 2016a).

7.4.1 Wastewater and sewage discharge

The *Strategy for Management of Sewage Discharge from Vessels into the Marine Environment* outlines guidelines for marine sewage discharge in Western Australian waters (Department of Transport 2009). Three zones apply in state coastal waters

Zone 1- no discharge

Zone 2- discharge only using approved treatment systems

Zone 3- open for discharge of untreated vessel sewage.

Sanctuary zones, special purpose zones (cultural protection), special purpose zones (biocultural conservation) and all waters in the marine park within 500 m of land, islands and aquaculture activities are designated as Zone 1 areas (no sewage discharge). Sewage discharge is permitted in the remainder of the marine park through the gazettal of designated areas under the CALM Regulations.

A Wastewater Treatment Plant (WWTP) has been operating at Ardyaloon since 2001. The treated effluent is discharged into the ocean via a tidal flushing tank located in the intertidal zone. It is recognised that the continuation of this activity is critical to the servicing and health of the Ardyaloon Community and will continue to operate, discharging into a general use area of the marine park.



7.4.2 Marine debris

Marine debris can reduce water quality and cause injury and fatality to wildlife by ingestion of, or entanglement in, the debris. The waters and coastline of the marine park are relatively free of marine debris. Management will focus on preventing marine debris entering the marine environment through education and removing the debris that is found in the marine park. Currently Bardi Jawi Rangers undertake beach surveillance for marine debris through funding from the Commonwealth Department of Agriculture.

7.4.3 Biosecurity

Biosecurity is the management of the risk of animal and plant pests and diseases entering, emerging, establishing or spreading in the marine environment. Ballast water is a major source of marine pests in coastal waters, although marine pests and pathogens can also potentially be spread on the hulls of commercial and recreational vessels transiting through the region. The Australian Government Department of Agriculture, Water and the Environment is responsible for marine pest biosecurity. Part of the Department of Agriculture, Water and the Environment's charter is to ensure that foreign vessels ballast water has been managed in accordance with the *Australian Ballast Water Management Requirements* before permitting discharge inside Australia's territorial sea. Australian ballast water management requirements are consistent with International Maritime Organisation (IMO) guidelines for minimising the risk of translocation of harmful aquatic species in ships' ballast water. DPIRD also carries out inspections of vessels from interstate and overseas for marine pests.

An invasive cyanobacterio sponge *Terpios hoshinota*, which encrusts live coral, giant clams, and other benthos, has been detected on Kimberley inshore coral reefs and poses a risk to the health of the reef systems (Fromont *et al.* 2019). Given its invasive potential, reef health and monitoring surveys should include this species.

7.4.4 Oil spills

Although the risk of a serious marine oil pollution event is considered low, the nature of the habitats and fauna that depend on high water quality (e.g. large intertidal areas, mangroves and rare protected species) means the consequences of such an event could be significant. As the lead agency for developing State policy to prevent and respond to such events, the Department of Transport (DoT) prepared the *Oil Spill Contingency Plan 2015*. The aim of this plan is to outline the management arrangements for the prevention of, preparation for, response to and recovery from a marine oil pollution emergency to minimise the impacts of marine oil pollution from vessels, offshore petroleum activities and other sources in WA State waters.

Summary of management arrangements for water and sediment quality (KPI)			
Current status	Water and sediment quality is likely to be high throughout the marine park.		
Existing and potential pressures	<ul style="list-style-type: none"> • Climate change impacts (e.g. increased water temperatures, riverine input from increased terrestrial monsoonal runoff – increased turbidity). • Marine debris (including microplastics). • Toxicants (e.g. anti-fouling agents, ballast/bilge water discharge). • Increased nutrients (e.g. sewage discharge). • Major pollution events (e.g. oil spills). • Development activities (e.g. development or expansion of existing infrastructure). 		
Current major pressure	Climate change impacts gradually increasing water temperature.		
Management objectives	To ensure that water and sediment quality are not significantly impacted by human activities in the marine park.		
		Management program	Priority
Management strategies Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	<ol style="list-style-type: none"> 1. Develop and implement a biosecurity, detection and mitigation program [DPIRD]. 2. Undertake and/or support research on water and sediment quality in the marine park, including establishing baselines for water and sediment quality. 3. Monitor the condition of water and sediment quality within the marine park including establishing baselines for water and sediment quality variables and identifying the pressures acting on it. 4. Map the areas of the marine park that are highly sensitive to oil and chemical spills and ensure that this information is accessible to the State Marine Oil Pollution Coordination Group [DoT]. 5. Designate areas for vessel sewage discharge and incorporate into education, patrol and enforcement programs to enforce sewage discharge arrangements. 6. As part of on-Country work, patrol the shoreline and waters of the marine park for marine debris and remove and record as necessary, and seek support of partners and marine park users to do the same [DPIRD]. 7. Work with relevant departments, marine park users and stakeholders to address sources of marine debris and abandoned infrastructure in the marine park to reduce the amount of floating, submerged and beached debris and pollution entering the marine park [DPIRD]. 8. Educate users of the importance of good water and sediment quality, and the potential impacts human activities, particularly nutrient and pollution inputs can have on these communities. 	Management Framework Research Monitoring Management Framework Management intervention and visitor services Patrol and enforcement Management intervention and visitor services Education and interpretation	H H H H M M M M
Performance measure	Indicators to be developed but may include: <ul style="list-style-type: none"> • Seawater temperature. • Nutrient concentration. • Pathogen concentration. • Total suspended sediments. 		
Target	No significant change in performance measures as a result of human activity.		
Reporting	3-5 years.		



7.5 Geomorphology including beaches

Cape Leveque marks the southern limit of the Kimberley ria (submerged river valley) coast and the beginning of the very different low relief and sandy coastal types typical of the coast of the IMCRA Canning Bioregion. The large tidal range associated with the coastal geomorphology creates significant areas of intertidal habitat along the coast. Sand dunes, long sandy beaches and a series of deep V-shaped bays are a key feature of the Dampier Peninsula (Marine Parks and Reserves Selection Working Group 1994). Kimberley coast is the largest rocky coast in Australia and is of global geo-heritage significance (Brocx and Semeniuk 2011).

In Bardi and Jawi belief, powerful and creative ancestral beings roamed the sea, creating the geomorphological features seen today including the beaches backed by aeolian (wind-blown) sand dunes, reefs and islands. There are currently no major pressures on geomorphology in the marine park, however there are some localised disturbances where compaction from vehicles occurs.

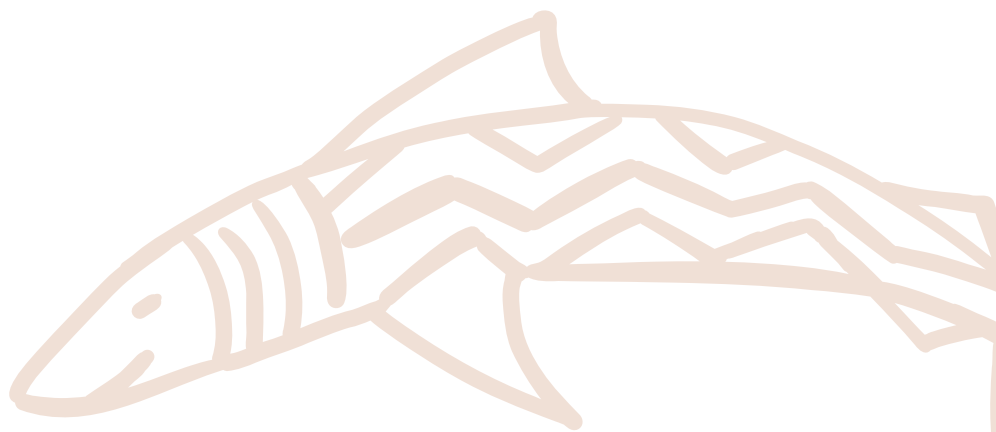
Summary of management arrangements for geomorphology (including beaches)			
Current status	Geomorphology is assumed to be in a generally undisturbed condition.		
Existing and potential pressures	<ul style="list-style-type: none"> • Establishment of coastal infrastructure and mining activities. • Climate change impacts including rising sea level and increased severity of tropical cyclones and storms. • Uncontrolled visitation. 		
Current major pressure	None currently identified.		
Management objectives	To ensure that the seabed structural complexity, geomorphic processes and coastal landforms are not significantly impacted by human activities within the marine park.		
		Management program	Priority
Management strategies Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	<ol style="list-style-type: none"> 1. Undertake and/or support research to characterise the geomorphic features and processes in the marine park. 2. Monitor the condition of geomorphology and the pressures acting on it within the marine park. 3. Ensure that coastal infrastructure and resource development proposals for the area that have the potential to disturb the geomorphology of the marine park are appropriately assessed in accordance with the EP Act. 	Research Monitoring Management Framework	L L As required
Performance measure	Indicators to be developed but may include: <ul style="list-style-type: none"> • Aerial coastline position. • Mean High Water mark. 		
Target	No significant change in performance measures as a result of human activity.		
Reporting	5-10 years.		

7.6 Subtidal filter-feeding communities

Subtidal filter-feeding communities provide important habitat and food for many species. These communities are generally comprised of Poriferans (sponges), Tunicates (sea squirts) and Anthozoans (soft and hard corals). They are generally found in areas with strong currents and hard underwater surfaces (e.g. rocky sea floor), although some types such as sea pens are found in soft sediment habitats (Bryce *et al.* 2018).

The Kimberley region has high sponge diversity with 342 species recorded in the area. Most species are widespread throughout the Indo-Pacific and approximately one third are endemic to Australia (Fromont & Sampey 2014). There is little information on the filter feeding communities in the Bardi Jawi Marine Park, although a survey conducted in 2009 at Packer Island identified 25 species of Porifera, 13 species of Ascidiacea and 19 species of Cnidaria. The same survey conducted at Perpendicular Head identified 11 species of Porifera, nine species of Ascidiacea and 18 species of Cnidaria (Keesing *et al.* 2011).

Filter feeding communities are protected under the BC Act and FRM Act.



Summary of management arrangements for subtidal filter feeding communities

Current status	Unknown, but assumed to be in a generally undisturbed condition, particularly as the entirety of the marine park is closed to prawn trawling and limited dredging has taken place.		
Existing and potential pressures	<ul style="list-style-type: none"> • Decrease in water and sediment quality (see section 7.4). • Damage from anchoring. • Trophic effects of fishing. • Climate change increasing the severity and frequency of warming events and the severity of tropical cyclones (see section 11). 		
Current major pressure	None currently identified.		
Management objectives	To ensure that filter feeding communities are not significantly impacted by human activities within the marine park.		
		Management program	Priority
Management strategies Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	<ol style="list-style-type: none"> 1. Educate users of the important ecological role of subtidal filter feed communities and the potential impacts that human activities can have on these communities [DPIRD]. 2. Undertake and support research to characterise the diversity, density, abundance and distribution of filter feeding communities in the marine park [DPIRD]. 3. Monitor the condition of subtidal filter feeding communities and the pressures acting on them within the marine park [DPIRD]. 	Education and interpretation Research Monitoring	M L L
Performance measure	Indicators to be developed but may include: <ul style="list-style-type: none"> • Diversity. • Total cover. • Community composition. 		
Target	No significant change in community composition as a result of human activity.		
Reporting	3-5 years.		

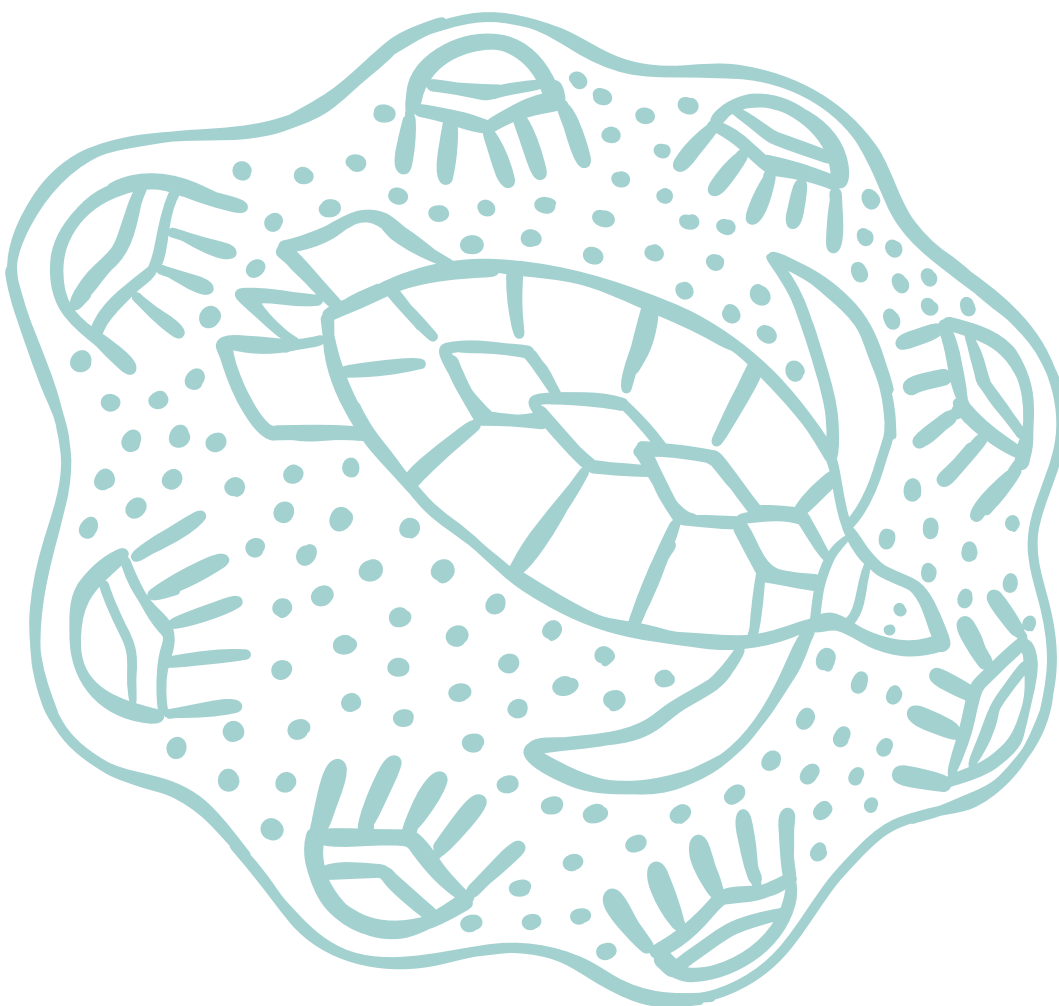
7.7 Intertidal sand and mud flat communities and *oombans* (freshwater soaks)

Although often bare of vegetation, intertidal sand and mudflat areas are colonised by assemblages of microorganisms and burrowing macro-invertebrates, which play a crucial role in primary production and nutrient cycling (Miththapala 2013). Invertebrates that live on the surface of the sand or mud, and burrow into the substrate, regularly turn over and oxygenate the sediment. The abundance of invertebrate life found on intertidal sand and mudflats provides a valuable food source for larger *aarli* (fish) and other organisms which swim over the area at high tide, and for resident and migratory shore *garrabal* (birds).

Extraordinarily wide intertidal sand flats are one of the most notable features along the open ocean shore of the west coast of the Dampier Peninsula. Some of these are more than a kilometre wide at low spring tide. The flats are remarkably rich with dense and diverse populations of bivalved molluscs and other burrowing invertebrates (Marine Parks and Reserves Selection Working Group 1994)

Oomban (freshwater soaks) appear in intertidal sand and mudflats, beaches and salt creeks. *Oomban* are culturally significant and important to Bardi and Jawi people and some have songs associated with them. Although, Bardi and Jawi no longer depend on their water supply for their survival, *oomban* still require careful management to ensure they do not become overgrown.

Intertidal sand and mudflat flora and fauna are protected under the BC Act and FRM Act.



Summary of management arrangements for intertidal sand and mudflat communities			
Current status	Unknown, but assumed to be in a generally undisturbed condition.		
Existing and potential pressures	<ul style="list-style-type: none"> • Climate change impacts such as greater heat stress, sea level rise and more severe cyclones and storms (see section 11). • Direct (e.g. removal of individuals) and indirect (e.g. changes to community structure) impacts from recreational and commercial fishing. • Decrease in water quality (see section 7.4) 		
Current major pressure	None currently identified.		
Management objectives	To ensure that intertidal sand and mudflat communities are not significantly impacted by human activities within the marine park.		
		Management program	Priority
Management strategies Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	<ol style="list-style-type: none"> 1. Undertake and/ or support research to characterise the diversity, community composition and condition of intertidal sand and mudflat communities and <i>oombans</i> in the marine park [DPIRD]. 2. Monitor the condition of intertidal sand and mudflat communities and <i>oombans</i> and the pressures acting on them within the marine park [DPIRD]. 3. Educate users of the important ecological role of intertidal sand and mudflat communities and the potential impacts that human activities can have on these communities [DPIRD]. 	Research Monitoring Education and interpretation	M M M
Performance measure	Indicators to be developed but may include: <ul style="list-style-type: none"> • Diversity. • Species abundance. • Community composition. 		
Target	<ul style="list-style-type: none"> • No significant decline in diversity or species abundance as a result of human activity. • No significant change in community composition as a result of human activity. 		
Reporting	3-5 years.		

7.8 Goorlil (marine turtles) (KPI)

The *noomool* (seagrass), *marnany* (reefs), soft bottom habitats and *jaarla* (sandy beaches) within the marine park are known to support foraging and nesting *goorlil* (turtles). *Goorlil* species identified in the Kimberley include green turtles (*Chelonia mydas*), flatback turtles (*Natator depressus*), loggerhead turtles (*Caretta caretta*), hawksbill turtles (*Eretmochelys imbricata*), leatherback turtles (*Dermochelys coriacea*) and olive ridley turtles (*Lepidochelys olivacea*) (Masini *et al.* 20099)

Research has indicated that green and flatback turtles nest in significant numbers along the Kimberley coast with minor records of nesting olive ridley and hawksbill turtles (Department of Parks and Wildlife 2013 and Whiting *et al.* 2018). Nesting occurs at many widely scattered beaches but also involves mass nesting at high-density rookeries. Small-scale nesting beaches have been identified throughout the marine park.

An inventory of *goorlil* nesting beaches across 12,000km of coastline in the Kimberley region found that the Dampier Peninsula marks a changeover point from summer nesting to winter nesting for *bawanjan* (flatback turtle) (Tucker *et al.* 2014). *Bawanjan* nesting occurs to the south west of the peninsula in the summer, but in the winter flatback nesting occurs to the east of the peninsula including within King Sound. Green turtles nest to the east of the Peninsula in the summer (Tucker *et al.* 2014).

Goorlil is second only to *aarli* (fish) as an important form of dietary protein for the Bardi and Jawi people. Because *goorlil* is much more numerous and available than *odorr* (dugong), it can be hunted all year round. The green *goorlil* (turtle) is mostly the only species taken because of its high quality as food. Because of this, Bardi and Jawi use different words when referring to green turtles, including *ankoorrbini* (small) and *aanngal* (young). Hunting for *goorlil* is very much a part of Bardi and Jawi life, especially amongst younger Bardi and Jawi men. Experienced hunters know how to select a good *goorlil* to hunt from the shape, colour and pattern on its shell, the way it swims and the noise it makes when breathing. A good *goorlil* is rich with fat (KLC/Bardi Jawi, 2013).

During *lalin*, the hot build-up time, *oondood* (married/ mating) *goorlil* are hunted, and the female *goorlil* is especially prized for her undeveloped eggs and the rich flavour of the meat. *Goorlil* meat is distributed according to the hunters' relationships. Bardi and Jawi people want to maintain this deep knowledge and continue their traditional practices (KLC/Bardi Jawi, 2013). Bardi and Jawi Traditional Owners have also expressed a need to balance hunting turtles for food with sustainability, which is outlined in the Bardi Jawi IPA Plan.

All marine *goorlil* species found in Western Australian waters are protected under the State BC Act and the Commonwealth EPBC Act. The BC Act provides for the sustainable harvesting of turtles for Aboriginal customary purposes.





Goorlil (green turtle). Photo – Roanna Goater.

Summary of management arrangements for <i>goorlil</i> (marine turtles) (KPI)			
Current status	Research suggests populations of <i>goorlil</i> are healthy in the marine park.		
Existing and potential pressures	<ul style="list-style-type: none"> • Disturbance from human interaction (e.g. boat strike, noise, nest disturbance, artificial light). • Loss or degradation of critical habitat (e.g. <i>noomool</i> (seagrass) and nesting beaches). • Entanglement in and ingestion of marine debris. • Unsustainable customary take. • Climate change impacts from rising sea level and increased cyclone severity may increase the risk of tidal inundation of nests. Higher temperatures could affect reproductive processes and food resources. 		
Current major pressure	Climate change (see section 11).		
Management objectives	<ul style="list-style-type: none"> • To ensure <i>goorlil</i> are not significantly disturbed by human activities occurring within and on the boundary of the marine park. • To manage customary harvesting of <i>goorlil</i> for cultural and ecological sustainability. 		
		Management program	Priority
Management strategies	<ol style="list-style-type: none"> 1. Ensure that management of <i>goorlil</i> in the marine park supports relevant international and regional agreements (e.g. Convention of Migratory Species of Wild Animals and MoU on the Conservation and Management of Marine Turtles and their Habitats of Indian Ocean and South-East Asia). 2. Undertake and/or support research to characterise natural variability, movement patterns and critical habitats for <i>goorlil</i> within the marine park. 3. Monitor the condition of <i>goorlil</i> and the pressures acting on them within the marine park. 4. Educate users of the marine park on how to reduce damage to <i>goorlil</i> habitat and impacts on individuals and to respect cultural practice 5. Refer to section 6.4 for strategies relating to customary take. 	<p>Management Framework</p> <p>Research</p> <p>Monitoring</p> <p>Education and interpretation</p>	<p>Principle</p> <p>H</p> <p>H</p> <p>H</p>
<p>Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.</p>			
Performance measure	<p>Indicators will include:</p> <ul style="list-style-type: none"> • Species abundance of resident <i>goorlil</i>. • Population structure of resident <i>goorlil</i>. • Spatial distribution of resident <i>goorlil</i>. • Mortality of resident <i>goorlil</i>. • Species abundance of nesting <i>goorlil</i>. • Spatial distribution of nesting <i>goorlil</i>. • Hatchling production. • Hatchling mortality. 		
Target	<ul style="list-style-type: none"> • No significant decline in hatchling production or species abundance of resident or nesting <i>goorlil</i> as a result of human activity. • No significant change in population structure of resident <i>goorlil</i> or distribution extent of resident or nesting <i>goorlil</i> as a result of human activity. • No significant increase in mortality of resident turtles or hatchlings as a result of human activity. 		
Reporting	Annual or as required.		



7.9 Aarli (fish) including joorroo (sharks) and barnamb (rays) (KPI)

The broad range of habitats in the marine park including *marrgoorr* (coral) *marnany* (reefs), *noomool* (seagrass) and mangrove creeks each support a unique and diverse array of *aarli* (fish) communities. It is therefore important that the full range of habitats in the marine park are protected. The Kimberley region supports some of the highest diversity and abundance of *aarli* in Australia (Moore & Morrison 2009, Moore *et al.* 2014 2020). Over 1500 species have been recorded in the area and it is home to nearly half of all species found in Western Australia (Moore *et al.* 2014, 2020). Environmental factors such as seasonal changes, diurnal cycles, tidal ranges and variations in nutrient loads have been shown to influence the assemblage structure of *aarli* in the Kimberley region (Travers *et al.* 2012, 2018). Mangrove associated *aarli*, for example, have been shown to be strongly influenced by tidal amplitude, salinity, and distance to reefs (Bradley *et al.* 2021). This has important implications for management of *aarli* within the Kimberley region, which exhibits complex hydrological conditions.

Aarli is the most important food for the Bardi and Jawi people, for its nutritional value and because it is the most available food on-Country. Fishing is a major feature of Bardi and Jawi lifestyle, undertaken by young and old. *Aarli* are sought when they are at their fattest, with the highest nutritional value. Fishing is guided by the seasonal calendar to ensure *aarli* targeted are caught at the right time of year. The most sought-after species of *aarli* are the *goolan* (small bluebone), *barrambarr* (large bluebone), *jirral*, numerous species of *yawilil* (trevally), *joordoo* (mullet) *joorloo* (spanish flag), *maarrarn* (mangrove jack), *biindarral* (coral trout), *biidib* (rock cod), *birrinyan* (queenfish), *gambarl* (surgeonfish), *gooloorrganjoon* (mackerel) and *barnamb* (stingray).

Australian waters are rich in *joorroo* (shark) and *barnamb* (ray) fauna with over 320 species recorded (MacNeil *et al.* 2020). Many *joorroo* are apex predators and play an important ecological role in the marine environment. Their presence in natural abundances is an indication of a healthy ecosystem. *Joorroo* and *barnamb* are diverse in the Kimberley and include threatened and protected species such as sawfish, *marrgaliny* (hammerhead sharks, *Sphyrna* sp.) and manta rays (*Mobula* sp.). The Kimberley along with the northern Pilbara are important refuges for sawfish, with four of the world's seven species found here (Morgan *et al.* 2011). Sawfishes are considered the most threatened group of marine fishes, with all species on the IUCN Red List as Critically Endangered or Endangered. Freshwater sawfish are pupped in the macrotidal estuary of King Sound during the wet season and migrate into the Fitzroy River estuary and then into the non-tidal, freshwater reaches of the river (Lear *et al.* 2019). Analysis of data and research from satellite tagging of both *Pristis clavata* and *Pristis zijsron* suggests they have limited, tidally influenced, movements and occupy a restricted range of only a few square kilometres within the coastal fringe (Stevens *et al.* 2008).

Some *joorroo* and *barnamb* in Bardi and Jawi Country are associated with stories while others are sought for food. Bardi people traditionally prized the liver of two *joorroo* species for food; the blacktip reef shark (*Carcharhinus melanopterus*), and the gummy shark (*Mustelus antarcticus*) which is now rarely eaten (Willing 2011). Two species of *barnamb* are mostly frequently hunted; *jangarr* which are hunted from boats in the wet season and *yawiny* which are speared on foot in pools among the mangroves at low tide. The larger *joorroo* species, *marrgaliny* (hammerhead, *Sphyrnidae* sp.), *gandarr* (tiger shark, *Galeocerdo cuvier*) and *arragool* (bronze whaler shark, *Carcharhinus brachyurus*) are treated with respect.

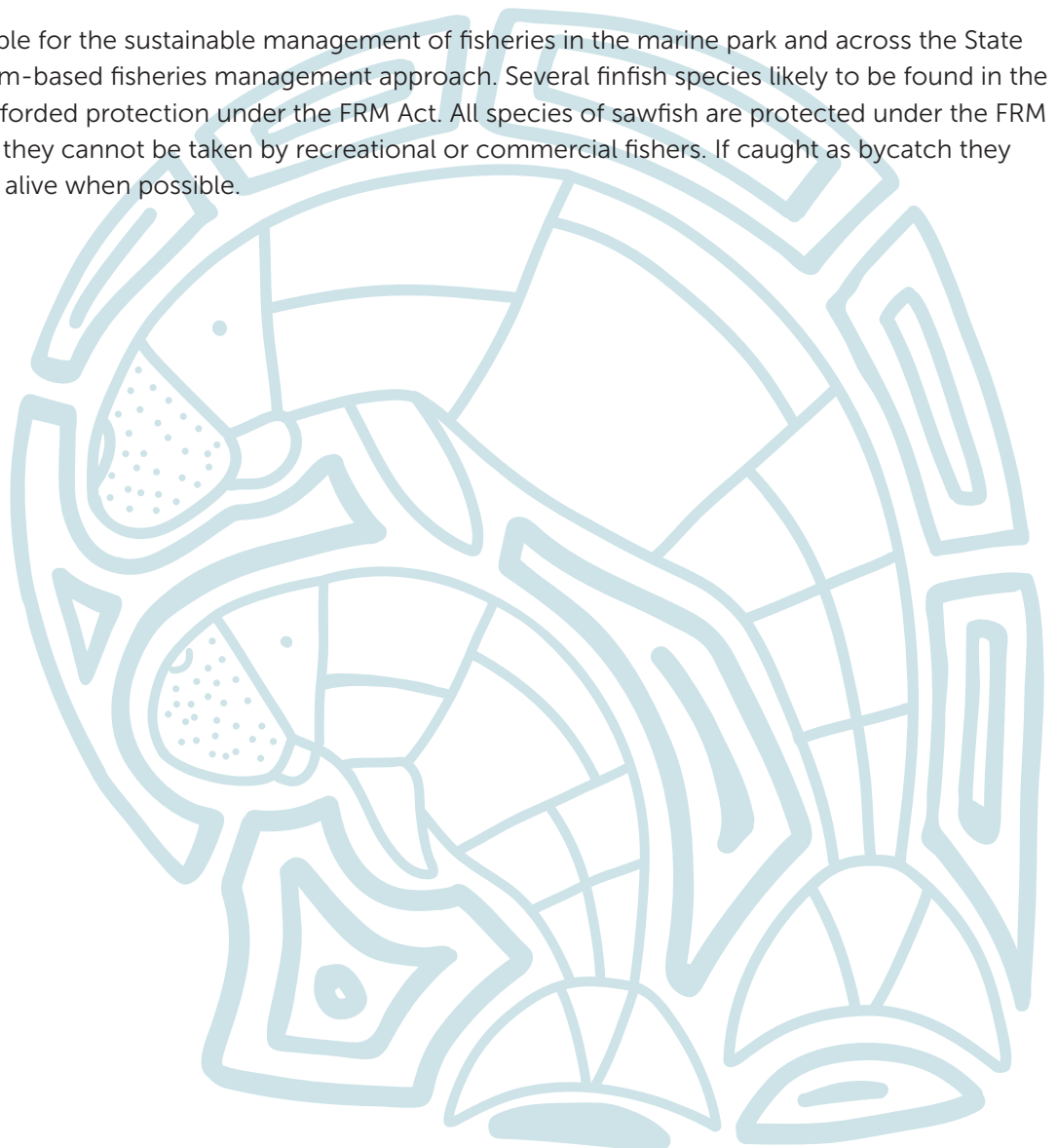
Loolooloo, a dreaming ancestor associated with saltwater, is said to manifest as a shark that helps guide people if they are in trouble whilst travelling or hunting on Sea Country (Frank Davey in Vigilante *et al.* 2013).

“Two sharks shared everything they got between each other, and one day *Mardgaliny* got greedy and never gave *Loolooloo* any fat *goorlil* (turtle) meat. So *Loolooloo* got angry and they had a fight, and *Loolooloo* got a shield and hit *Mardgaliny* over the head, and it got stuck. That is why we have the hammerhead shark today, and call *Marrgaliny* after the shield, *Mardga*.” (as told by Edward James, IPA Plan)

The main pressures on *aarli* in the marine park are fishing and climate change. *Aarli* are assumed to be in a generally good condition in the marine park. While DPIRD is responsible for the management of *aarli* and aquatic resources through the State, within the marine park a representative system of sanctuary zones, special purpose zones (cultural protection) and special purpose zones (biocultural conservation) (see section 12.2), regulations under the FRM Act and relevant research, monitoring and education strategies will be used to collectively address marine park values.

Threats to *joorroo* and *barnamb* include fishing, entanglement, inappropriate interaction such as feeding *joorroo*, loss and degradation of habitats, pollution and reduced access to prey resources. *Joorroo* and *barnamb* are particularly vulnerable to overfishing as they are often slow growing, late maturing, long-lived with slow reproductive rates.

DPIRD is responsible for the sustainable management of fisheries in the marine park and across the State using an ecosystem-based fisheries management approach. Several finfish species likely to be found in the marine park are afforded protection under the FRM Act. All species of sawfish are protected under the FRM Act, meaning that they cannot be taken by recreational or commercial fishers. If caught as bycatch they are to be released alive when possible.



Summary of management arrangements for *aarli* (fish) including *joorroo* (sharks) and *barnamb* (rays) (KPI)

Current status	<i>Aarli</i> communities in the marine park are assumed to be in a generally good condition. <i>Joorroo</i> and <i>barnamb</i> populations in the Kimberley are in good condition but location specific information for the marine park is not available.
Existing and potential pressures	<ul style="list-style-type: none"> • Fishing including incidental catch, bycatch and local depletion of some targeted species. • Loss and degradation of critical habitat (i.e. nursery areas, aggregation areas). • Entanglement in and ingestion of marine debris. • Climate change impacts on habitat and food availability. • Tourism. • Illegal foreign fishing.
Current major pressure	<ul style="list-style-type: none"> • Fishing. • Climate change (see section 11).
Management objectives	<ul style="list-style-type: none"> • To ensure non-targeted (those not targeted by recreational and commercial fishers) <i>aarli</i>, <i>joorroo</i> and <i>barnamb</i> species are not significantly impacted by human activities within the marine park. • To manage targeted (those targeted by recreational and commercial fishers) <i>aarli</i>, <i>joorroo</i> and <i>barnamb</i> species for cultural and ecological sustainability.

		Management program	Priority
Management strategies Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	1. Undertake or support research to characterise <i>aarli</i> , <i>joorroo</i> and <i>barnamb</i> diversity, abundance, biomass/size frequency, movement patterns and critical habitats within the marine park and to understand the ecological role of targeted <i>aarli</i> species and the consequences of their removal [DPIRD for targeted species].	Research	H
	2. Monitor the condition of <i>aarli</i> , <i>joorroo</i> and <i>barnamb</i> stocks and the pressures acting on them in the marine park [DPIRD for targeted species].	Monitoring	H
	3. Educate users about recreational fishing rules and the ecological importance of <i>aarli</i> (fish), <i>joorroo</i> (sharks) and <i>barnamb</i> (rays) [DPIRD]	Education and interpretation	H
	4. Refer to additional strategies in sections 6.4, 9.3 and 9.4.		

Performance measure	Indicators will include: <ul style="list-style-type: none"> • Diversity. • Species abundance. • Species size distribution. • Protected species abundance. • Community composition.
----------------------------	---

Target	<p>Sanctuary zones³</p> <ul style="list-style-type: none"> • No significant decline in diversity, species abundance, species size structure or protected species abundance as a result of human activity. • No significant change in community composition as a result of human activity. <p>SPZ (cultural protection), SPZ (biocultural conservation) and general use zones³</p> <ul style="list-style-type: none"> • No significant decline in species richness or protected species abundance as a result of human activity. • No significant change in community composition as a result of human activity. • No change in target species abundance or target species biomass beyond ecologically sustainable levels as a result of human activity (to be determined in consultation with DPIRD).
---------------	--

Reporting	3-5 years.
------------------	------------

3 - Refer to section 12 for the location of zones and permitted activities and uses.



Sand Flats at Kooljaman. Photo- Michael Higgins, DBCA

7.10 *Odorr* (dugongs) (KPI)

Odorr (dugongs) are an important species in marine ecosystems and are of high cultural significance. *Odorr* often aggregate in protected shallow bays and mangrove channels. They primarily feed on a suite of ephemeral seagrasses and migrate depending on seasonality and food availability. Northern Western Australia has one of the largest remaining *odorr* (dugong) populations in the world, extending from the Northern Territory border to Shark Bay. The estimated number of *odorr* in the Kimberley region is approximately 12,600 (Bayliss and Hutton, 2017).

Since 2007, the Bardi Jawi Rangers have participated in satellite tracking of *odorr* to improve the understanding of local migration patterns, educate the community and gain more support for species conservation. *Odorr* in the Kimberley can move large distances over short periods of time. To date there have been limited anthropogenic threats to *odorr* in the Kimberley, making the area an important global stronghold for the species (Bayliss and Hutton, 2017).

Cultural harvesting of *odorr* has been carried out for thousands of years. *Odorr* always played a major role in Bardi and Jawi culture, and their use has been well documented. *Odorr* hunting takes place in the cooler months, typically May to July, when they appear in Bardi and Jawi Country. The annual harvest of *odorr* can fluctuate widely, probably dependent on the availability of seagrass along the Kimberley coast (KLC/Bardi Jawi 2013).

Experienced hunters avoid hunting pregnant *odorr* or mothers with young calves. Most Bardi and Jawi people believe that the introduction of outboard motors has made *odorr* increasingly wary of boats. Chasing an *odorr* during a hunt is not favoured by older hunters, who say it reduces the quality of the meat. Many older men advocate for a return to *galaway* (sculling) and want to see younger hunters learn and use this technique (KLC/Bardi Jawi 2013).

In the days before dinghies and outboard motors, Bardi and Jawi men were adept at hunting *odorr* and *goorlil* (turtle) from their *gaalwa* (mangrove wood rafts) with *jadarr* (wooden spears). *Galaway*, (the sculling technique) requires skill to enable hunters using only a paddle and their judgement of the tide and current to locate themselves close enough to an animal to be able to take a shot. This style of hunting is much closer to the traditional method. Another change has been the introduction of fridges and freezers, allowing the meat to be kept fresh for longer. Consequently, hunters are often approached by relatives in Broome and further afield for a share of meat from Country for their families. This has widened the distribution circle and put more pressure on skilful hunters and the species (KLC/Bardi Jawi 2013). Management of this value will focus on protecting the habitat which is important for *odorr* and developing sustainable management arrangements for customary hunting of marine wildlife (see section 6.4).

All *odorr* (dugongs) in Australian waters are protected under the BC Act and the Commonwealth EPBC Act. The BC Act provides for the sustainable harvesting of *odorr* for Aboriginal customary purposes. *Odorr* are also identified as a key management target in the Bardi Jawi IPA plan.

Summary of management arrangements for <i>odorr</i> (dugongs) (KPI)			
Current status	<i>Odorr</i> are assumed to be in good condition, although they appear in typically low densities and are patchily distributed.		
Existing and potential pressures	<ul style="list-style-type: none"> • Disturbance from human interaction (e.g. boat strike, noise). • Loss or degradation of critical habitat (e.g. <i>noomool</i> (seagrass) (see section 7.3)). • Entanglement in and ingestion of marine debris. • Disease. • Unsustainable customary take. • Climate change impacts may alter movement patterns and survival rates. Impacts on <i>noomool</i> (seagrasses) (e.g. from warming events and increased intensity of cyclones) are predicted to have flow on effects for <i>odorr</i> population. 		
Current major pressure	Climate change (see section 11).		
Management objectives	<ul style="list-style-type: none"> • To ensure <i>odorr</i> are not significantly impacted by human activities in the marine park. • To manage customary harvesting of <i>odorr</i> for cultural and ecological sustainability. 		
		Management program	Priority
Management strategies	<ol style="list-style-type: none"> 1. Undertake and/or support research on the abundance, distribution, natural variability and habitat requirements of <i>odorr</i> in the marine park. 2. Monitor the condition of <i>odorr</i> and the pressures acting on them within the marine park. 3. Educate users about ways to minimise disturbance to <i>odorr</i> and respect cultural practice. 4. Maintain records of the incidence of boat collisions with <i>odorr</i>. <p>Refer to section 6.4 for strategies relating to customary take.</p>	Research Monitoring Education and interpretation Monitoring	H H H M
	<p>Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.</p>		
Performance measure	Indicators will include: <ul style="list-style-type: none"> • Abundance. • Spatial distribution/home range. 		
Target	<ul style="list-style-type: none"> • No significant decline in <i>odorr</i> abundance as a result of human activity. • No significant change in <i>odorr</i> distribution as a result of human activity. • Management targets for sustainable customary harvesting of <i>odorr</i> to be developed in collaboration with relevant Joint Management partners. 		
Reporting	3-5 years.		



7.11 *Miinimbi* (whales) and *bayalbarr* (dolphins)

Humpback whales are known to inhabit the waters of the marine park in large numbers between June and November each year. The Western Australian humpback whale population, known as Breeding Group D, is the largest humpback whale population in the world. Since they were protected in Australian waters in 1963 and worldwide in 1965, the group D population has recovered from an estimated low of 800 individuals to current estimates close to 33,000 (Salgado-Kent *et al.* 2012). The group migrates from summer feeding grounds in Antarctic waters to the coastal calving areas of the northwest of Western Australia. Pender Bay has been recognised as an important calving, breeding, feeding (inferred), resting and staging area (Blake *et al.* 2011). A study has found that humpback whale activity is concentrated at Pender Bay for longer durations than other areas of the Kimberley (Thums *et al.* 2018).

A number of *bayalbarr* (dolphin) species are known to inhabit the Bardi Jawi Marine Park. Snubfin dolphins (*Orcaella heinsohni*) and Australian humpback dolphins (*Sousa sahulensis*) are broadly distributed throughout coastal waters of the Kimberley and have been recorded in a variety of shallow-water ($\leq 30\text{m}$) habitats, including tidal inlets and creeks; sheltered bays with mangroves; exposed stretches of open rocky coast; and shallow sand and mud habitats extending up to 35 km offshore (Brown *et al.* 2016 and Bouchet *et al.* 2021). Research on coastal dolphins indicates that they have high sight-fidelity and limited gene flow (Parra *et al.* 2006).

Research has found that Cygnet Bay is regularly used by a small number of snubfin and humpback dolphins. Genetic analysis of snubfin dolphins has found that there is limited gene flow between snubfin dolphins sampled at Cygnet Bay and Roebuck Bay, about 250kms to the south (Brown *et al.* 2016). A significant genetic difference was found between snubfin dolphin pods between Cygnet Bay and Cone Bay, which are about 60kms apart (Brown *et al.* 2016). Pender Bay, which has extensive mangrove growth, is also a significant area for bottlenose dolphins (*Tursiops* sp.), Indo-Pacific bottlenose dolphins and Australian snubfin dolphins (DEWHA 2008).

Populations of *miinimbi* and *bayalbarr* in the marine park are likely to be healthy. Threats to *miinimbi* and *bayalbarr* include physical disturbance from vessels and vessel strike, entanglement, inappropriate interaction, loss and degradation of habitats, pollution and reduced access to prey resources.

All *miinimbi* and *bayalbarr* are protected under the BC Act and EPBC Act. A licence is required for marine tourism operators in the marine park and wildlife viewing is controlled by a code of conduct which includes minimum approach distances, maximum boat speeds and restrictions on the use of lights in the vicinity of wildlife. Restrictions also apply to recreational activities. All vessels must stay 100 metres away from a *miinimbi* (whale), or if a *miinimbi* approaches a vessel the motor must be in neutral or be driven at less than five knots away from the *miinimbi*. Restrictions also exist on recreational and commercial drone flying around marine mammals.

Summary of management arrangements for <i>miinimbi</i> (whales) and <i>bayalbarr</i> (dolphins)			
Current status	Humpback whales are considered to be in good condition. Little is known about other <i>miinimbi</i> species inhabiting the marine park. Populations of snubfin dolphins are considered to be in good condition although little is known about other <i>bayalbarr</i> species.		
Existing and potential pressures	<ul style="list-style-type: none"> • Disturbance from human interaction (e.g. boat strike, noise). • Entanglement in and ingestion of marine debris. • Climate change impacts may affect movement patterns and food availability. 		
Current major pressure	None identified.		
Management objectives	To ensure <i>miinimbi</i> and <i>bayalbarr</i> are not significantly impacted by human activities in the marine park.		
		Management program	Priority
Management strategies	<ol style="list-style-type: none"> 1. Facilitate large whale disentanglement response training for relevant departmental staff and Bardi Jawi Rangers. 2. Educate users about ways to minimise disturbance to <i>miinimbi</i> (whales) and <i>bayalbarr</i> (dolphins), including rules for whale watching. 3. Maintain a record of stranding and mortalities of <i>miinimbi</i> (whales) and <i>bayalbarr</i> (dolphins) in the marine park. 4. Monitor the condition of <i>miinimbi</i> and <i>bayalbarr</i> and the pressures acting on them within the marine park. 5. Undertake and/or support research to characterise <i>miinimbi</i> and <i>bayalbarr</i> diversity, abundance, natural variability and critical habitats within the marine park. 	Management Framework Education and interpretation Monitoring Monitoring Research	H H M L L
Performance measure	Indicators will include: <ul style="list-style-type: none"> • Diversity. • Key species abundance. • Key species spatial distribution. 		
Target	<ul style="list-style-type: none"> • No significant decline in diversity or key species abundance as a result of human activity. • No significant change to key species distribution as a result of human activity. 		
Reporting	2-3 years.		





Mangroves. Photo – Roanna Goater.

7.12 *Linygurra* (estuarine crocodiles)

Linygurra (estuarine crocodiles) are apex predators which have been protected in Australia since the 1970s after 30 years of unregulated hunting drove their numbers to extreme lows. Genetic studies of *linygurra* have identified that West Kimberley populations are genetically distinct from Northern Territory populations (Halford and Barrow 2017). The overall number of estuarine *linygurra* in the Kimberley region is still unknown, however, a recent study conducted in the Prince Regent and Roe-Hunter river systems showed that populations are recovering. The relative lack of larger *linygurra* found in studied rivers of the Kimberley compared to those in the Northern Territory indicates a less mature recovery. It is likely that the Kimberley populations will continue to increase in abundance and size structure (Halford and Barrow 2017). Anecdotal sightings of crocodiles in Bardi and Jawi Country are reported to be increasing.

Linygurra are protected under the BC Act and the EPBC Act. Management strategies to reduce the risk of interactions between *Linygurra* and users of the marine park is described in section 9.2.

Summary of management arrangements for <i>linygurra</i> (estuarine crocodiles)			
Current status	<i>Linygurra</i> populations are considered to be increasing.		
Existing and potential pressures	<ul style="list-style-type: none"> • Disturbance from human interaction and altered behaviour through feeding. • Entanglement in and ingestion of marine debris. • Climate change impacts from rising sea level and increased cyclone severity may increase the risk of tidal inundation of nests. Higher temperatures could affect reproductive processes and food resources. • Illegal hunting. 		
Current major pressure	None identified.		
Management objectives	To ensure <i>linygurra</i> are not significantly impacted by human activities in the marine park.		
		Management program	Priority
Management strategies	<ol style="list-style-type: none"> 1. Educate users about known and potential distributions of <i>linygurra</i> and of the risk of feeding them and ensure compliance. 2. Undertake and/or support research on the abundance and condition of <i>linygurra</i> in the marine park. 3. Monitor the condition of <i>linygurra</i> and the pressures acting on them within the marine park. 	Education and interpretation	M
Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.		Research	L
		Monitoring	L
Performance measure	Indicators will include: <ul style="list-style-type: none"> • Abundance. • Size distribution. • Spatial distribution/home range. 		
Target	<ul style="list-style-type: none"> • No significant decline in the abundance of <i>linygurra</i> as a result of human activity. • No significant decline in the size distribution of <i>linygurra</i> as a result of human activity. • Spatial distribution/home range 		
Reporting	5-10 years.		



7.13 Sea and shore garrabal (birds)

Seabirds are generally those *garrabal* (birds) that forage at sea for the greater part of their lives. Shorebirds are *garrabal* that commonly feed by wading in shallow water or saturated substrate along the shores of lakes, rivers and sea. The islands of the Kimberley region are an important area for maintaining populations of *garrabal* (birds) which are threatened on mainland Australia due to human pressures and feral predators. As no comprehensive surveys have been performed in the area, there is only limited information about populations and the distribution of sea and shore *garrabal* in the marine park.

Large breeding colonies of roseate terns (*Sterna dougallii*) have been reported on *Joowanan* and *Moorroodooloon* (Twin Islands) and they feed on *aarli* (fish) in the marine park. Bardi and Jawi traditionally collected the eggs of *giido* (oystercatchers) and *garril* (terns) from the Twin Islands during *barrgana* season (July to June) (Conservation Commission, 2010).

All *garrabal* are protected under the BC Act with some species also protected under the EPBC Act. Some migratory species are also subject to international treaties and Australia has obligations to protect species listed under those treaties.



Crested terns foraging around the Twin Islands. Photo – Roanna Goater, DBCA.

Summary of management arrangements for sea and shore <i>garrabal</i> (birds)			
Current status	The current condition of sea and shore <i>garrabal</i> populations in the marine park is unknown.		
Existing and potential pressures	<ul style="list-style-type: none"> • Disturbance to feeding, roosting and nesting activity by people, vessels and low flying aircraft and drones. • Loss or degradation of critical habitat (e.g. coastal vegetation, intertidal sand and mudflats). • Entanglement in and ingestion of marine debris. • Climate change impacts including increased temperatures and increased intensity of storm and cyclone events. 		
Current major pressure	None identified.		
Management objectives	To ensure that sea and shore <i>garrabal</i> (birds) that inhabit or migrate through the marine park are not significantly impacted by human activities in the marine park.		
Management strategies		Management program	Priority
Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	1. Educate users about ways to minimise disturbance to sea and shore <i>garrabal</i> including the use of drones.	Education and interpretation	H
	2. Undertake and/or support research to characterise sea and shore <i>garrabal</i> diversity, abundance, natural variability, movement patterns and critical habitats within the marine park.	Research	L
	3. Monitor the condition of sea and shore <i>garrabal</i> and the pressures acting on them within the marine park.	Monitoring	L
Performance measure	Indicators will include: <ul style="list-style-type: none"> • Species abundance. • Breeding success. • Seasonal distribution. 		
Target	<ul style="list-style-type: none"> • No significant decline in the abundance of sea and shore <i>garrabal</i> species as a result of human activity. • No significant decline in breeding success of sea and shore <i>garrabal</i> species as a result of human activity. 		
Reporting	3-5 years.		



7.14 Invertebrates

Marine invertebrates are those marine animals without a backbone and include trochus, crabs, squid, cuttlefish, shellfish, corals, sponges, anemones, sea squirts, urchins and marine worms. Management arrangements for habitat forming invertebrates such as corals and sponges have been described in sections 7.1 and 7.6 and benthic invertebrate fauna strongly associated with intertidal sand and mudflats are discussed in section 7.7. Invertebrates have important functions within the ecosystem as a food source for other invertebrates, *aalii* (fish) and migratory *garrabal* (birds), as well as in nutrient cycling.

There is little known about the invertebrate populations of the marine park, although a survey conducted on soft-sediment habitats in 2009 at Packer Island identified 21 species of Crustacea, six species of Crinoidea (feather stars), 21 species of Mollusca and 22 species of Echinodermata. In a similar survey at Perpendicular Head, 16 species of Crustacea, five species of Mollusca and 20 species of Echinodermata were identified (Keesing *et al.* 2011).

Invertebrates which are particularly sought after by Bardi and Jawi people for food include *ngarrangg* (mud crabs), rock oysters, clams and trumpet shell. Bardi and Jawi people also use some invertebrates for bait.

Bardi, Jawi and Mayala Traditional Owners commercially harvest *alngir* (trochus) for sale both locally and overseas. It is a small fishery based on a single species (*Trochus niloticus*). Following implementation of management arrangements in 1998-1999 by DPIRD (then Department of Fisheries), combined with reduced market demand, the *alngir* (trochus) fishery has remained sustainable. The fishery's low impact collection methods result in minimal impact on reef habitat and the wider ecosystem generally, and there is no bycatch in the fishery (Gaughan and Santoro 2020) (see 9.4 section for more information).

Under the FRM Act, DPIRD is responsible for the sustainable management of the recreational and commercial take of invertebrate species using strategies such as bag and size limits, closures and quotas.

Summary of management arrangements for invertebrates	
Current status	The current condition of invertebrate populations in the marine park is unknown but assumed to be in a good condition.
Existing and potential pressures	<ul style="list-style-type: none"> • Recreational, customary and commercial fishing, including targeted fishing (e.g. prawns, crabs, squid, octopus, lobster, oysters), live shell collecting (e.g. specimen shells and hermit crabs), bait collection, bycatch and local depletion of some targeted species. • Degradation of critical habitat as a result of human activities (e.g. reef walking, development and aquaculture). • Climate change impacts such as changes in the intensity of cyclones and storms. • Illegal foreign fishing.
Current major pressure	<ul style="list-style-type: none"> • Climate change (see section 11). • Fishing
Management objectives	<ul style="list-style-type: none"> • To ensure non-targeted invertebrate species are not significantly impacted by human activities within the marine park. • To manage targeted invertebrate species for cultural and ecological sustainability.

		Management program	Priority
Management strategies Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	1. Educate users about ways to minimise disturbance and taking of invertebrates (e.g. trumpet shells and clams) [DPIRD].	Education and interpretation	H
	2. Undertake and/or support research to characterise the diversity, abundance, natural variability, distribution and habitat requirements of invertebrates within the marine park and to understand the ecological role of targeted invertebrate species and the consequences of their removal [DPIRD for targeted species].	Research	M
	3. Monitor the condition of invertebrates susceptible to localised depletion in the marine park and take remedial action if human activities are impacting these species [DPIRD for targeted species]. Refer to additional strategies in sections 6.4, 9.3 and 9.4.	Monitoring	M
Performance measure	Indicators to be developed but may include: <ul style="list-style-type: none"> • Community richness. • Target species abundance. • Introduced species abundance. • Community composition. • Other to be developed by DPIRD for targeted species. 		
Target	Sanctuary zones⁴ <ul style="list-style-type: none"> • No significant decline in community richness, or target species abundance as a result of human activity. • No significant increase in the abundance of introduced species as a result of human activity. • No significant change in community composition as a result of human activity. Special purpose zones (cultural protection), SPZ (biocultural conservation) and general use zones⁴ <ul style="list-style-type: none"> • No Significant decline in community richness as a result of human activity • No significant increase in the abundance of introduced species as a result of human activity. • No significant change in community composition as a result of human activity. • No change in target species abundance beyond ecologically sustainable levels as a result of human activity (to be determined in consultation with DPIRD). 		
Reporting	3-5 years.		

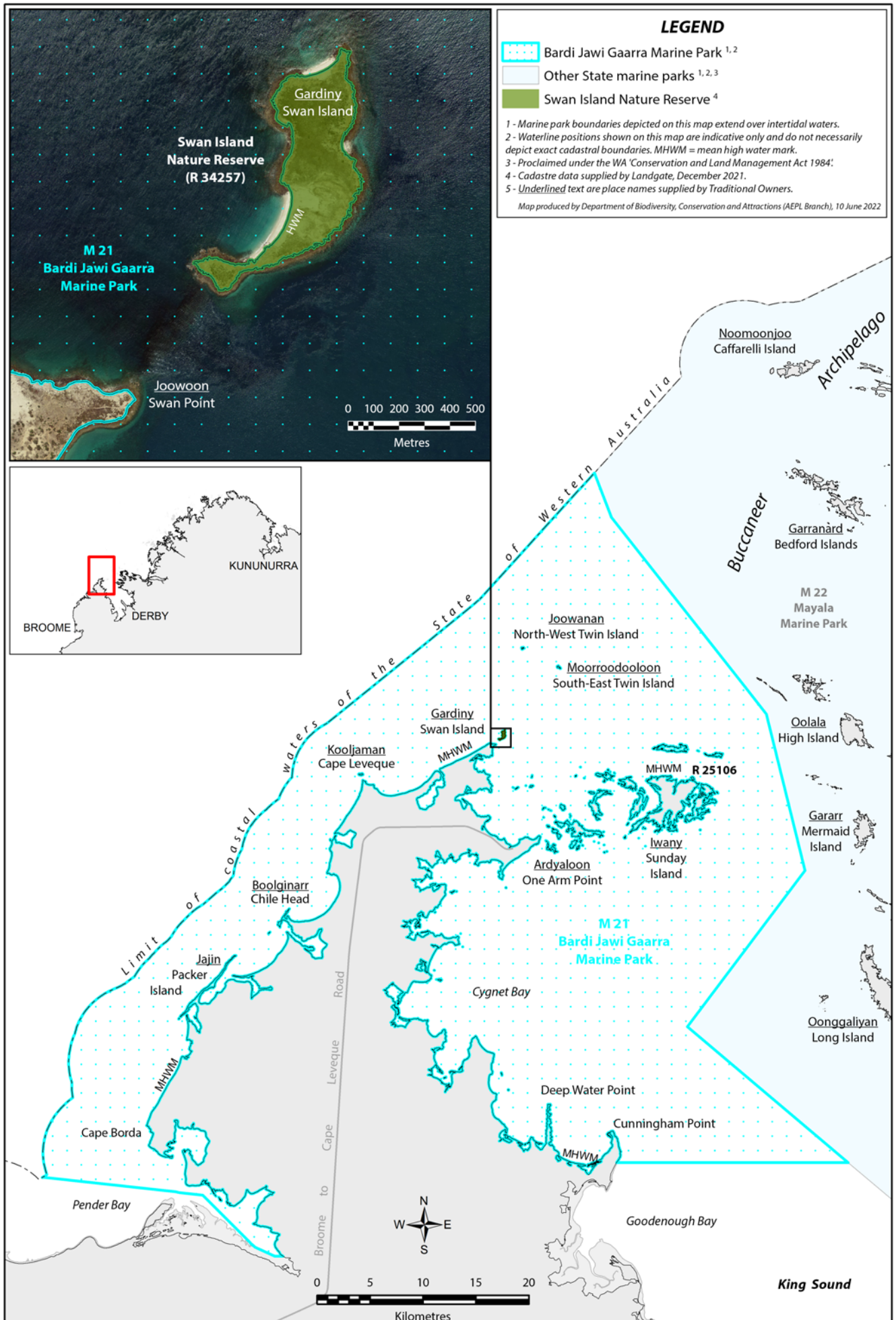
4 - Refer to section 12 for the location of zones and permitted activities and uses.



8. Swan Island Nature Reserve

Gardiny (Swan Island) is an 18 hectare reserve located to the north east of Swan Point on the tip of the Dampier Peninsula (Map 5). In 1976, the Swan Island Nature Reserve (Reserve 34257) was gazetted as a nesting place for the lesser frigatebird and reserved as a Class A nature reserve for the purpose of conservation of flora and fauna. Since its gazettal as a nature reserve, Bardi and Jawi people have held a long-term aspiration to reclaim management of the island. The Swan Island Nature Reserve will be jointly managed with Bardi and Jawi Traditional Owners and vested in the Commission. Despite being initially reserved to protect the breeding population of the lesser frigatebird, nesting no longer occurs on the island. The nature reserve will continue to protect nesting turtles. The nature reserve will not be accessible to visitors.

Summary of management arrangements for Swan Island Nature Reserve			
Current status	Assumed to be in a near natural state with the exception of the area which was cleared for the lighthouse and associated infrastructure.		
Existing and potential pressures	<ul style="list-style-type: none"> • Fire. • Introduced animals and plants. • Climate change. 		
Current major pressure	None identified.		
Management objectives	To identify, protect and conserve the natural and cultural values of Swan Island.		
		Management program	Priority
Management strategies	<ol style="list-style-type: none"> 1. Ensure cultural heritage values, cultural knowledge and cultural Laws and protocols inform land management. 2. Rename the Swan Island Nature Reserve to its traditional name. 3. Implement restrictions on visitor access as required for cultural or environmental reasons (through commercial operator licences, by regulation or other mechanisms as relevant). 4. Undertake or support baseline surveys of native plants, animals and ecological communities. 	Management Framework Management Framework Management Framework Research	Principle M M L
Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.			
Performance measure	To be determined by the JMB.		
Target	To be determined by the JMB.		
Reporting	To be determined by the JMB.		



Map 5: Swan Island Nature Reserve locality and tenure



9. People on-Country (social and economic values)

Strategic objective: To support and enhance a sustainable balance between community use, recreation, tourism and other commercial activities within the marine park.

9.1 Bardi and Jawi economic development opportunities

This joint management plan recognises Bardi and Jawi Traditional Owners have a need and inter-generational obligation to maintain family livelihoods and sustain existence from their land and saltwater Country and its resources. Identification and development of commercial opportunities and investments that can deliver incomes and capacity to sustain Traditional Owners living on-Country will be an early and ongoing park management focus.

The creation of the marine park will contribute to long-term employment for Bardi and Jawi Traditional Owners on-Country through the provision of jobs associated with the marine park, including direct employment and fee for service work for management purposes.

Summary of management arrangements for Bardi and Jawi economic development opportunities			
Requirements	High environmental and aesthetic quality.		
Management objectives	To enable Bardi and Jawi Traditional Owners to realise livelihoods and achieve economic benefits from their Sea Country, consistent with the purpose of the marine park.		
		Management program	Priority
Management strategies Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	1. Identify opportunities to provide a range of employment, business and career development opportunities that are culturally appropriate and relevant to the management of the marine park [DPIRD].	Management Framework	H-KMS
	2. Seek to employ or train Bardi and Jawi people in roles relating to the management of the marine park [DPIRD].	Management Framework	H-KMS
	3. Work with stakeholders to facilitate Bardi and Jawi employment opportunities in industries such as the tourism industry.	Management Framework	H
	4. Encourage and support Bardi and Jawi people to develop and enhance business opportunities on-Country [DPIRD].	Management Framework	H
	5. Support BJNAC to attract funding to assist with management of the marine park [DPIRD].	Management Framework	M

9.2 Visitation, tourism and visitor safety

The marine park features spectacular scenery, diverse wildlife and cultural heritage which provide excellent opportunities for nature-based and cultural recreational activities and tourism experiences. Recreation and tourism will allow people to experience the marine park, develop an appreciation of the cultural and ecological values, and support conservation outcomes, whilst creating economic benefits for the region.

Kimberley tourism has been growing in recent years with visitor numbers reaching an average record high of 593,000 in 2017 (KDC 2019). Tourism makes a significant contribution to the Kimberley region's economy and generates approximately \$563 million annually or 10% of the region's economic output, with visitation to the area's unique natural environment a major attraction (REMPPLAN 2020). Approximately 33,000-36,000 visitors a year currently visit the Dampier Peninsula by road (KPP Business Development 2018).



Tourism at Kooljaman. Photo – Roanna Goater, DBCA.

The types of tourism operating in and immediately surrounding the marine park includes coastal camps, cultural tours and the expedition cruise boat industry, which operates multiday tours between Broome and Wyndham. Tourists generally visit the region between April and October to enjoy the climate, wildlife, remote seascapes, cultural sites and fishing.

Bardi and Jawi are keen to expand on the tourism potential of their Country to create jobs for Bardi and Jawi people on-Country, whilst promoting cultural understanding and respect by immersing tourists in a cultural experience. The tourism potential of Bardi and Jawi Country will be further enhanced by the sealing of the Broome-Cape Leveque Road. At least a 76 percent increase in visitors to the Dampier Peninsula in the first 10 years of the road being sealed is predicted (KPP Business Development 2018). Management arrangements in this plan will help to fulfil the tourism potential of the area whilst ensuring the protection of the values which tourists seek. Once established, visitors to the marine park will be encouraged to sign up to a voluntary marine park pass before visiting the marine park. It is intended that this will educate visitors on culturally appropriate visitation, marine park values and management arrangements.

The CALM Act and CALM Regulations require commercial businesses operating in marine parks and reserves to have a commercial operations licence and abide by the conditions outlined in the DBCA's *Commercial Operator Handbook*. Recreation and tourism activities are managed in accordance with Parks and Wildlife Policy No. 18 – Recreation, tourism and visitor services. DBCA's *Commercial Operator Handbook* provides specific information for commercial businesses operating in a marine park or reserve.



9.2.1 Mooring and anchoring

Management of moorings and anchoring is a key aspect of managing increasing vessel use in Western Australia's marine parks. With an expected increase in commercial and recreational vessels visiting and operating in the marine park, it is expected that mooring and anchoring activities will increase over time. The marine park allows for mooring and anchoring activities, however if not installed and maintained correctly, moorings may cause irreversible damage to the surrounding habitat and pose a risk to marine park users and property. Refer to the department's Policy Statement 59: Mooring Policy for further information regarding the management of moorings within marine parks. If required, a mooring and anchoring plan may be developed for the marine park.

9.2.2 Visitor safety

Visitor risk management is an important focus for DBCA and Bardi and Jawi Traditional Owners. Bardi and Jawi Traditional Owners are concerned for the safety and wellbeing of visitors to their Country. The remote nature of the marine park, combined with the large intertidal areas, strong tides and currents, occurrence of *linygurra* (estuarine crocodiles), extreme weather conditions including tropical cyclones, pose risks to visitors. This is particularly dangerous for visitors who may be inexperienced in, or unprepared for, such conditions.

Visitors to the marine park are advised to be mindful of the risk that estuarine crocodiles pose to their safety. Interactions with *linygurra*, such as illegally feeding them, are inappropriate and can have serious effects. In 2017 DBCA adopted the 'Be Crocwise' safety campaign used in the Northern Territory and Queensland to increase knowledge and awareness of appropriate behaviour in crocodile risk areas.

As visitation to the marine park is likely to increase during the life of the management plan, an ongoing visitor risk management program will be undertaken to identify potential hazards and actions to be taken to minimise these. Risks to visitors are managed under the framework of the department's Policy Statement No. 53 – Visitor Risk Management Policy.

The policy seeks to ensure that the department implements VRM procedures and practices through a consistent and integrated approach that:

- minimises the potential for incidence of injury to visitors on lands and waters managed by DBCA
- encourages appropriate behaviour by visitors on lands and waters managed by the department that will reduce the risks posed by their activities
- aligns with industry standards and best practice principles, and
- will enable departmental staff to effectively manage visitor risk.

Other departments and organisations which have a shared responsibility for visitor safety in the marine park include;

- DoT which is responsible for installing and maintaining navigation aids and other boating safety measures in all State waters (DBCAs policy No. 59 provides direction on the control and management of moorings within marine parks and reserves).
- The Australian Maritime Safety Authority (AMSA) which is responsible for ensuring domestic commercial vessels comply with the requirements of the *Marine Safety (Domestic Commercial Vessel) National Law Act 2012*.



Bardi Jawi Gaarra (saltwater). Photo - Michael Higgins, DBCA

9.2.3 Visitor access

There are a number of areas in Bardi and Jawi Country where access may be restricted to non-Traditional Owners using CALM Regulations for various reasons including protecting highly significant cultural areas such as lore grounds, safety reasons, providing privacy for Traditional Owners engaging in cultural practices and for other cultural reasons. The use of regulations to restrict vessel access will be limited to areas within the sanctuary zones or special purpose zones (cultural protection). Access may be granted to non-Traditional Owners if authorisation is acquired. The location of the restricted access areas will be confirmed during the development of the visitor management plan.

Summary of management arrangements for visitation, tourism and visitor safety			
Current status	<ul style="list-style-type: none"> • High environmental and aesthetic quality (e.g. minimal debris, undeveloped marine and coastal areas). • Equitable access to natural values of the marine park. • Provision of areas free of human impacts for nature appreciation. 		
Management objectives	<ul style="list-style-type: none"> • To provide for nature-based and cultural tourism activities and ensure that they are managed in a manner that is consistent with maintaining the cultural, ecological and social value of the marine park. • To maintain the cultural, ecological and social values of the marine park that are important for nature-based and cultural tourism. • To minimise risks to visitors and encourage appropriate behaviour. 		
		Management program	Priority
Management strategies	<ol style="list-style-type: none"> 1. Encourage the establishment of Bardi and Jawi owned commercial tourism businesses in the marine park [DPIRD]. 2. Ensure promotion and marketing of the marine park is consistent with Bardi and Jawi's aspirations and cultural protocols. 3. Work with Bardi and Jawi people and commercial operators to promote culturally appropriate visitation and facilitate the establishment of high-quality commercial tourism operations that [DPIRD]: <ul style="list-style-type: none"> • Increase visitor enjoyment and safety • Demonstrate a commitment to protect and promote the park's cultural, natural, recreation and tourism values • Ensure staff and passengers behave appropriately and respectfully at cultural sites • Conduct operations according to Parks and Wildlife Service policy and licence conditions [Tourism WA] • Foster community stewardship of the marine park • Reduce impacts on sites • Enhance visitor's cultural experiences. 	<p>Management intervention and visitor services</p> <p>Management intervention and visitor services</p> <p>Education and interpretation</p>	<p>Principle</p> <p>Principle</p> <p>H-KMS</p>
<p>Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.</p>			

		Management program	Priority
	4. In collaboration with Bardi and Jawi Traditional Owners and BJNAC, develop a visitor management plan.	Management intervention and visitor services	H-KMS
	5. Develop a voluntary visitor pass, for the marine park to plan for sustainable and culturally appropriate visitor usage.	Management intervention and visitor services	H
	6. Conduct a visitor survey to gather data on use of the marine park including visitor numbers, locations and anchoring points to understand potential impacts and direct monitoring programs.	Management intervention and visitor services	H
	7. Assess the need for a mooring and anchoring plan in the marine park and implement if required.	Management intervention and visitor services	H
	8. Conduct periodic visitor risk assessment in the marine park as required and mitigate identified issues [AMSA, DoT, DPIRD].	Management intervention and visitor services	H
	9. Undertake a review of shipping activity in the marine park to determine the need for navigational measures such as compulsory pilotage, speed limit and/or designation of shipping routes [DoT].	Management framework	H
	10. Maintain a quantitative and qualitative spatial database of human use in the marine park.	Management intervention and visitor services	H
	11. Work with relevant agencies and industry bodies to adapt and improve existing mapping programs or apps reflecting marine park risks and zoning [DPIRD, DoT, WA Police, AMSA].	Education and interpretation	H
	12. Educate marine park users of the risks in the marine park including, strong currents, cyclones and crocodiles.	Education and interpretation	H
	13. Facilitate <i>linyurra</i> (estuarine crocodile) handling and removal training for relevant departmental staff and Mayala rangers.	Management framework	H
	14. Work with relevant agencies to prepare for and respond to emergencies situations e.g. search and rescue.	Management Framework	M
	15. Educate marine park users about protocols and regulations for the use of drones in the marine park to minimise impacts and disturbance to marine park values.	Education and interpretation.	M
	16. Promote opportunities for sustainable recreation and tourism, including the provision of visitor facilities if required.	Management intervention and visitor services	L
Performance measure	<ul style="list-style-type: none"> • Visitor satisfaction (e.g. experiences and expectations) as determined by the Visitor Monitoring Program. • Number of visitor safety incidents reported to DBCA and/or the JMB. 		
Target	<ul style="list-style-type: none"> • Visitor satisfaction is 85% or above within 5 years. • No increase in the total number of serious visitor safety incidents per capita compared to baseline levels. 		
Reporting	To be determined by JMB.		



9.3 Recreational fishing

Recreational fishing in the marine park is highly valued by the Kimberley community and tourists alike due to the quality of its sport and game fishing. Fishing is a key part of the Kimberley lifestyle and is central to how people live. The Bardi Jawi Gaarra Marine Park and surrounds provides a diversity of fishing experiences, including a range of species and habitats not available in the waters directly adjacent to Broome or Derby. Whether it is spending time with family and friends, connecting with nature or teaching children about boating and fishing, the local recreational fishers have advised they have a deep connection with Bardi Jawi Sea Country. Approximately 49 percent of the marine park is available for unguided recreational fishing. A further 26 percent of the marine park is available for fishing through a traditional owner supported tourism operation.

The main targeted *aarli* (fish) on the western coast of the Dampier Peninsula are *birrinyan* (queenfish), *jirral* and *yawilil* (trevally), *joorloo* (spanish flag), and *biindarral* (coral trout). The mangrove lined creeks and channels in the marine park also provide excellent fishing for threadfin salmon, *iingalan* (barramundi), *Lates calcarifer*, and *maarrarn* (mangrove jack).

The potential pressures associated with recreational fishing in the marine park include by-catch of unwanted non-target species, overfishing of targeted species and associated impacts on other ecological values (i.e. from litter, discarded/ broken off fishing gear and disturbance of sensitive habitats). Whilst Bardi and Jawi people welcome culturally appropriate recreational fishing, they have concerns about the potential impacts of recreational fishing activity in the marine park on their ability to continue to access healthy *aarli* (fish) stocks for customary use. Recreational fishing in the marine park is predicted to increase as visitation to the region grows and will need to be carefully monitored to ensure it remains ecologically sustainable and is culturally appropriate for all to enjoy.

There are some areas in the marine park which are of high cultural significance and valued highly by non-traditional owners for recreational fishing. Some of these areas have been zoned as a special purpose zone (biocultural conservation). The purpose of these zones is to provide for the conservation of ecologically and culturally important marine ecosystems such as *marnany* (reefs) and mangroves whilst continuing to allow for low impact recreational and commercial activities. The JMB will work with DPIRD, traditional owners and stakeholders to develop additional fisheries regulations for these zones to ensure that recreational fishing carried out in these zones is culturally appropriate.

Sanctuary zones which prohibit extractive activities such as commercial and recreational fishing will be used to ensure ecologically important and representative areas of ecosystems are protected from a variety of pressures including commercial and recreational fishing. Special purpose zones (cultural protection) will also be applied which limit extractive activities for cultural reasons (refer to zoning section).

While DPIRD is responsible for the management of *aarli* (fish) and aquatic resources throughout the State, within the marine park a representative system of sanctuary zones, special purpose zones (cultural protection) and special purpose zones (biocultural conservation) (see section 12.2), regulations under the FRM Act and relevant research, monitoring and education strategies will be used to collectively address marine park values.

The JMB will work closely with DPIRD to ensure management arrangements for recreational fishing are in place to ensure *aarli* (fish) are sustainably managed into the future, in line with cultural values.

Summary of management arrangements for recreational fishing			
Requirements	<ul style="list-style-type: none"> • High water quality. • Maintenance of critical habitats for recreationally targeted <i>aarli</i> (fish) species. • Maintenance of recreationally targeted <i>aarli</i> (fish) stocks. • Access to suitable and culturally appropriate recreational fishing areas within the marine park. 		
Management objectives	<ul style="list-style-type: none"> • To maintain the ecological values of the marine park that support recreational fishing. • To ensure that, in collaboration with the community and DPIRD, recreational fishing is managed in a manner consistent with maintaining the marine park's cultural and ecological values while providing for social uses and enjoyment. • To work collaboratively with agencies, stakeholders and the community to maintain and promote safe and enjoyable recreational fishing opportunities in the marine park. 		
		Management program	Priority
Management strategies	<ol style="list-style-type: none"> 1. Through a collaborative approach with traditional owners Recfishwest, and recreational fishers, develop fishing regulations for the SPZ (biocultural conservation) which help ensure recreational fishing is culturally appropriate [DPIRD]. 2. Work with BJNAC and Elders to develop, communicate and promote a Bardi and Jawi-led sustainable fishing protocol including traditional seasonal calendars and access restrictions for dissemination to recreational fishers, fishing clubs and commercial tour operators [DPIRD]. 3. Educate recreational fishers on the zoning scheme, fisheries regulations and any restrictions that may apply to their activities in the marine park [DPIRD]. 4. Conduct research to determine if ecosystem effects from recreational fishing occur in the marine park and undertake adaptive management actions if required [DPIRD]. 5. Monitor recreational fishing catch and effort in the marine park and report the results to DBCA and the Commission for the periodic reviews of the implementation of the management plan [DPIRD]. 6. Investigate whether the take of recreationally targeted species is sustainable in the marine park and undertake adaptive management actions if required [DPIRD]. 		
Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.		Management framework	H-KMS
		Education and interpretation	H-KMS
		Education and interpretation	H
		Research	H
		Monitoring	H
		Research	M



9.4 Commercial fishing

Commercial fisheries that operate within the boundaries of the marine park include the Kimberley Gillnet and Barramundi Managed Fishery, which operates in the nearshore and estuarine zone of the marine park; a small *alngir* (*Trochus*) Fishery run by Bardi and Jawi and Mayala based on the collection of a single target species, *Tectus niloticus*; the mackerel managed fishery; a developing mud crab fishery and the Specimen Shell Managed Fishery. Other fisheries licenced to operate in the marine park included the Northern Demersal Scalefish Fishery, the Marine Aquarium Fishery and the Beche de mer Fishery. The Joint Authority Northern Shark Fishery has been inactive since 2008 and the whole of the marine park lies within a permanent prawn and fish trawl closure area.

When conducted sustainably, commercial fishing has social and economic benefits. Unsustainable fishing practices can result in unwanted bycatch, habitat damage and destruction, ecosystem degradation, altered food web dynamics and a decline in stocks. Commercial fishing in Western Australia is managed by DPIRD under the FRM Act using an ecosystem-based fisheries management approach. The department and joint management partners will work with DPIRD to ensure the continued sustainability of commercial fishing practices in the marine park. Zones which prohibit extractive activities will be used to ensure ecologically important and representative areas of ecosystems are protected from a variety of pressures including commercial fishing.

Summary of management arrangements for commercial fishing			
Requirements	<ul style="list-style-type: none"> • High water quality. • Maintenance of critical habitats for commercially targeted <i>aarli</i> (fish) species. • Maintenance of commercially targeted <i>aarli</i> (fish) stocks. • Access to suitable and culturally appropriate areas for commercial fishing within the marine park, where consistent with the objectives of the marine park. 		
Management objectives	<ul style="list-style-type: none"> • To maintain the ecological values of the marine park which are important to the continuation of commercial fishing industries. • To ensure that, in collaboration with the industry and DPIRD, commercial fishing is managed in a manner that is consistent with maintaining the values of the marine park. 		
		Management program	Priority
Management strategies	<ol style="list-style-type: none"> 1. Ensure Bardi and Jawi are kept informed and where possible involved in the monitoring and management measures for commercial <i>aarli</i> (fish) stocks in the marine park [DPIRD]. 2. Work with commercial fishers, through peak stakeholder bodies, to ensure operations are conducted in a culturally sensitive manner [DPIRD]. 3. Conduct research to determine if ecosystem effects from commercial fishing occur in the marine park and undertake adaptive management actions if required [DPIRD]. 4. Investigate the extent and significance of interactions between commercial fishing and marine mammals and other protected species and address as required [DPIRD]. 5. Monitor commercial fishing catch and effort in the marine park to inform periodic reviews of the implementation of the management plan and make data available to MIAC/JMB [DPIRD]. 	<p>Monitoring</p> <p>Management Framework</p> <p>Research and monitoring</p> <p>Research</p> <p>Monitoring</p>	<p>Principle</p> <p>H</p> <p>H</p> <p>H</p> <p>M</p>
<p>Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.</p>			

9.5 Aquaculture

The high water quality and high tidal range of the Bardi Jawi Gaarra Marine Park makes ideal conditions for aquaculture.

There are two aquaculture leases in Bardi and Jawi Country. One of the leases is associated with the Ardyaloon hatchery which was established to address declining stocks of *Trochus niloticus* and to create a commercially sustainable industry harvesting the shell. The hatchery has been successful in restocking juvenile *alngir* (trochus) to support community members commercially fishing for the species and for sale to the Australian aquarium industry (Ardyaloon Hatchery 2020).

The intensity and type of environmental impacts from aquaculture activities is dependent on the species farmed, the intensity of production and on the farm location. Finfish culture involves an addition of solids and nutrients to the marine environment which can cause a build-up of organic material beneath *aarli* (fish) farms and can impact on the flora and fauna of an area. Additional threats include impacts from farm discharges and waste products, the escaping of organisms and transmission of disease.

DPIRD will continue to manage aquaculture in the marine park. Aquaculture will be permitted in general use zones of the marine park and managed under the FRM Act. The primary role of management in relation to aquaculture in the marine park will be to work with the aquaculture industry to ensure activities are culturally, socially and ecologically sustainable and appropriate and to help maintain the excellent environmental conditions of the marine park upon which the industry depends.

Summary of management arrangements for aquaculture			
Requirements	<ul style="list-style-type: none"> High water quality. Access to suitable and culturally appropriate locations within the marine park, subject to environmental assessment where consistent with the objectives of the marine park. 		
Management objectives	<ul style="list-style-type: none"> To maintain the ecological values of the marine park which are important to the continuation of a viable aquaculture industry. To ensure that, in collaboration with the industry and DPIRD, aquaculture is managed in a manner that is consistent with maintaining the values of the marine park. 		
		Management program	Priority
Management strategies	<ol style="list-style-type: none"> Work with the Aquaculture Council of Western Australia and aquaculture proponents to ensure environmental best practice aquaculture management is applied in the marine park [DPIRD]. Work with aquaculture companies and DPIRD to help them conduct operations in a culturally sensitive manner [DPIRD]. Ensure that aquaculture authorisations are consistent with the management plan and include appropriate monitoring programs, lighting, navigational marking and site utilisation conditions [DPIRD, DoT]. 	Management Framework	H
Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.		Management Framework	H
		Management Framework	M



9.6 Pearling

The Kimberley is one of the most important regions for *goowarn* (pearl oyster) production due to the remote and pristine conditions of the area, and pearling has long been an important industry for the Kimberley. At its peak, the pearling industry was one of the most valuable aquaculture sectors in northern Australia, generating \$200 million revenue per year. Aboriginal people along the west Kimberley coast, including Bardi and Jawi people, collected pearl shells for use in rituals, ceremonies and for trade long before the arrival of Europeans. This trade originated from the north-west Kimberley and spread across the Australian continent as far as Yalata in South Australia (MIAC RNTBC 2019). Shell was collected for buttons then trade moved to culturing pearls.

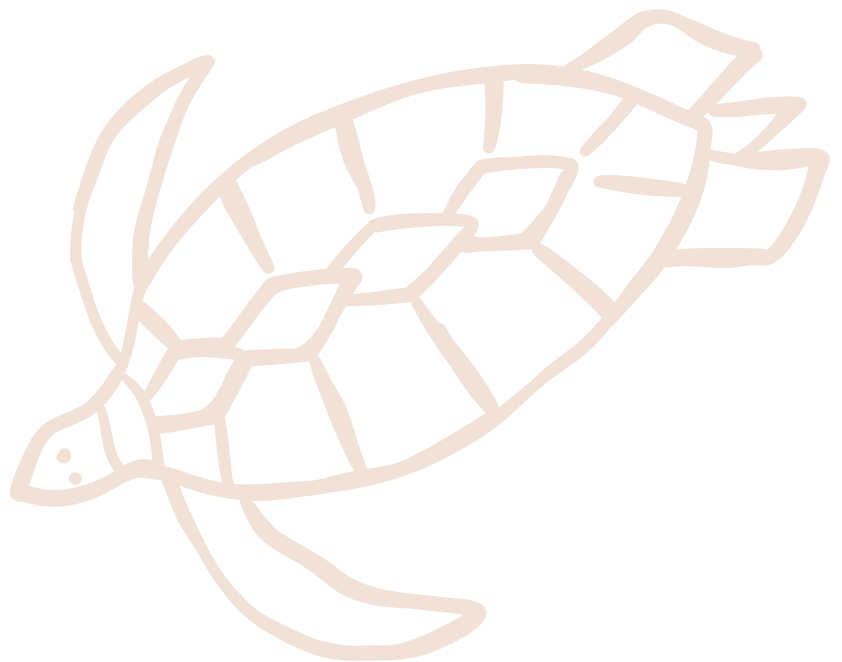
There are six pearl farms and leases within the Bardi Jawi Gaarra Marine Park. Maintaining the excellent environmental conditions such as the high-water quality in the marine park will be critical to the success of the pearling and aquaculture industries. Research into the environmental impacts of pearling in the Kimberley concluded that, in general, the industry is environmentally benign, producing a high value product with minimal environmental disruption (Enzer Marine Environmental Consulting 1998; McCallum and Prince 2009). Research undertaken by the University of Newcastle concluded that benthic conditions beneath pearling operations in Kimberley coastal waters are within the bounds of natural variability compared with areas not used for pearling (Jelbart *et al.* 2009).

The primary role of management in relation to pearling in the marine park will be to work with the pearling industry to ensure activities are culturally, socially and ecologically sustainable and appropriate, and to help maintain the environmental conditions of the marine park upon which the industry depends. Pearling activities including ancillary activities such as vessel transit, shell cleaning and aircraft access which are currently permitted in the area will continue to be permitted in general use areas in the marine park. Ancillary activities related to the pearling operations will be permitted in sanctuary and special purpose (cultural protection) zones if deemed compatible with the conservation purpose of the zone.

DPIRD will continue to manage pearling in the marine park. Pearling leases that exist prior to the establishment of a marine park have a right of renewal and cannot be displaced by the creation of the marine park. New proposals for leases will be assessed on a case-by-case basis by DPIRD in liaison with DBCA/Joint Management Body, the Commission and other stakeholders. The Minister for Environment's approval is required before the Minister for Fisheries grants a new pearl lease area within a marine park.

The *Pinctada maxima* pearl oyster resource will be the first to transition to the new management framework under the ARM Act, when the new Act commences.

Summary of management arrangements for pearling			
Requirements	<ul style="list-style-type: none"> • High water quality • Access to suitable and culturally appropriate locations within the marine park, subject to environmental assessment (including access between leases for pearl industry vessels) and where consistent with the objectives of the marine park. 		
Management objectives	<ul style="list-style-type: none"> • To maintain the ecological values of the marine park which are important to the continuation of a viable pearling industry. • To ensure that, in collaboration with the industry and DPIRD, pearling is managed in a manner that is consistent with maintaining the values of the marine park. 		
		Management program	Priority
Management strategies Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	<ol style="list-style-type: none"> 1. Work with the Pearl Producers Association and pearling proponents to ensure environmental best practice management is applied in the marine park [DPIRD]. 2. Work with pearling companies and DPIRD to help them conduct operations in a culturally sensitive manner [DPIRD]. 3. Ensure that pearling authorisations are consistent with the management plan and include appropriate monitoring programs, lighting, navigational marking and site utilisation conditions [DPIRD, DoT]. 	Management Framework Management Framework Management Framework	H H M



9.7 Maritime heritage

There are three distinct overlapping phases of maritime cultural activity identified in the marine park:

- Aboriginal activities
- Macassan seafaring activity and trepang (sea cucumber) harvesting (c. 17th–20th century)
- European exploration and activities (pre and post colonisation of Western Australia).

At least one shipwreck is known in the waters of the marine park, however there are likely to be more. Twenty-six vessels have been reported lost in the King Sound region of which only two have been identified. The *SS Karrakatta*, a 1251 tonne steamship, was wrecked near Swan Point in 1901. It was carrying a cargo of mail, wool and timber, as well as passengers on its regular route between Western Australian and Singapore when it struck an uncharted rock. All aboard were saved but the wreck was never recovered due to its hazardous position and rapid deterioration caused by the large tidal currents (WA Museum 2020).

Pre-1900 shipwrecks are protected under the *Maritime Archaeology Act 1973* and all shipwrecks over 75 years old are protected under the Commonwealth *Historic Shipwrecks Act 1976*. The Western Australian Museum is responsible for managing historic shipwrecks.

Summary of management arrangements for maritime heritage			
Requirements	Identification and protection of historic sites.		
Management objectives	<ul style="list-style-type: none"> • To ensure that, in collaboration with the Western Australian Museum, human activity does not significantly affect historical sites or shipwrecks in the marine park. • To increase awareness of maritime heritage within the local community and among visitors. 		
		Management program	Priority
Management strategies	<ol style="list-style-type: none"> 1. Identify sites with maritime heritage value within the marine park and develop and implement plans of management for identified sites [WAM, Heritage Council of WA]. 2. Provide interpretive information to enhance visitor enjoyment of and, where appropriate, to mitigate or stop impacts on maritime heritage values in the marine park. 	<p>Research</p> <p>Education and interpretation</p>	<p>M</p> <p>L</p>
<p>Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.</p>			

9.8 Industry, resources and development

9.8.1 Infrastructure

During the life of the management plan there may be proposals to install or construct infrastructure associated with commercial and recreational activities in or adjacent to the marine park. These could be major developments such as ship loading facilities or minor works such as the installation of moorings or navigation markers. The nature of the development will determine the appropriate level of assessment. DoT and Department of Planning, Lands and Heritage are responsible for planning and development of coastal infrastructure. Environmentally significant infrastructure associated with mineral and petroleum exploration and development and industrial developments may be subject to environmental impact assessment by the Environmental Protection Authority under the EP Act. Such environmental impact assessments within or near the marine parks will generally be referred to the department, the Commission and JMB for advice.

9.8.2 Mining

There are no mining tenements in the Bardi Jawi Marine Park. The establishment of the marine park will have implications for approvals for resource exploration or development activities within any future mining tenements directly intersecting or overlapping the marine park boundary.

The consent of the Minister for Mines, with the concurrence of the Minister for Environment and prior recommendations of the Minister for Fisheries and the Minister charged with the administration of the *Marine and Harbours Act 1981*, will be required for all mining (including exploration) activities within the marine park boundary. The granting of a mining lease or general-purpose lease will require the approval of both Houses of Parliament. Areas within and adjacent to the marine park may be affected by zoning arrangements. Any mining related activities within the marine park boundary, including exploration, will require approvals pursuant to Section 24A of the *Mining Act 1978*.

The CALM Act specifies that mining and petroleum exploration and production is permitted in a marine park general use zone or special purpose zone if it is compatible with the specified purpose of that zone. Mining is not compatible with the conservation purposes of the special purpose zone (cultural protection) and special purpose zone (biocultural conservation) in the marine park and therefore mining and petroleum exploration and production can only occur in general use zones. The environmental and cultural impacts of mining and petroleum exploration or production proposals within or adjacent to the marine park will be subject to evaluation through the normal assessment and approvals process under Western Australian and Commonwealth legislation. Mineral, petroleum and pipeline activities are regulated by the Department of Mines, Industry Regulation and Safety (DMIRS) under the *Mining Act 1978*, *Offshore Minerals Act 2003*, the *Petroleum and Geothermal Energy Resources Act 1967*, the *Petroleum (Submerged Lands) Act 1982* and *Petroleum Pipelines Act 1969*. In some cases, development may also trigger assessments under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or referral to the Environmental Protection Authority.

9.8.3 Seismic testing

Seismic testing is used to explore for oil and gas. Marine seismic surveys can increase background noise levels while they are in progress, and have the potential to impact marine life by disrupting cetacean communication, navigation and foraging habits, as well as damaging *aarli* (fish) with air bladders, destroying eggs and larvae, and causing *aarli* (fish) and other marine species such as whales to temporarily migrate away from the affected area. Any seismic surveys in the marine park will be subject to evaluation as part of the applicable State and Commonwealth government approval process. Management of seismic surveys to avoid or minimise potential risks to cetaceans involves using precautionary measures aimed at preventing injury and minimising risks of behavioural changes.



9.8.4 Coastal infrastructure and ports

The DoT and Department of Planning, Lands and Heritage are responsible for planning and development of coastal infrastructure, while port authorities are autonomous bodies operating under the *Port Authorities Act 1999*. This Act requires port authorities to protect the environment of the port and minimise the impact of port activities on the environment. Environmental risks associated with shipping and ports are managed through a range of state and national legislation and international agreements.

Summary of management arrangements for industry, resources and development			
Requirements	Access to suitable and culturally appropriate locations for current and activities.		
Management objectives	To ensure industry, development and associated activities are managed in a manner consistent with the objectives of the marine park.		
		Management program	Priority
Management strategies Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	1. Provide formal advice to the Commission, the EPA and/or the Minister for Environment relating to mineral, petroleum and pipeline activities in and adjacent to the marine park. [DMIRS, DWER].	Management Framework	As required
	2. Provide advice on the assessment, setting of conditions, and monitoring and reporting requirements for mineral, petroleum and pipeline activities consistent with management objectives and management targets for values of the marine park. [DMIRS, OEPA].	Management Framework	As required
	3. Consider the quality of the remote seascapes of the marine park in site planning and assessment of development proposals.	Management Framework	As required

10. Understanding Country

Strategic objective:

To encourage collaborative research and monitoring to increase understanding of the values of the marine park through research and monitoring to guide, adapt and improve management.

10.1 Research

Developing an increased understanding of the cultural, ecological and social values of the marine park will be critical to effective management. The joint management arrangements for the marine park will rely significantly on the capacity of western science and Indigenous knowledge to work together. This will ensure the best available knowledge-base for making decisions about Saltwater Country that provides social, economic, cultural and environmental benefits for all (Austin *et al.* 2017). The Kimberley Indigenous Saltwater Science Project (KISSP) has produced a range of documents that seek to build capacity for collaborative management of Kimberley Saltwater Country.

Research in the marine park informed by traditional ecological knowledge will help to inform management practices and decisions and ensure the marine park is effectively managed. A comprehensive research program should be designed to fill knowledge gaps relevant to management.

External organisations carrying out research within the marine park will require a licence to be issued so the department can:

- maintain an understanding of research effort;
- direct research effort, where necessary, so it is relevant to management;
- collaborate with researchers where possible; and
- share research outcomes with others.

Additional permits or special permission may also be required from DBCA to take flora and fauna and from DPIRD to carry out research on *aarli* (fish) (as defined in the FRM Act) in the marine park, particularly if the activity would otherwise be prohibited, such as the take of protected *aarli* (fish) or the use of prohibited fishing gear.

In culturally sensitive areas, Bardi and Jawi may deem it appropriate for Bardi and Jawi advisers to accompany researchers whilst carrying out their work. Findings from the research should be made available in full to BJNAC and the JMB for review and any culturally sensitive matter deemed 'unsuitable for public view' omitted from publication.

Research strategies specific to particular values of the marine park are detailed in sections 6-9. A summary of the generic management objectives, strategies and targets for the research program are described in the table below.



Summary of management arrangements for research			
Requirements	<ul style="list-style-type: none"> • Suitable access to the marine park for cultural, ecological and social research. • Access to representative sites in areas free of human impacts for scientific reference sites and in areas with human activities for impact reference sites. 		
Management objectives	<ul style="list-style-type: none"> • To obtain increased understanding of the biodiversity, biocultural and cultural values and key ecological process and socio-economic uses within the marine park to inform management. • To promote research that improves knowledge of the values of the marine park to inform management decisions. • To maximise the integration of conservation science with traditional ecological knowledge in all aspects of research in the marine park. 		
		Management program	Priority
Management strategies	<ol style="list-style-type: none"> 1. Encourage involvement of Bardi and Jawi people in research projects where possible [DPIRD]. 2. Ensure that new knowledge from research and monitoring is communicated to BJNAC and the Bardi Jawi community [DPIRD]. 3. Prepare a research plan which is informed by existing research and considers the research strategies and priorities listed in this joint management plan and/or emerging priorities nominated by the JMB [DPIRD]. 4. Develop a communication framework to guide the communication of science and knowledge to BJNAC and the Bardi Jawi community. 5. Identify and communicate high priority research projects which address key knowledge gaps to appropriate external organisations and funding bodies and ensure results are shared with marine park managers. 6. Develop and implement protocols (where possible utilising or adapting existing protocols) to ensure research is culturally appropriate, commences only with appropriate permissions and that information shared by Traditional Owners is used in a culturally appropriate manner [DPIRD]. 7. Develop scientific and research protocols and partnership agreement frameworks through the JMB that support genuine scientific and research partnerships with BJNAC. 8. Where possible, support two-way science programs in schools. 9. Facilitate or support research in the marine park, including projects by external organisations, by providing assistance where possible [DPIRD]. 10. Ensure granting and renewal of permits relating to scientific research is consistent with the management plan and complies with DBCA's Science Policy (No.28) and associated guidelines and any protocols developed with BJNAC [DPIRD]. 	<p>Research</p> <p>Research</p> <p>Research</p> <p>Research</p> <p>Research</p> <p>Research</p> <p>Research</p> <p>Research</p> <p>Research</p> <p>Research</p>	<p>Principle</p> <p>Principle</p> <p>H-KMS</p> <p>H-KMS</p> <p>H-KMS</p> <p>H-KMS</p> <p>H-KMS</p> <p>L</p> <p>As required</p> <p>As required</p>
Performance measure	Prioritised research plans have been developed and approved by the JMB and research activities, as detailed in the plan, have been implemented.		
Target	<ul style="list-style-type: none"> • Preparation and implementation of a research plan. • Number of current and completed research projects. 		
Reporting	To be determined.		

10.2 Monitoring

Long-term monitoring of the conditions of the values of the marine environment and the pressures that impact the values is essential to evaluate management effectiveness and inform an adaptive management approach. Monitoring enables the detection of detrimental impacts and can determine trigger points for corrective management action before cultural, ecological or social values of a marine park become significantly degraded. Where changes have occurred and remediation measures are required, a monitoring program should also determine the rate of recovery of an affected area or value. The detection of human induced changes requires an understanding of what is 'natural' as a benchmark and this information should be progressively established through ongoing monitoring of sanctuary areas, or low impact sites, and through the research program.

The department, in collaboration with joint management partners around the State, is progressively implementing the DBCA Marine Monitoring Program, a systematic program in the State's marine parks and reserves, designed to improve understanding of management effectiveness, and to inform future research, monitoring and decision making.

In addition to DBCA and Bardi and Jawi Traditional Owners, other organisations that may be involved in the monitoring of the Bardi Jawi Gaarra Marine Park include DPIRD for *aarli* (fish) and pearl oysters (as defined in the FRM Act and Pearling Act 1990), the North Australian Indigenous Land and Sea Management Alliance, CSIRO, Australian Institute of Marine Science, universities and community groups where appropriate.

Monitoring of the Bardi Jawi Gaarra Marine Park will focus on determining trends in key ecological, cultural and social values within a 'condition-pressure management response' framework that measures the 'health' of values against defined management targets. Sections 6, 7 and 9 detail the performance indicators for the key cultural, ecological and social values of the marine park. Where required, interim management targets will be developed or further refined to reflect meaningful short-term steps in achieving the longer-term management targets and objectives. Additional strategies may be required throughout the life of the joint management plan to ensure effective management of marine park values. Where new strategies are required, and it is appropriate to do so, key stakeholder consultation will occur prior to implementation.





Bardi Jawi Rangers monitoring *goorlil* (turtle).
Photo – Bardi Jawi Rangers.

Summary of management arrangements for monitoring			
Requirements	<ul style="list-style-type: none"> • Access to suitable areas within the marine park for monitoring purposes. • Access to representative sites in areas free of human impacts for scientific reference sites and in areas with human activities for impact reference sites. 		
Management objectives	To monitor key cultural, ecological and social values in the marine park within a 'condition-pressure-management response' framework, to provide a basis to assess, adapt and improve management.		
		Management program	Priority
Management strategies Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	<ol style="list-style-type: none"> 1. Facilitate knowledge transfer and uptake of monitoring findings to adaptive marine park management, planning and policy, and where relevant report on conservation achievements and challenges [DPIRD]. 2. Encourage monitoring in the marine park which aligns with Mayala and departmental priorities. 3. Collate and review existing monitoring information and techniques to inform the development of a monitoring plan 4. Prepare a monitoring plan which considers the strategies and priorities listed in this joint management plan and/or emerging priorities nominated by the JMB. 5. Develop a cultural values monitoring framework (and data storage and access process) to guide these activities in a joint management context, with respect to cultural Law and governance. 6. Develop and implement protocols to ensure monitoring is culturally appropriate and that any cultural information shared is used in a culturally appropriate manner e.g. ISWAG/KISSP protocols are supported. 7. Investigate opportunities and develop a process to integrate traditional ecological knowledge with monitoring, where appropriate. 8. Liaise with industry, other government agencies and non-government organisations to access information held on ecological monitoring in the area. 9. Provide necessary information and support for assessments of management plan implementation by the Commission [DPIRD]. 	Monitoring Monitoring Monitoring Monitoring Monitoring Monitoring Monitoring Monitoring Monitoring	Principle Principle H-KMS H-KMS H-KMS H-KMS H-KMS H As required
Performance measure	A prioritised monitoring plan has been developed and approved by the JMB, and monitoring activities, are being implemented.		
Target	<ul style="list-style-type: none"> • Preparation and implementation of a monitoring plan. • Length of time-series monitoring data. • Number of values, including KPIs, currently being monitored. 		
Reporting	To be determined.		



11. Climate Change

Climate change refers to changes in weather patterns (i.e. temperature, rainfall) and associated changes in oceans, land surfaces and ice sheets, occurring over a period of decades or longer (CSIRO & BoM 2015, Australian Academy of Science 2020). The effects of ocean warming and sea level rise due to climate change are currently impacting the marine environment globally and climate change is considered to be one of the greatest threats to marine life (Intergovernmental Panel on Climate Change 2019). The ecological impact of climate change effects including increased temperatures and frequency of episodic events such as heatwaves can range from species shifting their geographic ranges, seasonal activities and migration patterns to *marrgoorr* (coral) bleaching events, decreased ocean productivity, altered habitats and greater incidence of disease or mortality (Hoegh-Guldberg and Bruno 2010). This can in turn affect cultural and social values by changing the ecological health of the marine resources upon which customary, recreational and commercial activities rely.

Bardi and Jawi Traditional Owners are particularly concerned about the potential effects of climate change on *goorlil* (turtles), *odorr* (dugongs), *aarli* (fish), *marnany*, *oola* (traditional water places) and significant sites. Bardi and Jawi people have always observed seasonal indicators to tell them what is happening in the natural environment, when to hunt and for what species. Bardi and Jawi are concerned about how climate change may impact the health



Coral bleaching in the Kimberley. Photo – Claire Ross, DBCA.

Establishing marine protected areas can contribute to maintaining climate change resilience and rebuilding ecological and social resilience (IUCN 2017). Protection of coastal carbon habitats such as mangroves and *noomool* (seagrass) can help to ensure that carbon is not released as a result of the loss and degradation of those areas, while maintaining these critical habitats. Additionally, effective management of human use and local pressures can help to maintain or increase ecosystem health, thereby increasing resilience to external pressures such as climate change. Although marine protected areas can contribute to reducing local stressors, they do not protect against the impacts of climate change, which is one of the biggest challenges that marine protected area managers face.

Little is known about the current impact of climate change on the values of the Bardi Jawi Marine Park, but climate change is considered the greatest emerging pressure on the health of the ecological, cultural and social values (Boschetti *et al.* 2020). Sea surface temperature in the Kimberley is predicted to rise by 2.2-4.0°C by 2030, which is likely to exacerbate heat stress and threaten the persistence of intertidal communities (Kendrick, *et al.* 2018). Modelling has predicted that climate variability will become more intense, such as extreme El Nino and La Nina and there will be more frequent and stronger marine heatwaves in the region (Feng *et al.* 2017). Sea level is also predicted to rise in the region at a rate of a few centimetres per decade (Feng *et al.* 2017).

Climate change impacts are already being recorded in the Kimberley region and the frequency of such events are predicted to increase. A coral bleaching event in the near shore region of the Kimberley adjacent to the marine park was recorded in the summer of 2016 (McCulloch *et al.* 2017, Le Nohaïc *et al.* 2017). This was followed by further incidents of bleaching in 2020 (DBCA, unpublished).

Research and monitoring programs contribute to our understanding of the effects of climate change, as well as the development of effective adaptive management responses. Management to reduce the impacts of climate change on the marine park will focus on:

- increasing knowledge and understanding of the effects of climate change on the values of the marine park;
- monitoring the effects of climate change on the values and pressures of the marine park;
- increasing the health and resilience of ecosystems through the sound management of human uses and local pressures; and
- undertaking local adaptive management.

Summary of management arrangements for climate change			
Management objectives	To increase understanding of the effects of climate change on the values of the marine park and increase the resilience of values to climate change.		
		Management program	Priority
Management strategies	1. Support international and national climate change initiatives where relevant in marine park research and adaptive management.	Management Framework	Principle
Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	2. Ensure that impacts of climate change are considered in monitoring programs of the KPI's for the marine park.	Monitoring	Principle
	3. Assess areas, habitats and species which are most at risk from the effects of climate change and increase their resilience by reducing other pressures where possible [DPIRD].	Research	H-KMS
	4. Monitor marine park values and the climate-related pressures acting on them to inform the development of local and regional level adaptive management responses for the protection of park values.	Monitoring	H
	5. Educate marine park users of impacts of climate change on marine park values and encourage them to reduce their carbon emissions where possible.	Education and interpretation	H
	6. Support or provide necessary information to contribute to climate forecast models to help predict the impacts of climate change on the values of the marine park.	Research	As required



12. Plan implementation and operation

Sections 6 to 11 outline the management objectives, strategies, performance measures and targets required to achieve the strategic objectives for the marine park. To successfully implement these strategies a number of supporting management strategies are required to effectively administer the park, support overall management and ensure compliance with management arrangements.

12.1 Administration and governance

The following strategies will ensure appropriate legal, administrative, financial, governance, human resources and data management arrangements are in place to effectively implement and operate the marine park in a collaborative setting

Summary of management arrangements for administration and governance			
Management objectives	To ensure the marine park has appropriate legal, administrative, financial, operational and human resource frameworks in place so that it is effectively jointly managed in a collaborative setting.		
		Management program	Priority
Management strategies Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.	1. Ensure the objectives detailed in the JMA are applied to all management activities in the marine park.	Management framework	Principle
	2. Collaborate with and provide advice to agencies, stakeholders and adjacent land managers, where necessary, to ensure the protection of marine park values and complementary management of adjacent reserves	Management framework	Principle
	3. Implement all legal provisions necessary to establish and jointly manage the marine park including execution of the JMA, gazettal of the zoning scheme under the CALM Act and gazettal of orders under the FRM Act [DPIRD].	Management framework	H-KMS
	4. Develop governance tools to support effective and efficient decision-making by the JMB including terms of references, code of conduct and conflict resolution policy.	Management framework	H-KMS
	5. Develop and maintain appropriate staff structures, funding, operational equipment, including vessels, and infrastructure to adequately implement the joint management plan and JMA [DPIRD (subject to funding)].	Management framework	H-KMS
	6. Develop and maintain understanding of and support for the marine park governance, management plan and activities, by the local Bardi Jawi community	Management Framework	H-KMS
	7. Investigate the need for, and if required, support BJNAC to develop procedures to guide the JMB on what cultural decisions need to be referred to BJNAC.	Management framework	H-KMS
	8. Develop and maintain an understanding about the delegation of authority from the BJNAC to JMB and vice versa, in relation to advice given to external parties and marine park management decisions, consistent with the joint management plan.	Management Framework	H-KMS
	9. Promote culturally inclusive hiring processes by inviting BJNAC nominated JMB representative/s to participate in hiring processes for positions related to the marine park.	Management framework	H-KMS

		Management program	Priority
	10. Provide licences and permits with appropriate conditions where required [DPIRD, Commission].	Management framework	H-KMS
	11. Develop annual work plans.	Management framework	H-KMS
	12. Develop collaborative operational plans for implementation of relevant strategies in the plan [DPIRD].	Management framework	H-KMS
	13. Work with the BJNAC and Bardi and Jawi Traditional Owners to develop commercial tour operator licence conditions to manage access in special purpose zones (cultural protection) to ensure activities including fishing are compatible with the purpose of protecting the land and waters to the culture and heritage of Traditional Owners.	Management framework	H-KMS
	14. Facilitate regional annual meetings between the JMBs of Bardi, Jawi, Mayala and Lalang-gaddam marine park.	Management framework	H-KMS
	15. In accordance with DPIRD's responsibilities under the FRM Act, Pearling Act, and ARM Act (when implemented), develop a framework for DPIRDs involvement in the joint management of the marine park including mechanisms for DPIRD to attend JMB meetings [DPIRD].	Management framework	H-KMS
	16. Develop materials to aid communication of the management plan to the Bardi and Jawi community and support BJNAC and JMB in the implementation of the plan [DPIRD].	Management framework	H
	17. Pursue external funding opportunities to implement strategies in the joint management plan.	Management framework	H
	18. Develop and implement a monitoring and evaluation framework to assess joint management effectiveness for the marine park [DPIRD].	Management framework	H
	19. Undertake a five-year review of the permitted activities in the special purpose zones [DPIRD].	Management framework	M
	20. Undertake routine inspections and maintenance of department managed infrastructure in the marine park, particularly zone markers and signage.	Management framework	L
	21. Consider the need for temporary or longer-term restrictions e.g. speed limits and/or additional measures where necessary to protect threatened species, ecological communities, and natural features or for safety reasons [DoT].	Management framework	As required



12.2 Zoning and permitted activities

The implementation of an appropriate zoning scheme is an important strategy for the conservation of marine biodiversity, increased recognition and protection of culturally significant areas and customary practices, and the management of human use in the marine park. Importantly, the application of the zoning scheme should not be viewed in isolation but as one tool in a suite of complementary tools available to marine park managers to achieve desired ecological, cultural and social outcomes.

12.2.1 Zoning design

Multiple use zoning and other management strategies work together to protect and manage the values and uses of the area. Zoning is a key strategy for protecting the health and resilience of the marine park, while supporting ongoing tourism and recreation, commercial activities and fishing.

The CALM Act requires marine parks to be zoned as one or a combination of sanctuary, recreation, special purpose or general use zones. The zones provide for varying levels of conservation, recreational and commercial use. Through multiple-use zoning, marine parks provide economic, recreational and cultural benefits for local communities, as well as environmental benefits. Where possible and appropriate, the development of the marine park zoning seeks to accommodate existing uses.

The national guidelines for establishing marine protected areas recommend that the IMCRA bioregions form the basis for reserve design, with one or more examples of conservation features (e.g. habitats and ecosystems) found in each bioregion represented in highly protected zones (Australian and New Zealand Environment and Conservation Task Force on Marine Protected Areas 1999).

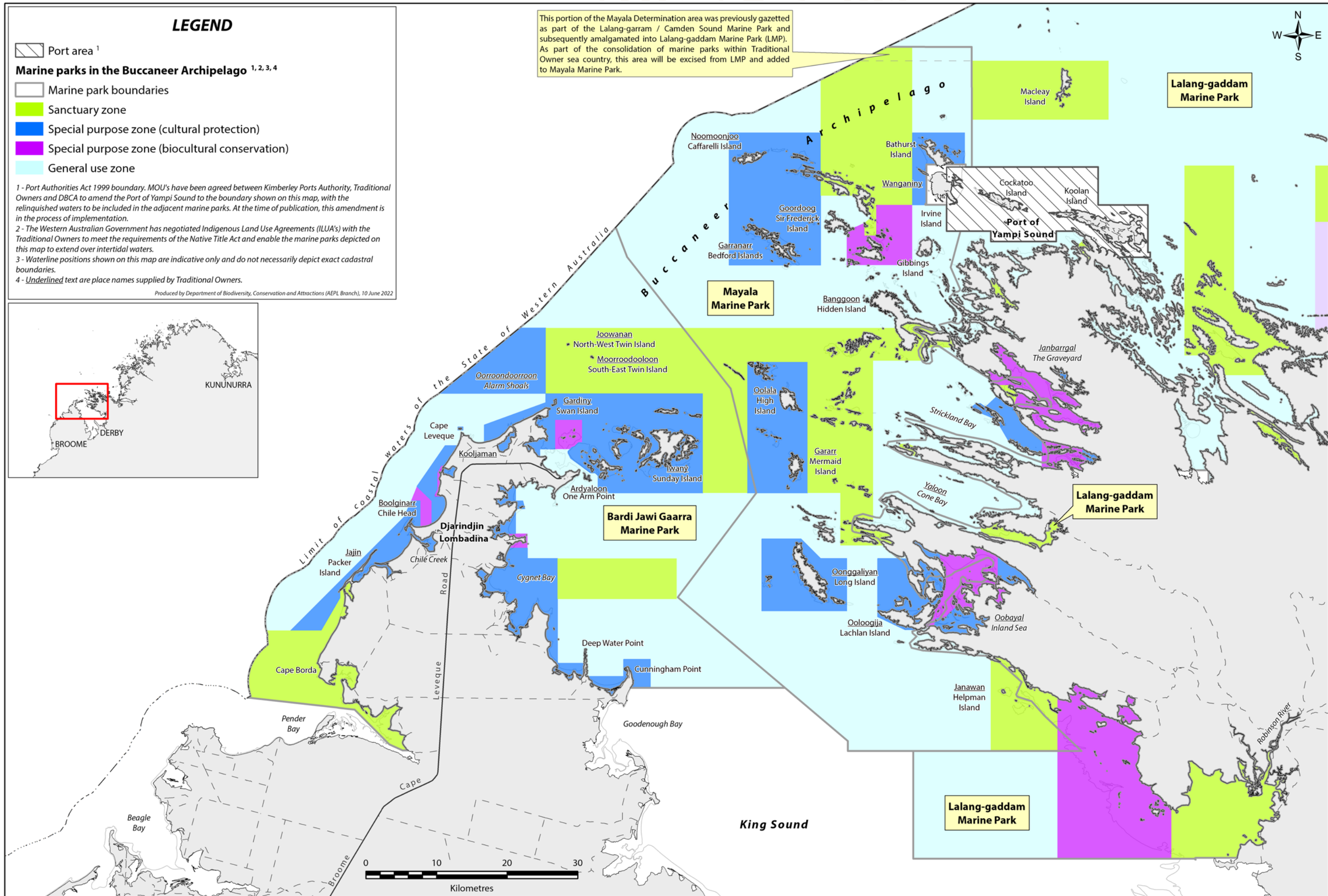
To complement the bioregional framework, a network-based approach was taken, to ensure the zoning scheme complements other existing and marine parks in the Kimberley region and was designed in collaboration with the Lalang-gaddam Marine Park and Mayala Marine Park (Map 6).

Design of the zoning scheme has been guided by a set of principles which aim to provide for natural, cultural, recreation, tourism and other sustainable use (see Appendix 1).

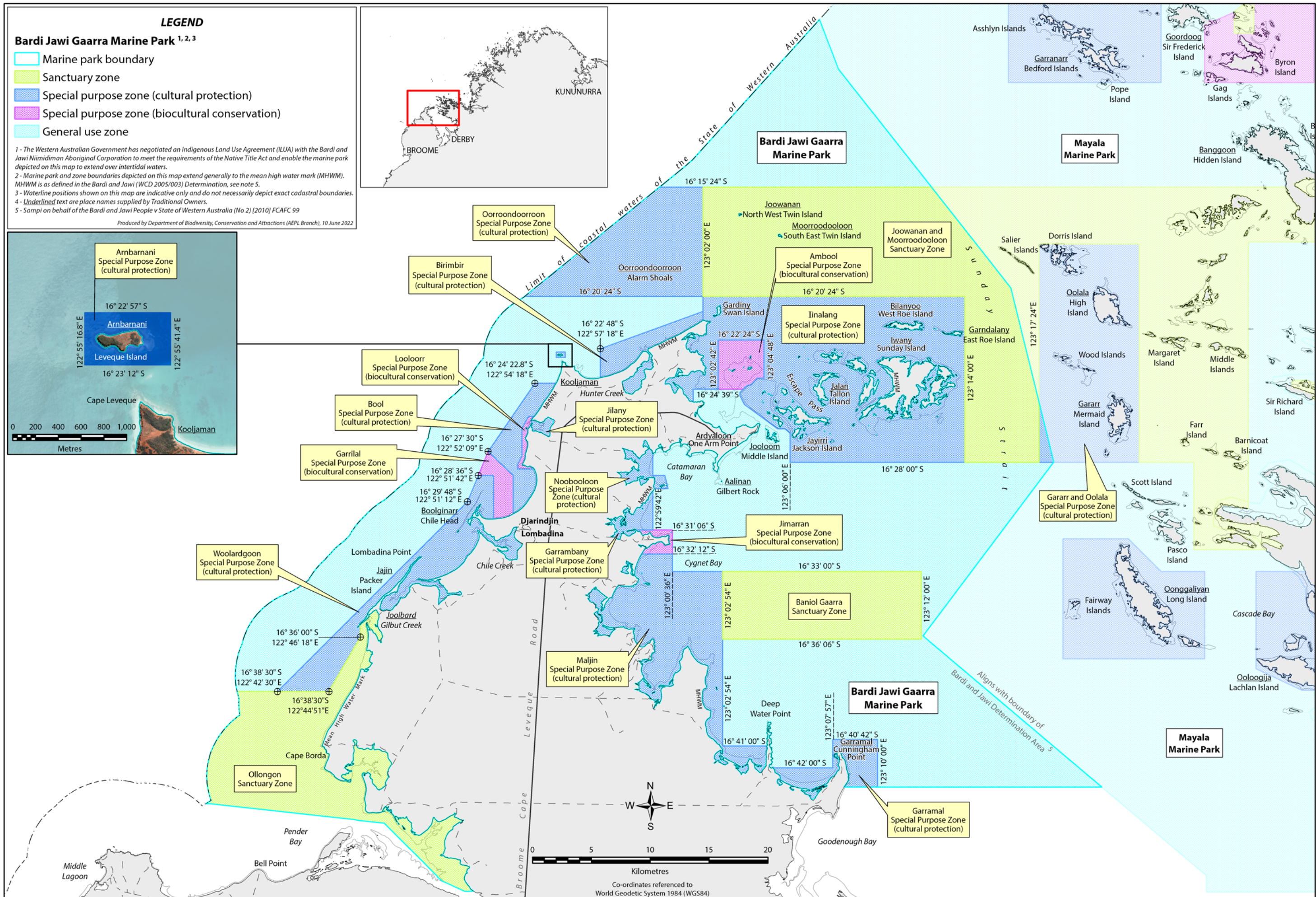
The zoning scheme for the Bardi Jawi Gaarra Marine Park is shown in Maps 7 - 11 and a summary of the activities permitted in each zone is presented in Table 1. The zoning scheme comprises:

- Eleven special purpose zones (cultural protection) covering approximately 53,500 hectares or 26 percent of the park
- four special purpose zones (biocultural conservation) covering approximately 2,800 hectares or two percent of the park
- three sanctuary zones covering approximately 51,200 hectares or 25 percent of the park
- general use in the remainder of the park, covering approximately 96,500 hectares or 47 percent of the park.

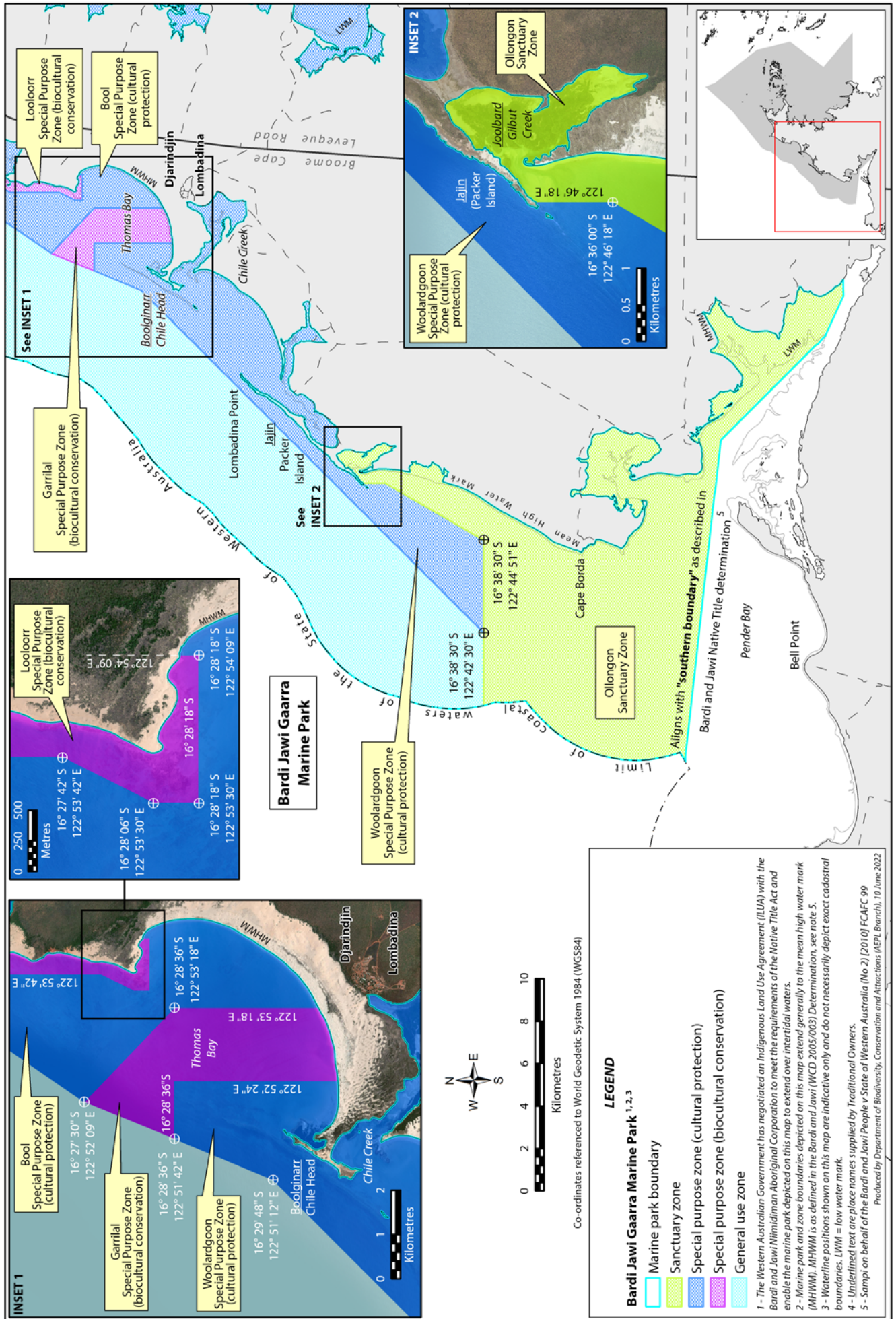
To ensure consistency and efficiency of management arrangements across the neighbouring Bardi Jawi Gaarra, Mayala and Lalang-gaddam marine parks and Sea Countries, some zones extend across the parks. The different parts to the zone may have different names depending on which marine park it is in, reflecting the different language groups. If zone descriptions are not available in this management plan for small sections of a zone, please refer to the Mayala Marine Park Joint Management Plan.



Map 6: Overview map of zoning for marine parks in the Buccaneer Archipelago

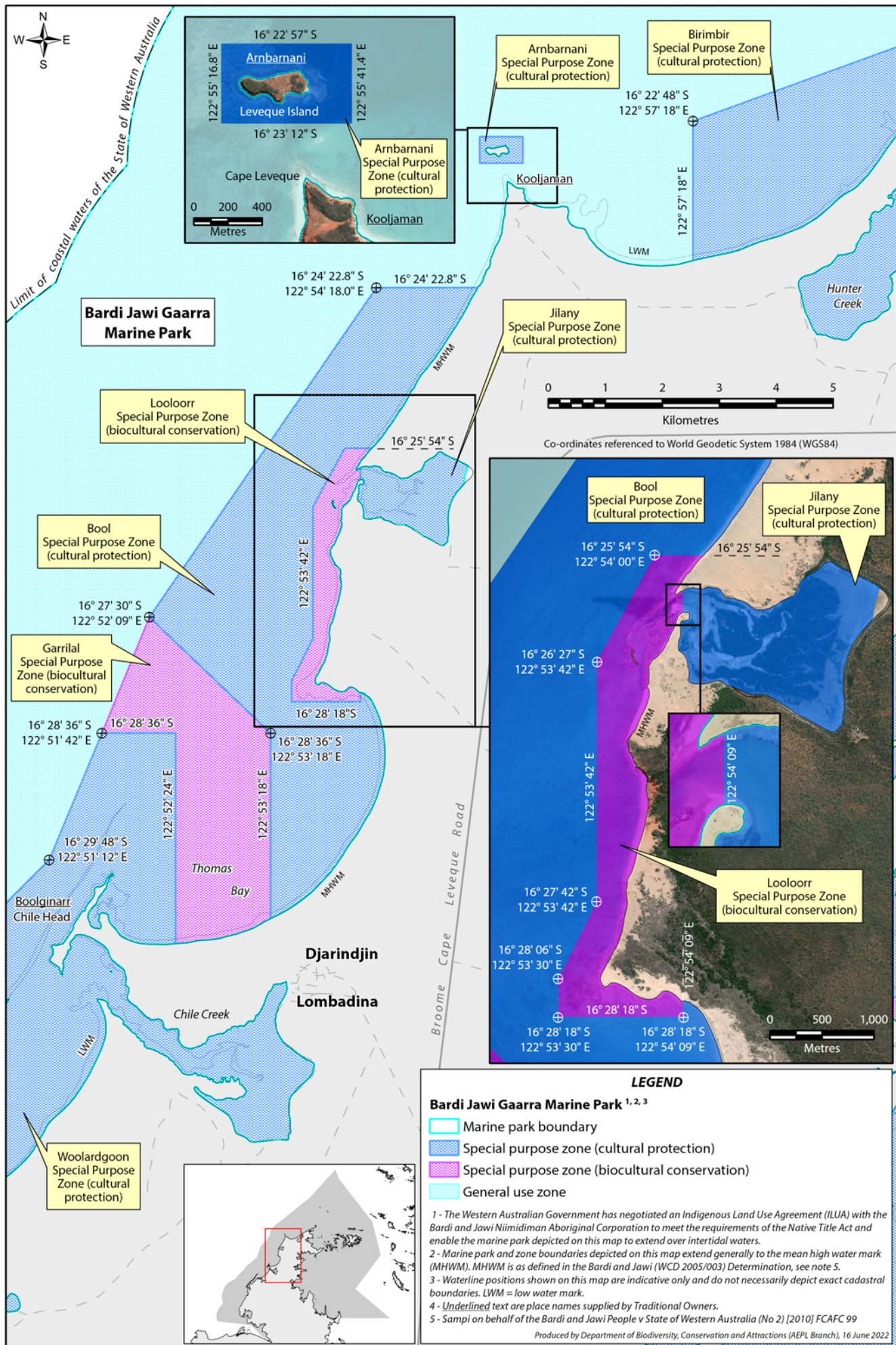


Map 7: Zoning for Bardi Jawi Gaarra Marine Park

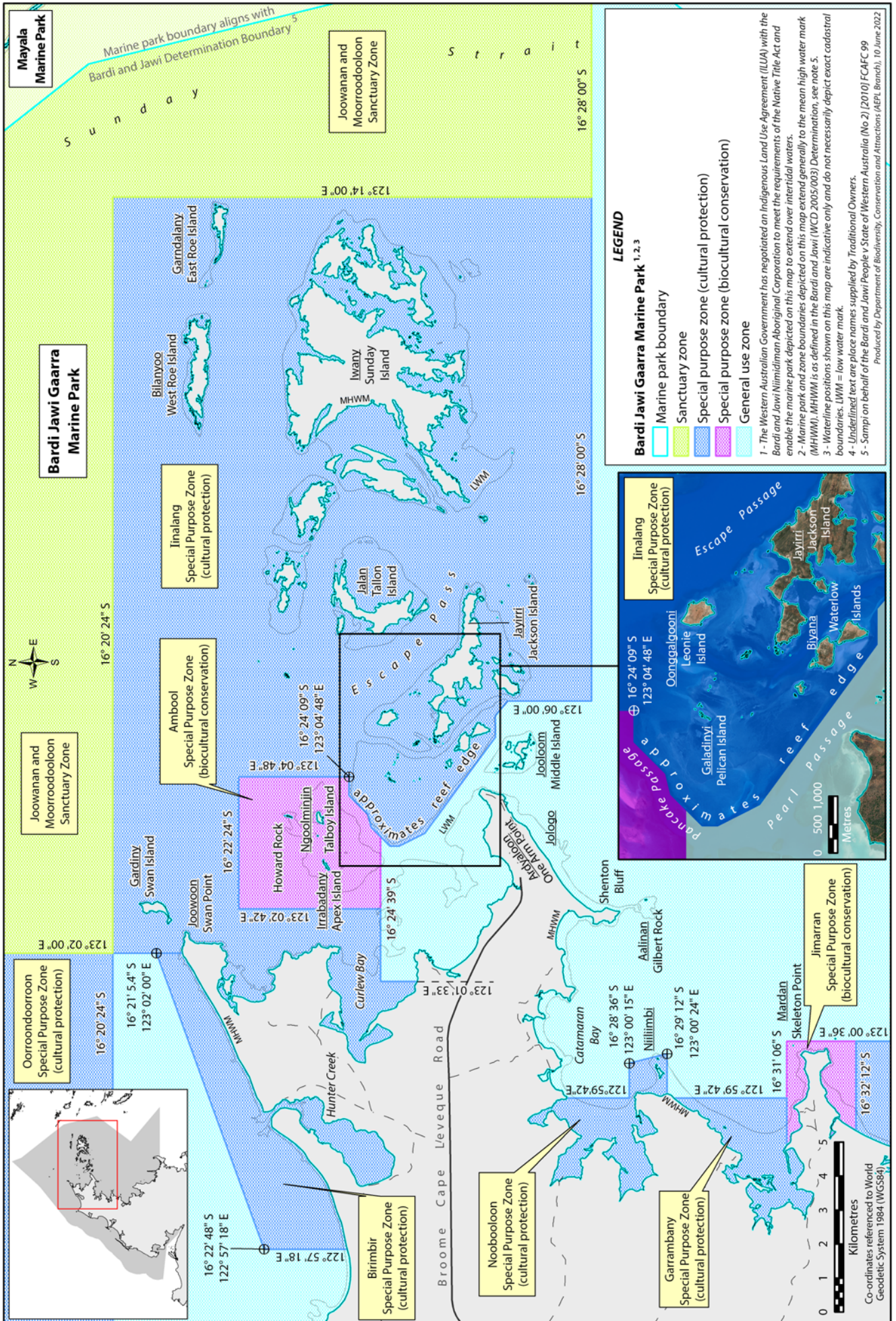


Map 8: Zoning for Bardi Jawi Gaarra Marine Park - Goorbalgoon (Pender Bay) area



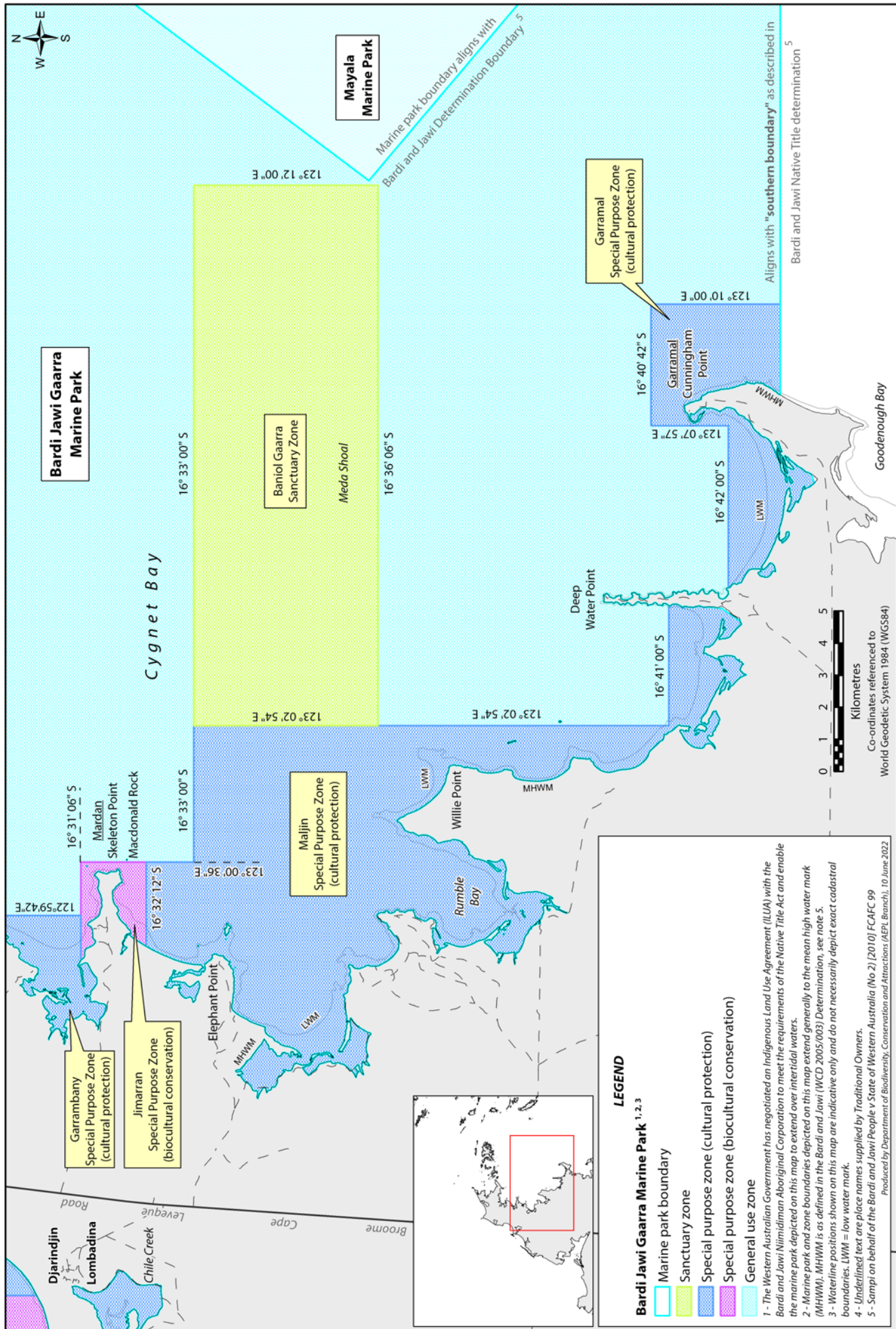


Map 9: Zoning for Bardi Jawi Gaarra Marine Park - Thomas Bay area



Map 10: Zoning for Bardi Jawi Gaarra Marine Park - Iwany (Sunday Island) area





Map 11: Zoning for Bardi Jawi Gaarra Marine Park - Cygnet Bay area

12.2.2 Special purpose zones (cultural protection)

The special purpose zones (cultural protection) play an important role in protecting the value of Bardi and Jawi Country to the culture and heritage of Bardi and Jawi people.

The conservation purpose of the special purpose zones (cultural protection) is to protect and conserve culturally sensitive geographical areas and features that are significant to Bardi and Jawi people. These areas may contain tangible values such as *baarngaboor* (seasonal camping areas), areas important for customary food and other resources and culturally significant features such as *aarli* (fish) traps, cultural sites, *marnany* (reefs), *noomool* (seagrass) beds and mangrove communities. They may also contain intangible values such as those related to Law, ceremony and oral histories. Achieving protection of cultural and heritage values will require protection of environmental values as there is often a high level of interdependence and correlation between them. For Bardi and Jawi people their Country is more than a simple geographic location, it includes all living things, incorporating people, plants, animals, seasons, stories and spirits, and they carry the responsibilities of their ancestors to manage and speak for Country, which has been recognised in Australian Law through a native title determination process. Inappropriate access and/or use of Country can have significant consequences under Aboriginal Law.

Bardi and Jawi people have used, relied on, enjoyed and protected Country over thousands of years and continue to do so today. The special purpose zones (cultural protection) will protect the areas within their Country which are of the greatest cultural significance. While cultural and heritage values apply across the whole of the marine park, customary activities are more likely to be carried out in the special purpose zones (cultural protection) compared to other areas in the marine park.

The areas which are to be protected in Bardi and Jawi Country as special purpose zones (cultural protection) are regularly used by Traditional Owners, including for customary fishing and hunting. Many of these areas are adjacent to outstations or near communities and the management arrangements for the marine park complement current land management arrangements.

As the Traditional Owners, custodians of Country and custodians of knowledge of Country Bardi and Jawi people have provided advice on the known or potential impacts from activities so that compatibility with these special purpose zones (cultural protection) can be determined. In general, all forms of extractive commercial and recreational use are considered incompatible, with the exception of some activities that can be adequately managed to minimise any detrimental effects to the value of the land and sea to the culture and heritage of Bardi and Jawi people. This includes the commercial *alngir* (trochus) fishery and tourism operations (including charter fishing), managed through licences or other authorisations. Activities that cannot be adequately managed to ensure they do not have an unacceptable impact on the conservation purpose of protecting the value of the land and sea to the culture and heritage of Bardi and Jawi people will be prohibited. This includes most forms of commercial fishing, recreational fishing not undertaken as part of a fishing tour, pearling and aquaculture, as well as other non-fishery related uses such as oil and gas exploration and mining.

Commercial and recreational activities that have an unacceptable impact on the cultural and heritage values are considered incompatible and excluded due to culturally inappropriate land use, culturally inappropriate access, culturally inappropriate behaviours or a lack of appropriate cultural protocols followed in these areas. Visitors and users of the marine park are asked to respect Traditional Owners' requests for privacy while they are undertaking customary activities in these zones.

The commercial *alngir* (trochus) fishery is considered to be compatible with the protection of the value of the lands and waters to the culture and heritage of Bardi and Jawi people. Collecting *alngir* (trochus) shell was a customary activity undertaken by the Traditional Owners in the past and in recent times has been accepted as a commercial activity in the area by Traditional Owners. The commercial *alngir* (trochus) fishery is different to other forms of commercial fishing, which will unacceptably affect the cultural values of the area and associated customary practices by targeting culturally significant species, or risk catching / harming culturally significant species through by-catch.



Recreational fishing not undertaken as part of a fishing tour is not considered to be compatible with the conservation purpose of this zone type because it will be disruptive to cultural activities and lead to culturally inappropriate access, particularly to areas important for customary food and other resources. Traditional Owners consider that recreational fishing undertaken as part of a fishing tour is compatible, provided the activity is subject to a CALM Act licence where conditions can be applied to regulate the activity to address cultural concerns. Licencing will ensure that commercial tourism operations are carried out in a culturally appropriate manner and that operators and customers follow cultural protocols.

The designation of special purpose zones (cultural protection) is dependent on the enactment of amendments to the CALM Act to update the purpose of marine parks to include allowing only that level of recreational and commercial activity which is consistent with the protection and conservation of the value of the marine park to the culture and heritage of Aboriginal persons.

Woolardgoon Special Purpose Zone (cultural protection) - Packer Island

The conservation purpose of the Woolardgoon Special Purpose Zone (cultural protection) is to conserve the value of the land⁵ and waters to the culture and heritage of Bardi and Jawi people. This zone recognises the high cultural value and continuing use of the area by Bardi and Jawi people, particularly people who are in the *Ollongon* clan. The zone will protect the rocky reefs and mangrove creeks in the Canning Bioregion which are highly valued for customary fishing and hunting purposes and support a wide variety of culturally significant marine fauna including *goorlil* (turtles), *aarli* (fish), *joorroo* (sharks) and *barnamb* (rays).

Bool Special Purpose Zone (cultural protection) - Thomas Bay

The conservation purpose of the Bool Special Purpose Zone (cultural protection) is to conserve the value of the land and waters to the culture and heritage of Bardi and Jawi people. This zone recognises the high cultural value of the area and high use of the area for customary activities by Bardi and Jawi people, particularly people who are in the *Gullarrgon* clan. The zone will protect the rocky reefs and mangrove creeks in the Canning Bioregion which are highly valued for customary fishing and hunting purposes. This zone will protect culturally and ecologically significant marine fauna including *bayalbarr* (dolphins) *goorlil* (turtles), *aarli* (fish), *joorroo* (sharks) and *barnamb* (rays).

Jilany Creek Special Purpose Zone (cultural protection)

The conservation purpose of the Jilany Special Purpose Zone (cultural protection) is to conserve the value of the land and waters to the culture and heritage of Bardi and Jawi people. This zone recognises the high cultural value of the area and high use of the area for customary activities by Bardi and Jawi people, particularly people who are in the *Gullarrgon* clan. Visitors to the area are asked to respect the Traditional Owners request for privacy in this area, particularly when they are undertaking customary activities. Fishing is a major feature of Bardi and Jawi lifestyle, undertaken by young and old, and the protected and clear waters of the creek system is regularly used by the local families who gather to spend time on-Country and pass down knowledge to the younger generation in a safe environment. This zone will protect culturally and ecologically significant mangroves and marine fauna such as *aarli* (fish), *joorroo* (sharks) and *barnamb* (rays).

Arnbarani Special Purpose Zone (cultural protection) - Cape Leveque Island

The conservation purpose of the Arnbarani Special Purpose Zone (cultural protection) is to conserve the value of the land and waters to the culture and heritage of Bardi and Jawi people, particularly people who are in the *Gullarrgon* clan. This zone recognises the cultural importance of Cape Leveque Island, which includes the intertidal area surrounding the island. Cape Leveque Island is a culturally significant site and should not be visited. Walking on the intertidal reef surrounding the island is not culturally appropriate and regulations are to be used to prohibit such activity. Additionally to it being culturally inappropriate to walk on the reef from Kooljaman to Cape Leveque Island, the large tidal range and strong currents makes it a safety risk. Bardi and Jawi people understand this area is valued for recreational fishing, and this can still be carried out on the reefs surrounding the island in the adjacent general use zone.

5 - Land as defined in the CALM Act.



Cape Leveque Island. Photo – Roanna Goater, DBCA.

Oorroondoorroon Special Purpose Zone (cultural protection) – Alarm Shoals

The conservation purpose of the Oorroondoorroon Special Purpose Zone (cultural protection) is to conserve the value of the land and waters to the culture and heritage of Bardi and Jawi people. This area of Country has such high cultural significance that, in alignment with cultural protocols, only Bardi and Jawi men should visit this area.

Birimbir Special Purpose Zone (cultural protection) - Hunter Creek

The conservation purpose of the Birimbir Special Purpose Zone (cultural protection) is to conserve the value of the land and waters to the culture and heritage of Bardi and Jawi people. This zone recognises the continuing use of the area for customary activities by Bardi and Jawi people, particularly those in the *Gullarrgon* and *Ardiol* clans. The zone extends from Kooljaman beach to Swan Point. This zone will protect important biocultural values including mangrove lined creeks

linalang Special Purpose Zone (cultural protection) - Sunday Island Group

The conservation purpose of the linalang Special Purpose Zone (cultural protection) is to conserve the value of the land and waters to the culture and heritage of Bardi and Jawi people. This zone recognises the continuing use of the area for customary activities by Bardi and Jawi people, particularly those in the *Gullarrgon*, *Ardiol*, *Iwany* and *Inalabulu* and *Jawi* clans. The zone includes the Sea Country surrounding *Jayirri* (Jackson Island), *Jalan* (Tallon Island) and *Iwany* which contain important *baarngaboos* (seasonal camping areas) and cultural sites and are regularly used by Bardi and Jawi people. This zone will protect important biocultural values including coral reefs, seagrass beds, seaweeds and sandy lagoons (Depczynski et al. 2019) which support populations of culturally important fauna including *goorlil* (turtles), *odorr* (dugongs) and a wide diversity of *aarli* (fish). The reefs which will be protected surrounding *Jalan* are ecologically important and geomorphologically important (Richards et al. 2015). The abundance of *Acropora* spp. protected in this zone may provide a critical refuge for this increasingly threatened group of corals (Richards et al. 2015, Wilson 2013). This zone will also protect the seagrass meadows surrounding *Iwany* and *Jalan* which are rich in both species and meadow size (Kendrick, et al. 2017). These seagrass meadows provided an important nursery and foraging areas for a variety of *aarli* (fish) including the herbivorous *barrbal* (golden-lined rabbitfish, *Siganus lineatus*) (Depczynski et al. 2017).





Iwany (Sunday Island). Photo – Roanna Goater, DBCA.

Noobooloon Special Purpose Zone (cultural protection) - Catamaran Bay

The conservation purpose of the Noobooloon Special Purpose Zone (cultural protection) is to conserve the value of the land and waters to the culture and heritage of Bardi and Jawi people. This zone will protect culturally important mangrove and creek systems. This area is regularly used by Bardi and Jawi Traditional Owners, particularly those in the *Banararr* clan, who carry out customary activities here, including fishing and collecting oysters. This zone will protect many significant cultural sites, including *aarli* (fish) traps. Bardi and Jawi people know the mangrove creeks in this area provide important nursery areas for *aarli* (fish) and wish to protect these creeks for future generations.



Mangroves in the Noobooloon Special Purpose Zone (cultural protection). Photo – Roanna Goater, DBCA.

Garrambany Special Purpose Zone (cultural protection) - Chunnelarr Creek

The conservation purpose of the Garrambany Special Purpose Zone (cultural protection) is to conserve the value of the land and waters to the culture and heritage of Bardi and Jawi people. This area is regularly used by Bardi and Jawi Traditional Owners, particularly the *Baniol* clan, who regularly carry out customary activities here including fishing, collecting oysters and hunting for green turtles and *odorr* (dugong). Significant cultural sites which are protected in this zone include an *aarli* (fish) trap. This zone provides protection to creek, mangrove and saltmarsh communities in the King Sound Bioregion which are ecologically and culturally important. This zone also contributes to the protection of snubfin and bottlenose *bayalbarr* (dolphins) which frequently forage in the area. Bardi and Jawi people know the creeks in this area provide important nursery areas for *aarli* (fish) and wish to protect these creeks for future generations.

Maljin Special Purpose Zone (cultural protection) - Cygnet Bay

The conservation purpose of the Maljin Special Purpose Zone (cultural protection) is to conserve the value of the land and waters to the culture and heritage of Bardi and Jawi people. This area is regularly used by Bardi and Jawi Traditional Owners, particularly the *Baniol* clan, who regularly carry out customary activities here including fishing and collecting oysters. This zone protects significant cultural sites including *oombans* (freshwater soaks) and *aarli* (fish) traps. This zone provides protection to creek, mangrove and saltmarsh communities in the King Sound Bioregion which are ecologically and culturally important. This zone also contributes to the protection of snubfin and bottlenose *bayalbarr* (dolphins) and flatback turtles which frequently forage in the Cygnet Bay area. Bardi and Jawi people know the creeks in this area provide important nursery areas for *aarli* (fish) and wish to protect these creeks for future generations.

Garramal Special Purpose Zone (cultural protection) - Cunningham Point

The conservation purpose of the Garramal Special Purpose Zone (cultural protection) is to conserve the value of the land and waters to the culture and heritage of Bardi and Jawi people. This area is regularly used by Bardi and Jawi Traditional Owners, particularly the *Baniol* clan, who regularly carry out customary activities here including fishing and collecting oysters. This zone provides protection to important creek, mangrove and saltmarsh communities in the King Sound Bioregion which are ecologically and culturally important. Bardi and Jawi people know the creeks in this area provide important nursery areas for *aarli* (fish) and wish to protect these creeks for future generations.

12.2.3 Special purpose zones (biocultural conservation)

The conservation purpose of the special purpose zones (biocultural conservation) is to provide for the protection of ecologically and culturally important marine ecosystems such as *marnany* (reefs) and mangroves. This zone type continues to allow for low impact recreational and commercial activities. The special purpose zones (biocultural conservation) play an important role in protecting the value of Bardi and Jawi Country to the culture and heritage of Bardi and Jawi people by protecting important ecological and biocultural values from high impact commercial activities.

To ensure that recreational fishing in these zones does not impact significantly on the important cultural values of these areas additional fishing regulations will be put in place under the FRM Act. The additional fishing regulations will help to ensure that recreational fishing is carried out in a culturally appropriate manner.

The low impact commercial fishing operations which are deemed to be compatible with the conservation of the cultural and ecological values of the special purpose zones (biocultural conservation) are *alngir* (trochus) collection, mackerel fishing, specimen shell fishing, crab fishing and sea cucumber fishing. All other commercial fishing, pearling and aquaculture activities are considered to be incompatible with the conservation purpose of this zone and are not permitted.



Garrilal Special Purpose Zone (biocultural conservation) – Thomas Bay

The conservation purpose of the Garrilal Special Purpose Zone (biocultural conservation) is to provide for the conservation of ecologically and culturally important marine ecosystems. This zone recognises the significant cultural value of the area, particularly to the people from the *Gullarrgon* clan. The zone protects the rocky reefs and mangrove creeks in the Canning Bioregion which are highly valued for customary and recreational purposes. Visitors to the area are asked to respect the Traditional Owners request for privacy in this area, particularly when they are undertaking customary activities. This zone continues to allow for low impact recreational and commercial activities.

Looloorr Special Purpose Zone (biocultural conservation) – Thomas Bay

The conservation purpose of the Looloorr Special Purpose Zone (biocultural conservation) is to provide for the conservation of ecologically and culturally important marine ecosystems. This zone recognises the significant cultural value of the area, particularly to the people from the *Gullarrgon* clan. The zone protects the rocky reefs and mangrove creeks in the Canning Bioregion which are highly valued for customary and recreational purposes. Visitors to the area are asked to respect the Traditional Owners request for privacy in this area, particularly when they are undertaking customary activities. This zone continues to allow for low impact recreational and commercial activities.

Ambool Special Purpose Zone (biocultural conservation) – Apex Island

The conservation purpose of the Ambool Special Purpose Zone (biocultural conservation) is to provide for the conservation of ecologically and culturally important marine ecosystems. This zone recognises the significant cultural value of the area, particularly to the *Iwanyi* and *Inalabulu* clan. This zone protects important biocultural values including, coral reefs, seagrass beds, seaweeds and sandy lagoons which support populations of culturally important fauna including *goorlil* (turtles), *odorr* (dugongs) and a wide diversity of *aarli* (fish). This zone continues to allow for low impact recreational and commercial activities.

Jimarran Special Purpose Zone (biocultural conservation) – Skeleton Point

The conservation purpose of the Jimarran Special Purpose Zone (biocultural conservation) will be to provide for the conservation of ecologically and culturally important marine ecosystems. This zone recognises the significant cultural value of the area, particularly to the *Baniol* clan. The zone protects the rocky reefs, intertidal sand and mudflats and mangrove creeks in the King Sound Bioregion which are highly valued for customary and recreational purposes. Visitors to the area are asked to respect the Traditional Owners request for privacy in this area, particularly when they are undertaking customary activities. This zone continues to allow for low impact recreational and commercial activities.

12.2.4 Sanctuary zones

The sanctuary zones play a central role in protecting areas of critical habitat to maintain the healthy functioning of the complex ecosystems that make up the marine park. For Bardi and Jawi people, many ecological values also have a particular cultural significance, and the sanctuary zones will also contribute to the protection and conservation of Bardi and Jawi cultural heritage values including culturally important reef and mangrove areas.

Sanctuary zones protect critical habitats and aggregation sites, and act as benchmarks to compare to other areas with similar habitats and ecosystems that are subject to extractive use. This allows managers to gain a better understanding of local and regional pressures on the marine environment over time. As such, sanctuary zones provide important opportunities for education, research and monitoring. Research may include Traditional Owners assessing commercial opportunities for present and future sustainable livelihoods, and future reviews of the plan will assess the need for zoning revisions to enable these opportunities to be realised.

Sanctuary zones can help to increase ecosystem health by reducing pressures on the ecosystems protected, thereby increasing resilience to external pressures such as climate change. Modelling by Boschetti et al. 2020 has shown that sanctuary zones in the Kimberley can be particularly beneficial increasing resilience of climate change to exploited fauna such as barramundi (*Lates calcarifer*), Snappers (e.g. *Lutjanus* spp) and emperors (e.g *Lethrinus* spp) and for relatively sedentary species such as reef fishes (e.g. *Choerodon* spp, *Scarus* spp, *Cheilinus* spp).

Ollongon Sanctuary Zone - Pender Bay

The Ollongon Sanctuary Zone protects representative examples of marine habitats including mangrove habitat, intertidal sand and mudflats, seagrass beds and subtidal soft coral and sponge habitat in the Canning Bioregion (Depczynski et al. 2019). These habitats provide a range of different nursery areas for a diverse array of *aarli* (fish) (Depczynski et al. 2017). This zone supports a rich diversity of fauna and species of special conservation interest. Research conducted through WAMSI found Pender Bay to be consistently important for humpback whales throughout the migration season, where the highest abundances of humpback whales and habitat suitability was detected compared to other sites in the Kimberley region (Thums et al. 2018). Not only is Pender Bay an important staging area, results of the research suggested that calving and breeding may also occur there (Thums et al. 2018). Pender Bay is also a biologically important area for Indo-pacific bottlenose *bayalbarr* (dolphins) (*Tursiops aduncus*), Australian humpback *bayalbarr* (dolphins), (*Sousa sahalensis*) and Australian snubfin *bayalbarr* (dolphins) (*Orcaella heinsohni*) (DEWHA 2008). *Odorr* (dugongs) are also regularly observed foraging in Pender Bay between May and July.

Joowan and Moorroodooloon Sanctuary Zone - Twin Islands

The Joowan and Moorroodooloon Sanctuary Zone extends from The Twin Islands in Bardi and Jawi Country to Shirley Islands in the Mayala Marine Park, protecting habitats on both sides of the Sunday Strait which has been shown to act as a barrier to the dispersal of seeds and larvae (McMahon et al. 2017). This zone will protect representative examples of marine biodiversity from deep subtidal habitats (50-100m) to shallow (0-10m) intertidal habitats including coral reefs in the Kimberley Bioregion. Large colonies of roseate terns (*Sterna dougallii*) nest on North West and South East Twin Islands and feed in the surrounding waters of this sanctuary zone (Conservation Commission 2010).

Baniol Gaarra Sanctuary Zone - Cygnet Bay

The Baniol Gaarra Sanctuary Zone protects examples of representative habitat in the King Sound Bioregion including subtidal habitats in depths up to 50m. Whilst the array of habitats and species this zone will protect is still to be determined, protection of this area is important to ensure deeper water habitats are represented. The Cygnet Bay area is a biologically significant area for snubfin *bayalbarr* (dolphins) and dwarf sawfish (foraging, pupping, juvenile, and nursing), freshwater sawfish (foraging and nursing) and green sawfish (pupping, foraging) (DEWHA, 2009).

12.2.5 General use zones

All areas in the marine park not included in sanctuary or special purpose zones are zoned as general use. Management of general use areas is provided for through mechanisms under the CALM Act and CALM Regulations, as well as the implementation of management strategies. The general use areas provide for biodiversity conservation and a range of activities including recreational and commercial fishing, pearling and aquaculture. Pearling and aquaculture leases that exist prior to the establishment of a marine park have a right of renewal and cannot be displaced by the creation of a marine park. New proposals for pearling leases will be assessed on a case-by-case basis by DPIRD in liaison with DBCA through the JMB, Commission and other stakeholders.



12.2.6 Permitted uses

The permitted uses table (Table 1) summarises the range of permitted activities across the different zone types in the marine park. Users should be aware that many of the listed activities are also regulated under complementary legislation and regulations, such as regulations regarding wildlife interactions, the disposal of sillage, and size and bag limits for recreational fishing.

In accordance with the CALM Act, a licence is required to carry out some activities (e.g. commercial tourism and research) in Western Australian marine parks.

The implementation of the management plan may include management actions such as temporal closures. Development of such management actions will aim to limit the impacts on permitted activities whilst meeting the management objectives. An activity marked as 'assess' indicates an assessment is required by the appropriate agencies in accordance with relevant legislation and the management objectives and targets in this plan.

A review of the permitted uses for the special purpose zones will be undertaken in five years to determine whether after research and development, some potential low impact economic development opportunities could be considered compatible with the purpose of the special purpose zones. Any changes to the permitted activities and uses table for the special purpose zones will require a statutory two-month public comment period and approvals from the Minister for Environment, Minister for Fisheries and Minister for Mines and Petroleum.

Table 1: Summary of permitted uses for the Bardi Jawi Marine Park.

Activity	Sanctuary zones [a]	Special Purpose Zones (cultural protection) [a]	Special Purpose Zones (biocultural conservation)	General use zones
Customary				
Customary activities (e.g. hunting and fishing)	Yes [b]	Yes [b]	Yes [b]	Yes [b]
Commercial				
Commercial trochus collection [c]	No	Yes	Yes	Yes
Commercial mackerel fishing [c]	No	No	Yes	Yes
Commercial specimen shell fishing [c]	No	No	Yes	Yes
Commercial crab fishing [c]	No	No	Yes	Yes
Commercial sea cucumber fishing [c]	No	No	Yes	Yes
Commercial fishing (other than trochus, mackerel, specimen shell, crab and sea cucumber) [c]	No	No	No	Yes [d]
Pearling and associated activities [c]	No	No	No	Yes
Aquaculture [c]	No	No	No	Yes
Scenic flights (charter) [c]	Yes	Yes	Yes	Yes
Ground disturbing mining and petroleum exploration and development [e]	No	No	No	Assess
Non-ground-disturbing activities including geophysical surveys, geological mapping, sampling and geochemical surveys [f]	No	No	No	Assess
Ship loading and other mining related infrastructure (e.g. ship loading docks, cabling or pipelines)	No	No	No	Assess
General marine infrastructure (e.g. groynes, jetties and boat launching facilities)	No	Assess	Assess	Assess
Artificial structures (e.g. artificial reefs)	No	No	No	Assess
Dredging and dredge spoil dumping	No	Assess [g]	Assess [g]	Assess

Activity	Sanctuary zones [a]	Special Purpose Zones (cultural protection) [a]	Special Purpose Zones (biocultural conservation)	General use zones
Commercial tour operators – fishing [c]	No	Yes	Yes	Yes
Commercial tour operators – non-extractive (e.g. wildlife viewing) [c]	Yes	Yes	Yes	Yes
Wildlife/fish feeding	No	No	No	No
Recreational				
Boating (motorised and non-motorised)	Yes	Yes	Yes	Yes
Nature appreciation and wildlife viewing	Yes	Yes	Yes	Yes
Recreational fishing [c – if from a boat]	No	No [h]	Yes [i]	Yes
Other use				
Access	Yes	Yes	Yes	Yes
Vessel transit	Yes	Yes	Yes	Yes
Navigation aids	Yes	Yes	Yes	Yes
Research and monitoring [c]	Yes	Yes	Yes	Yes
Anchoring (soft bottom only)	Yes	Yes	Yes	Yes
Mooring	Assess	Assess	Assess	Yes
Seaplane, helicopter and remotely piloted aircraft (drone) launching and landing [j]	Assess	Assess	Assess	Assess
Vessel sewage discharge and de-ballasting	No	No	No	Yes [k]

Permitted activities provisions

- [a] Access may be restricted, in specific areas within a sanctuary or special purpose zone (cultural protection) if deemed necessary to protect cultural or ecological values. Existing shipping channels will be maintained.
- [b] Customary take is confined to native title holders as determined under the *Native Title Act 1993* or where native title holders have provided consent to another Aboriginal person or group.
- [c] Licence or permit required under the *Conservation and Land Management Act 1984* and/ or *Fish Resources Management Act 1994*.
- [d] Prawn trawling is restricted in the marine park through a permanent inshore closure managed by DPIRD.
- [e] Ground-disturbing mining and petroleum exploration and development activities include any activity that disturbs the land, seabed and/or subsoil within the marine park (e.g. drilling).
- [f] Geophysical surveys will be assessed by the Department of Mines, Industry Regulation and Safety.
- [g] Activities permitted if activity is shown to be compatible with the specified purpose of the zone. Only small-scale dredging for the purpose of public access and safety will be considered.
- [h] Recreational fishing is only permitted as part of a tourism operation.
- [i] Additional regulations on recreational fishing under the *Fish Resources Management Act 1994* are likely to occur in special purpose zones (biocultural conservation).
- [j] Lawful authority must be obtained to launch, land or touchdown in an aircraft on CALM Act lands and waters.
- [k] Only in gazetted sewage discharge areas.



12.3 Community stewardship and compliance

Education and public participation will help to increase public awareness and understanding of the values and management issues in the marine park. Increased understanding helps to ensure appropriate behaviour and develop a sense of community stewardship and lead to better protection and management of the park. While most users comply with management arrangements when they understand why they are implemented, it is important to monitor compliance and mitigate inappropriate or illegal behaviour. To achieve this, an appropriate level of 'field' presence by DBCA, Bardi Jawi Rangers (employed directly by the department or contracted) and DPIRD will be necessary in the marine park. It will also be important that users of the marine park also play self-regulatory and peer surveillance roles.

Summary of management arrangements for community stewardship and compliance

Management objectives	To enhance community understanding of and support for the marine park and achieve a high level of compliance with regulations, permitted uses and other management arrangements within the marine park.		
		Management program	Priority
Management strategies	<ol style="list-style-type: none"> 1. Ensure marine park users, including researchers, obtain and comply with appropriate formal permissions [DPIRD]. 2. Encourage voluntary compliance and peer enforcement of regulations [DPIRD, DoT]. 3. Develop an education and interpretation plan which communicates: <ul style="list-style-type: none"> • the importance of the marine park's values • the purposes of management zones and regulations • appropriate behaviour to reduce human impacts and ensure public safety • Bardi and Jawi native title rights and visitor protocols on sea and land; and • Consideration of all education and interpretation strategies listed in the management plan. 4. Develop and implement a collaborative patrol and enforcement program [DPIRD]. 5. Monitor, promote and enforce compliance with fisheries and marine park legislation, including illegal foreign fishing [DPIRD] 6. Install zone markers and educational signage for the marine park where appropriate [DPIRD]. 7. Develop and implement a public participation plan for the marine park, which encourages community involvement in management through a range of opportunities including in education, research and monitoring. 8. Develop, monitor and maintain a database of compliance statistics and adapt management strategies to address any non-compliance issues [DPIRD]. 9. Facilitate cross-authorisation of enforcement officers as appropriate including training Bardi Jawi Rangers in CALM Act compliance with the intention of them obtaining the status of honorary enforcement officers pursuant to the CALM Act. 10. Facilitate training of Bardi Jawi Rangers in FRM Act compliance, to engage in DPIRD compliance activities [DPIRD] 11. Investigate and implement, where necessary, mechanisms to restrict vehicle access in the marine park to designated areas only. 	<p>Patrol and enforcement</p> <p>Education and interpretation</p> <p>Education and interpretation</p> <p>Patrol and enforcement</p> <p>Patrol and enforcement</p> <p>Education and interpretation</p> <p>Public participation</p> <p>Patrol and enforcement</p> <p>Management framework</p> <p>Management framework</p> <p>Patrol and enforcement</p>	<p>Principle</p> <p>Principle</p> <p>H-KMS</p> <p>H-KMS</p> <p>H-KMS</p> <p>H</p> <p>H</p> <p>H</p> <p>H</p> <p>H</p> <p>M</p>

13. Assessing management effectiveness

Progress in implementing the management plan and in assessing management effectiveness against stated objectives will be regularly reviewed through a formal process consisting of annual performance assessment reports and periodic and ten-year reviews of the management plan.

Annual reviews

The prioritised management strategies outlined in the management plan will be implemented by the joint management partners, primarily through the collaboration of DBCA's West Kimberley District, Marine Science Program, the Bardi Jawi Rangers and other specialist branches guided by the JMB. The JMB with the assistance of Bardi Jawi Rangers, the West Kimberley District and DPIRD will prepare an annual review of the implementation of the management plan for consideration by the BJNAC and the Commission. Key parts of the annual review will include:

- progress in implementing management plan strategies
- assessment of the condition of values, the pressures acting on values, management response and management effectiveness
- identifying issues affecting implementation
- resource allocation.

As part of the annual review process, BJNAC will also provide an update to the Bardi and Jawi Community on the implementation of the management plan and condition of Country.

Periodic assessments

The Commission has a statutory responsibility to periodically assess the implementation and effectiveness of management plans. The JMB, BJNAC and DBCA will provide information from monitoring and other operational programs to the Commission to enable an assessment of the plan's implementation. Monitoring by the Commission will also be informed by healthy Country assessments under the healthy Country plan. This outcome-based approach provides a robust framework to support adaptive marine park management.

Revision of the management plan

The joint management plan will guide joint management of the marine park for 10 years, or until a statutory revision is undertaken and a new joint management plan is prepared. If such a revision does not occur by the end of the plan's specified lifespan, the plan will remain in force in its original form unless it is revoked by the Minister for Environment or a new plan co-designed is approved. Full public consultation will occur at the time of revision, and endorsement of a revised joint management plan will be sought from the JMB and Commission and approval of the Minister for Environment following concurrence from the Minister for Mines and Petroleum and Minister for Fisheries.



Summary of management arrangements for assessing management effectiveness

Management objectives	To assess and evaluate management effectiveness.		
Management strategies		Management program	Priority
<p>Joint management partners are the lead for all strategies. Supporting agencies are listed in brackets. If agencies are required to take a lead role, their name is in bold.</p>	1. Develop and implement a performance assessment process that is suitable in a joint management setting and is consistent with DBCA and Commission policy and ensure results are reported back to the Bardi and Jawi Community [Commission, JMB].	Management Framework	H-KMS
	2. Through the JMB, support BJNAC to conduct periodic reviews of the effectiveness of plan implementation in meeting cultural aspirations, capacity building and other priority objectives [DPIRD].	Monitoring	H-KMS
	3. Develop and implement a monitoring and evaluation framework to assess joint management effectiveness for the marine park [DPIRD].	Management framework	H
	4. Provide necessary information and support for the performance assessment process [JMB, DPIRD].	Monitoring	As required
	5. Implement management strategies to mitigate or stop any impacts from human activities within the marine park which are negatively impacting the values of the marine park [DPIRD].	Management intervention and visitor services	As required



Bardi Jawi Rangers on the ranger boat *Almban*. Photo – Roanna Goater, DBCA.

References and Appendices

References

AIATSIS (2019). *Indigenous Australian Languages*. <https://aiatsis.gov.au/explore/articles/indigenous-australian-languages>. Accessed March 2020.

Ardyaloon Hatchery (2020). <https://www.ardyaloonhatchery.com.au/about/>. Accessed November 2018.

Austin B.J., Dobbs R.J., Lincoln G, Mathews D, Oades D, Wiggan A, with the Balangarra, Bardi Jawi, Dambimangari, Karajarri, Nyul Nyul, Wunambal Gaambera & Yawuru Traditional Owners (2017). *Navigating Knowledge Currents through Kimberley Saltwater Country*. Final Report of project 1.5 the Kimberley Indigenous Saltwater Science Project (KISSP). Prepared for the Kimberley Marine Research Program, Western Australian Marine Science Institution. Perth, Western Australia, 28pp.

Australian Academy of Science (2020) *The science of climate change*. <https://www.science.org.au/education/immunisation-climate-change-genetic-modification/science-climate-change>. Accessed 21 October 2020.

Australian Bureau of Statistics (2016). *2016 Census QuickStats*. Retrieved September 7, 2018, from http://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/UCL515010?opendocument. Accessed August 2020.

Boschetti F., Lozano-Montes H. and Stelfox B (2020) *Modelling regional futures at decadal scale: application to the Kimberley region*. *Scientific Reports* 10:849

Bowern C.L. (2012). *A Grammar of Bardi*. Walter de Gruyter GmbH and Co. KG, Berlin.

Bradley M., Nagelkerken I., Baker R., Travers M. & Sheaves M. (2021). *Local Environmental Context Structures Animal-Habitat Associations Across Biogeographic Regions*. *Ecosystems*, 1-15.

Bryce C., Bryce M. and Radford B. (2018). *Project methods and station geomorphology related to a multi taxon survey (2009-2014) of the Kimberley*. *Records of the Western Australian Museum Supplement*, 85: 001-043.

Claire Bowern (2016). *Language and land in the Northern Kimberley*. In *Language, land & song: Studies in honour of Luise Hercus*, edited by Peter K. Austin, Harold Koch & Jane Simpson. London: EL Publishing. pp. 277- 286.

Conservation Commission of Western Australia (2010). *Status Performance Assessment: Biodiversity Conservation on Western Australian Islands Phase II – Kimberley Islands*. Final Report.

Bayliss P. and Hutton, M. (2017). *Integrating Indigenous knowledge and survey techniques to develop a baseline for dugong (Dugong dugon) management in the Kimberley*. Perth. Western Australian Marine Science Institution.

Blake S., Dapson I., Auge O., Bowles A., Marohn E., Malatzky L., & Granger, S. (2011). *Monitoring of humpback whales in the Pender Bay, Kimberley region, Western Australia*. *Journal of the Royal Society of Western Australia*, 94, 393-405.

Bouchet P.J, Thiele D., Marley S.A., Waples K., Weisenberger F., Balangarra Rangers, Bardi Jawi Rangers, Dambimangari Rangers, Nyamba Buru Yawuru Rangers, Nyul Nyul Rangers, Uunguu Rangers and Raudino. (2021). *Regional Assessment of the Conservation Status of Snubfin Dolphins (Orcaella heinsohni) in the Kimberley Region, Western Australia*. *Frontiers in Marine Science* 7.



Brocx M. & Semeniuk (2011). The Global Geoheritage Significance of the Kimberley Coast, Western Australia. *Journal of the Royal Society of Western Australia*, 94: 57-88.

Brown A.M., Smith J., Salgado-Kent C., Marley S., Allen S.J., Thiele D., Bejder L., Erbe C. and Chabanne D. (2016). *Relative abundance, population genetic structure and acoustic monitoring of Australian snubfin and humpback dolphins in regions within the Kimberley*. Report of Project 1.2.4 prepared for the Kimberley Marine Research Program, Western Australian Marine Science Institution, Perth, Western Australia, 61pp plus appendices.

Collins L., Stevens A., O'Leary M., Bufarale G., Kordi M. and Solihuddin T. (2016). *Reef Growth and Maintenance*. Perth. Western Australian Marine Science Institution.

Cresswell I. and Semeniuk V. (2011). *Mangroves of the Kimberley coast: ecological patterns in a tropical ria coast setting*. *Journal of the Royal Society of Western Australia*, 94, 213–237.

CSIRO and Bureau of Meteorology (2015). *Climate Change in Australia. Information for Australia's Natural Resource Management Regions: Technical Report*. CSIRO and Bureau of Meteorology, Australia.

Department of Agriculture, Water and Environment (2020) <https://www.environment.gov.au/marine/marine-pollution>. Accessed September 2020.

Department of Environment. (2018). *National Heritage Places - West Kimberley*. <http://www.environment.gov.au/heritage/places/national/west-kimberley>. Accessed May 2018.

Department of Parks and Wildlife (2013). *Marine turtles of the Kimberley Coast*. <https://parks.dpaw.wa.gov.au/sites/default/files/downloads/parks/Marine%20Turtles%20of%20the%20Kimberley%20Coast.pdf>. Accessed October 2018.

Department of the Environment, Water, Heritage and the Arts (2007) *A Characterisation of the Marine Environment of the North-west Marine Region*. Commonwealth of Australia.

Department of Environment, Water, Heritage & the Arts (DEWHA) (2008) *The Northwest Marine Bioregional Plan*. DEWHA, Canberra.

Department of the Environment, Water, Heritage and the Arts (2009). *Approved Conservation Advice for *Pristis clavata* (Dwarf Sawfish)*. Canberra, ACT: Department of the Environment, Water, Heritage and the Arts. <http://www.environment.gov.au/biodiversity/threatened/species/pubs/68447-conservation-advice.pdf>. In effect under the EPBC Act from 20-Oct-2009.

Department of Transport (2009). *Strategy for Management of Sewage Discharge from vessels into the Marine Environment*. <https://www.transport.wa.gov.au/mediaFiles/marine/MAC-IS-SewageStrategy.pdf>.

Depczynski M., Cure K., Holmes T., Moore G., Piggott C., Travers M., Wilson S., Oades D., McCarthy P., George K. Snr, George K. Jnr, Edgar Z. and Howard A. (2017). *Final report of Project 1.1.2a Key Ecological Processes in Kimberley Benthic Communities: Fish Recruitment*, prepared for the Kimberley Marine Research Program, Western Australian Marine Science Institution, Perth, Western Australia, pp 35.

Depczynski M., Cook K., Cure K., Davies H., Evans-Illidge L., Forester T., George K., Gould J., Howard A, Oades D., Underwood J., Wyatt M. (2019) *Marine monitoring of Australia's indigenous sea country using remote technologies*. *The Journal of Ocean Technology* 14(1): 60-75 Australian Marine Science Institution, Perth, Western Australia, pp 35.

Environmental Protection Authority (2016a) *Technical Guidance. Protecting the Quality of Western Australia's Marine Environment*. Government of Western Australia.

Environmental Protection Authority (2016b) Environmental Factor Guideline. Marine Environmental Quality. The Government of Western Australia.

Enzer Marine Environmental Consulting (1998). The Environmental Impact of Pearling (*Pinctada maxima*) in Western Australia. Report to the Pearl Producers Association Inc. by Enzer Marine Environmental Consulting, Perth.

Feng M., Slawinski D., Shimizu K., Zhang N. (2017). *Climate change: knowledge integration and future projection*. Final Report of Project 2.2.7 prepared for the Kimberley Marine Research Program, Western Australian Marine Science Institution, Perth, Western Australia, 50 pp

Fromont J., Richards Z. T. and Wilson N. G. (2019). *First Report of the Coral-Killing Sponge *Terpios hoshinota* Rutzler and Muzik, 1993 in Western Australia: A New Threat to Kimberley Coral Reefs? Diversity, 11(10)*, <https://doi.org/10.3390/d11100184>.

Gaughan D.J. and Santoro K. (eds). (2020). *Status Reports of the Fisheries and Aquatic Resources of Western Australia 2018/19: The State of the Fisheries*. Department of Primary Industries and Regional Development, Western Australia.

Gilmour J., Speed C.W and Babcock R. (2016). *Coral reproduction in Western Australia*. PeerJ 4:e2010; DOI 10.7717/peerj.2010.

Halford A.R. and Barrow D (2017). *Saltwater crocodiles (*Crocodylus porosus*) in the northwest Kimberley*. Report of Project 1.2.3 prepared for the Kimberley Marine Research Program, Western Australian Marine Science Institution, Perth, Western Australia, 52 pp.

Halpern B.S., Walbridge S., Selkoe K.A., Kappel C.V., Micheli F., D'Agrosa C., Bruno J.F., Casey K.S., Ebert C., Fox H.E., Fujita R., Heinemann D., Lenihan H.S., Madin E.M.P., Perry M.T., Selig E.R., Spalding M., Steneck R. and Watson R. (2008). *A Global Map of Human Impact on Marine Ecosystems*. Science, 319, 948–952.

Hernawan U., Dijk K., Kendrick G., Feng M., Biffin E., Lavery P. and McMahon K. (2016). *Historical processes and contemporary ocean currents drive genetic structure in the seagrass *Thalassia hemprichii* in the Indo-Australian Archipelago*. Molecular Ecology. 26. 10.1111/mec.13966.

Hoegh-Guldberg O. and Bruno J. F. (2010). *The Impact of Climate Change on the World's Marine Ecosystems*. Science, 328, 1523-1528.

Huisman J. M. and Sampey A. (2014). *Kimberley marine biota. Historical data: marine plants*. Records of the Western Australian Museum Supplement, 84, 45-67.

Intergovernmental Panel on Climate Change (2019). *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate*. In press.

International Union for Conservation of Nature (2017). *Marine protected areas and climate change*. https://www.iucn.org/sites/dev/files/mpas_and_climate_change_issues_brief.pdf. Accessed March 2020.

Jelbart J.E., Schreider M. and MacFarlane G. (2009). *The influence of pearl oyster farms on benthic physicochemistry and macro benthic communities of the Kimberley coast, Western Australia, technical document prepared by University of Newcastle for Pearl Producers Association, scientific study for FRDC Project 2005/044*, Australia.

Kendrick G.A., Vanderklift M., Bearham D., Mclaughlin J., Greenwood J., Säwström C., Laverock B., Chovrelat L., Zavala-Perez A., De Wever L., Trapon M., Grol M., Guilbault E., Oades D., McCarthy P., George K., Sampi T., George D., Sampi C., Edgar Z., Dougal K. and Howard A. (2016). *Benthic primary productivity: production and herbivory of seagrasses, macroalgae and microalgae*. Report of 2.2.4 prepared for the Kimberley Marine Research Program, Western Australian Marine Science Institution, Perth, Western Australia, 61 pp.



Kendrick G., Fraser M. and Vanderklift M. (2018). *Surviving the Extreme: Seagrasses of the Kimberley*. In McGlashan H., Coate K., Gresham J. J. and Hart R. (Eds.). *The Natural World of the Kimberley* (pp. 217-231). Perth.

Kenneally K., Thomson C., Done, C. and Wheeler, J. (1996). *Common plants of the Kimberley*. Perth: Department of Conservation and Land Management.

Keesing J., Irvine T., Alderslade P., Clapin G., Fromont J., Hosie A. and Phillips J.C., Naughton K.M., Marsh L.M, Slack-Smith S.M. Thomson D.P and Watson J.E (2011). *Marine benthic flora and fauna of Gourdon Bay and the Dampier Peninsula in the Kimberley region of north-western Australia*. *Journal of the Royal Society of Western Australia*, 94, 285-301.

Kimberley Development Commission (2019). *Kimberley tourism hits record highs*. Retrieved from <https://kdc.wa.gov.au/tourism-visitors-hit-record-high-in-the-kimberley>.

Kimberley Land Council / Bardi Jawi Niimidiman Aboriginal Corporation RNTBC (2013) *Bardi Jawi Indigenous Protected Area Management Plan 2013-2023*. Broome.

KPP Business Development (2018) *Dampier Peninsula Visitor Forecasts*. Broome.

Le Nohaïc, M.; Ross, C.L.; Cornwall, C.E.; Comeau, S.; Lowe, R.; McCulloch, M.T.; Schoepf, V. *Marine heatwave causes unprecedented regional mass bleaching of thermally resistant corals in northwestern Australia*. *Scientific Report*. 2017, 7: 14999, doi:10.1038/s41598-017-14794-y.

Lear, K. O., A. C. Gleiss, J. M. Whitty, T. Fazeldean, J. R. Albert, N. Green, B. C. Ebner, D. C. Thorburn, S. J. Beatty, and D. L. Morgan. 2019. Recruitment of a critically endangered sawfish into a riverine nursery depends on natural flow regimes. *Scientific Reports* 9:17071.

Marine Parks and Reserves Selection Working Group (1994). *A Representative Marine Reserve System for Western Australia*. Perth: Department of Conservation and Land Management.

Masini R., Sim C., and Simpson C. (2009). *Protecting the Kimberley: A synthesis of scientific knowledge to support conservation management in the Kimberley region of Western Australia*. URL: http://imos.org.au/fileadmin/user_upload/shared/IMOS%20General/documents/external_reports/2009224_kimberleysciencercpt_finalweb_2_.pdf.

Mayala Inninalang Aboriginal Corporation RNTBC ICN 9067 (2019) *Mayala Country Plan 2019-2029*. Broome.

McCallum B. and Prince J. (2009). *Development of the Scientific Requirements of an Environmental Management System (EMS) for the Pearling (Pinctada maxima) industry*. FRDC Project 2005/044. Pearl Producers Association. Mt Hawthorn.

McCulloch M., Schoepf V., and Falter J. (2017). *Resilience of Kimberley coral reefs to climate and environmental extremes: past, present and future*. Report of Project 1.3.2 prepared for the Kimberley Marine. Perth, Western Australia: Western Australian Marine Science Institution.

McLeod E., Chmura G.L., Bouillon S., Salm R., Bjork M., Duarte C.M., Lovelock C.E., Schlesinger W.H. and Silliman B.R (2011). *A blueprint for blue carbon; toward an improved understanding of the role of vegetated coastal habitats in sequestering CO₂*. *Frontiers in Ecology and the Environment*, 9(10), 552-560

McMahon K., Hernawan U., van Dijk K.-J., Waycott M., Biffin E., Evans R., & Lavery P. (2017). *Genetic variability within seagrass of the north west of Western Australia*. Report of Theme 5 - Project 5.2 prepared for the Dredging Science Node. Perth, Western Australia: Western Australian Marine Science Institution.

- Miththapala S. (2013) *Tidal flats*. Coastal Ecosystems Series (Vol 5). iii + 48pp. Colombo Sri Lanka: IUCN.
- Moore G.I., Morrison S.M. and Johnson J.W. (2020) *The distribution of shallow marine fishes of the Kimberley, Western Australia, based on a long-term dataset and multiple methods*. Records of the Western Australian Museum Supplement, 85: 105-115.
- Moore G.I., Morrison S.M., Hutchins J.B., Allen G.R. and Sampey A. (2014) *Kimberley marine biota. Historical data: fishes*. Records of the Western Australian Museum Supplement, 84: 161-206.
- Moore G.I., Morrison S.M. and Johnson J.W. (2020) *The distribution of shallow marine fishes of the Kimberley, Western Australia, based on a long-term dataset and multiple methods*. Records of the Western Australian Museum Supplement, 85: 105-115.
- Morgan D.L., Whitty J.M., Phillips N.M., Thorburn D.C., Chaplin J.A. and McAuley R (2011). *North-western Australia as a hotspot for endangered elasmobranchs with particular reference to sawfishes and the Northern River Shark*. Journal of the Royal Society of Western Australia 94(2):345–358.
- Parra G.J., Corkeron P.J. and Marsh H. (2006). *Population sizes, site fidelity and residence patterns of Australian snubfin and Indo-Pacific humpback dolphins: Implications for conservation*. Biological Conservation 129:167–180.
- Pedersen O., Colmer T.D., Borum J., Zavala-Perez A. and Kendrick G.A. *Heat stress of two tropical seagrass species during low tides - impact on underwater net photosynthesis, dark respiration and diel in situ internal aeration* (2016). New Phytologist. 210(4):1207-18. doi: 10.1111/nph.13900. Epub 2016 Feb 23. PMID: 26914396.
- Pendretti Y.M and Paling E.I (2001). WA Mangroves Assessment Project 1999-2000. Murdoch University, Perth.
- REMPAN (2020) Economy, Jobs and Business Insights. Accessed 6 October 2020, <https://app.rempman.com.au/kimberleyregion/economy/tourism/output?state=gPzyfn!DB96FAq2BFGyr06tlKqo8SQtdhZDpl4AxAahehqqiAhVUzQ9NFyMq>.
- Richards Z.T., Garcia R.A., Wallace C.C., Rosser N.L. and Muir P.R. (2015). *A diverse assemblage of reef corals thriving in a dynamic intertidal reef setting (Bonaparte Archipelago, Kimberley, Australia)*. PLoS One, 10(2), p.e0117791.
- Richards Z. and O'Leary M. (2015). *The coralline algal cascades of Tallon Island (Jalan) fringing reef, NW Australia*. Coral Reefs, 34(2), 595-595.
- Richards Z., Berry O., Underwood J., McMahon K., Travers M., Moore G., Hernawan U., DiBattista J., Evans R., Gilmour J. (2017). *Ecological Connectivity of Kimberley Marine Communities*. Synthesis Report of Project 1.1.3 prepared for the Kimberley Marine Research Program, Western Australian Marine Science Institution, Perth, Western Australia, 18pp.
- Salgado-Kent C.P., Jenner K.C.S., Jenner M., Rexstad E.A. (2012). *Southern Hemisphere breeding stock 'D' humpback whale population estimates from North West Cape, Western Australia*. Journal of Cetacean Research and Management 12:29-38.
- Stevens J. D., McAuley R., Simpfendorfer C. and Pillans R. (2008). *Spatial distribution and habitat utilisation of sawfish (Pristis spp) in relation to fishing in northern Australia*. A report to Department of the Environment, Water, Heritage and the Arts CSIRO.
- Thackway R. and Cresswell I. (1998). *Interim Marine and Coastal Regionalisation for Australia; An ecosystem-based classification for marine and coastal environments*. Canberra: Environment Australia.



Thums M., Jenner C., Waples, K., Salgado-Kent C. and Meekan M. (2018). *Humpback whale use of the Kimberley: understanding and monitoring spatial distribution*. Perth: Western Australian Marine Science Institution.

Travers M. J., Potter I. C., Clarke K. R. and Newman S. J. (2012). *Relationships between latitude and environmental conditions and the species richness, abundance and composition of tropical fish assemblages over soft substrata*. Marine Ecology Progress Series 446, 221-241.

Travers M. J., Clarke K. R., Newman S. J., Hall N. G. and Potter I. C. (2018). *To what extents are species richness and abundance of reef fishes along a tropical coast related to latitude and other factors?* Continental Shelf Research 167, 99-110.

Tucker T., Whiting S., Mitchell N., Berry O., FitzSimmons N. and Pendoley K. (2014). *The Kimberley Marine Turtle Project under the Western Australian Marine Sciences Institution (WAMSI)*. Perth: Proceedings of the Second Australian and Second Western Australian Marine Turtle Symposia.

West Australian Museum (2020). <http://museum.wa.gov.au/sites/default/files/Kimberley.pdf>. Accessed August 2020.

Whiting S., Tucker T., Pendoley K., Mitchell N., Bentley B., Berry O. and FitzSimmons N. (2018). *Final Report of Project 1.2.2 prepared for the Kimberley Marine Research Program*, Western Australian Marine Science Institution, Perth, Western Australia, 146 pp.

Willing, T. (2011). *Literature Review for Terrestrial and Marine Environments on Bard Jawi Land and Sea Country*. Unpublished.

Wilson B. (2013). *The Biogeography of the Australian North West Shelf: Environmental Change and Life's Response*. Elsevier. Perth.

WWF (2018). *Marine Pollution*. <http://www.wwf.org.au/what-we-do/oceans/marine-pollution#gs.OAbodCM>. Accessed September 2018.

Vigilante T., Toohey J., Goring A., Blundell V., Saunders T., Mangolamara S., George K., Oobagooma J., Waina M., Morgan K. and Doohan K (2013) *Island country: Aboriginal connections, values and knowledge of the Western Australian Kimberley islands in the context of an island biological survey*. Records of the Western Australian Museum Supplement. 81 145-182.

Appendix 1 – Design Principles

Comprehensiveness: The full range of ecosystems and communities (e.g. all of the different habitat types) are represented within the network.

Adequacy: The network includes enough of each component of biodiversity (e.g. enough of each particular habitat type) to allow populations, species and communities associated with each component to remain healthy.

Representativeness: Biodiversity features should be represented across their natural range and variability, for example habitats and communities should be represented across a range of depths and across different wave exposures.

Ecological importance: The protection of ecologically important features such as known nursery, foraging, breeding and calving areas; areas that are unique, unusual or highly productive; and areas that are important for or where known aggregations occur of rare, threatened or protected species.

Connectivity and complementarity: Connectivity includes the way tides, currents, plants and the behaviour of animals combine to connect neighbouring and more widely separated ecosystems in the marine environment (DEH 2009). Population connectivity depends on the magnitude of immigration and migration within and between populations and has the potential to profoundly influence the resilience of communities to natural and anthropogenic disturbances. Complementarity assists with connectivity by connecting protected areas. Complementarity can help increase management effectiveness and provide ecosystem linkages between the land and sea (DEH 2008).

Protect and conserve Aboriginal cultural heritage: The protection of cultural heritage values can involve:

- the protection of culturally important sites or areas such as marnany (reefs), beaches and mangrove communities. Important sites may also include important dreaming sites, aarli (fish) traps, intertidal stone arrangements, increase sites, ceremonial sites and others.
- the protection of areas important for culturally significant species such as goorlil (turtles), odorr (dugongs), miinimbi (whales) and bayalbarr (dolphins)
- providing for ongoing customary activities such as fishing and hunting
- providing consistency (where culturally appropriate) with cultural Laws and protocols through zoning and other management arrangements.

Provide for ongoing ecologically sustainable use: The zoning scheme should:

- consider the existing use of the marine environment and the current management arrangements in place
- promote opportunities for recreation and appreciation of the marine environment
- promote opportunities for education and research
- provide for cultural, natural and maritime heritage values
- be designed so that it is easy for users to understand and comply with zoning and management arrangements.



Appendix 2 – Bardi language glossary

Bardi Language	Meaning
<i>Amboorin amboonoo</i>	People, together let's
<i>angallala jard booroo</i>	look after Country good
<i>Banyjoord</i>	Fish poison
<i>Baarngaboo</i>	Seasonal camping area
<i>Booroo</i>	Home place
<i>Gaalwa</i>	Double log rafts
<i>Galaway</i>	Sculling
<i>Gaarra</i>	Saltwater
<i>Galaloong</i>	Cultural hero
<i>goolajarrg</i>	Small fishing spear
<i>lIngam</i>	Fish poison
<i>Jarrar or Jadarr</i>	Turtle and dugong spear
<i>linalang</i>	Islands
<i>Loolooloo</i>	Dreaming ancestor (Hammerhead shark)
<i>Madjamadjin / Majamajin</i>	Law bosses
<i>Mardgaliny</i>	Dreaming ancestor- shark
<i>Rai</i>	Child spirits
<i>Wanggay</i>	Pindan wattle tree
Clans	
<i>Ollongon</i>	Clan name
<i>Gullarrgon</i>	Clan name
<i>Ardiol</i>	Clan name
<i>Iwanyiand Inalabulu</i>	Clan name
<i>Banararr</i>	Clan name
<i>Baniol</i>	Clan name
<i>Jawi</i>	Clan name
Habitats	
<i>Laanyji</i>	Macroalgae
<i>Marnany</i>	Reef
<i>Marrgoorr</i>	Coral
<i>Noomool</i>	Seagrass
Animals	
<i>Aarli</i>	Fish
<i>Alngir</i>	Trochus
<i>Ambool</i>	Baler shell
<i>Ankoorrbin</i>	Small green turtle
<i>Aanngal</i>	Young green turtle
<i>Arragool</i>	Bronze whaler shark
<i>Barnamb</i>	Ray
<i>Barbal</i>	Rabbit face fish
<i>Barrambarr</i>	Large bluebone
<i>Baboor</i>	Garfish
<i>Bayalbarr</i>	Dolphin
<i>Bawanjan</i>	Flatback turtle
<i>Bbiindarral</i>	Coral trout
<i>Biidib</i>	Rock cod
<i>Biindoon</i>	Spotted-leaved red mangrove
<i>Birrinyan</i>	Queenfish
<i>Ggarnamarrd</i>	Hammerhead shark

Bardi Language	Meaning
<i>Garrabal</i>	Bird
<i>Gaarrayoon alarrgarr</i>	Myrtle mangrove
<i>Marrgaliny</i>	Hammerhead shark
<i>Gambarl</i>	Surgeonfish
<i>Gandarr</i>	Tiger shark
<i>Goolan</i>	Small bluebone
<i>Gooloorrganjoon</i>	Mackerel
<i>Garril</i>	terns
<i>Giido</i>	Oystercatchers
<i>Goorlil</i>	Turtle
<i>lingalan</i>	Barramundi
<i>Goowarn</i>	Pearl oyster
<i>Jangarr</i>	Type of ray
<i>Jamalal</i>	Long tom
<i>Jirral and yawili</i>	Trevally
<i>Joolboo</i>	Kapok mangrove
<i>Joordoo</i>	Mullet
<i>loorloo</i>	Spanish flag
<i>Joorroo</i>	Shark
<i>Linygurra</i>	Estuarine Crocodile
<i>Maarrarn</i>	Mangrove jack
<i>Miinimbi</i>	Whale
<i>Minimboor</i>	Mullet
<i>Ngoorrngool</i>	White mangrove
<i>Ngarrangg</i>	Mudcrabs
<i>Odorr</i>	Dugong
<i>Oombans</i>	Freshwater soaks
<i>Oondood</i>	Mating turtle
<i>Vawiny</i>	Type of Ray (<i>Himantura toshi</i>)
Places	
<i>Arnbarani</i>	Cape Leveque Island
<i>Ardyaloon</i>	One Arm Point
<i>Gardiny</i>	Swan Island
<i>Iwany</i>	Sunday Island
<i>Jalan</i>	Tallon
<i>Jajin</i>	Packer Island
<i>Joowanan</i>	Northwest Twin islands
<i>Moorroodooloon</i>	Southeast Twin Islands
<i>Ngoolminjin</i>	Apex Island
<i>Oorroondoorroon</i>	Alarm Shoals
Seasons	
<i>Ngaladancy</i>	Approximately Jan - Feb (but depends on monsoon)
<i>Irralboo</i>	Approximately March - April
<i>Barrgana</i>	Approximately May - July
<i>Jalalay</i>	Approximately July - September
<i>Lalin</i>	Approximately October - November
<i>Mangal</i>	Approximately November - December





Mangroves. Photo - Roanna Goater, DBCA

