VALUING OUR TOP END COASTS AND SEAS

The economic, social and environmental importance of maintaining a healthy marine environment

KEEP TOP END COASTS HEALTHY

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FOREWORD

Exploring and taking photos of Territory landscapes is my passion, my lifestyle – and my livelihood. Once the camera is positioned on its tripod, and the shot framed, I wait.

I wait for the right moment to open the shutter and saturate the sensor with colour, light and shade. For me this is a still point while all around the world is turning – the landscape is alive.

In it, the eyes of a saltwater croc pierce the wetland's surface, belying the one-tonne creature beneath. A young jacana steps gingerly across a lily pad, a jabiru stork fishes with its long black bill, and the first party of frequent flyers from the Arctic suss out tidal mudflats.

My travels have taken me to all corners of the Top End to photograph its many landscapes, some more than once. By returning to a favoured spot, I hope to capture something different in the balance of colours and the mix of wildlife, cloud cover, water surfaces and the setting and rising of the sun. What I don't want to see is a landscape degraded.

Too many coast and seascapes around Australia and in other parts of the world have been changed irreparably. Even places in the Top End have been altered by coastal development, pollution, overfishing, destructive mining practices, and introduced species. The extensive dieback of mangroves in the Gulf of Carpentaria shows how quickly change comes around.

In reading this report, my mind returned to the images of cherished landscapes I have captured through a camera lens: their values are what will be lost if we fail to act.

I don't want my photographs to become time capsules of what once was, printed images hanging on a museum wall or digital memories on a card. We cannot allow our coast and seascapes to become virtual: we must now secure their virtue.

The Top End is a place of rare beauty, where country, culture and lifestyle are inseparably intertwined. It is a timeless landscape but the threats are now.

By committing to prepare a marine and coastal strategy, the Gunner Government has thrown down the challenge to Territorians. It's the perfect opportunity for us to show how much we love the Top End's coasts and seas, how much we depend on them for our culture, livelihoods, lifestyle, peace and enjoyment, and how strong our desire is to pass them on in good health to the people who follow.

Paul Arnold, bush explorer and photographer. Ambassador, Keep Top End Coasts Healthy

Nightcliff Jetty. Photo: Paul Arnold

Casting a line from a boat is central to the Top End fishing story. Honey Island, East Arnhem Land.

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Australia's Top End has become synonymous with 'global biodiversity hotspot', 'tourist mecca', 'angler's paradise' and where Indigenous communities maintain a continuing connection with saltwater country.

On the whole, the region's coasts and seas remain in very good condition and are part of the global centre for marine biodiversity. They are a natural treasure trove, their good health essential to maintaining culture, economy, lifestyle and livelihoods. But Territorians are becoming increasingly aware and concerned about existing and future threats to Top End environments – and a lifestyle that nothing down south comes close to.

Without improved protection and management, the Top End is at risk of going the same way as many degraded areas in southern and eastern Australia. For a place with such an enviable outdoor lifestyle, this would be devastating and undermine the cultural heritage of Indigenous communities, the tourism industry and the regional economy.

2. What is valuable about the Top End's coasts and seas?

This second section considers the natural values of the Top End's coasts and seas, those parts of nature that are important or have worth to people and society.

The Top End is a unique part of Australia, a remarkable mix of natural and cultural values with powerful social and lifestyle connections cherished by Territorians and visitors alike. It is also one of the last intact tropical marine and coastal regions in the world.

Containing more than 50 mangrove species, the Top End's mangrove forests are more diverse than any other part of Australia, representing 40% of the nation's mangrove cover. Six of the world's seven marine turtle species feed and breed in the region, which will become an important refuge from the serious threats they suffer elsewhere. The Top End's coasts and seas can also offer sanctuary for dugong, dolphins, whales and many threatened seabirds and shorebirds.

Seagrass meadows are critical for the survival of dugongs, and are also rated globally as the third-most valuable ecosystem for ecosystem services e.g. water quality regulation, shoreline protection, habitat for prawns and other marine life, and a refuge from predation.

Wetlands of the Top End's coastal floodplains support significant wildlife populations and also provide important ecosystem services, such as filtering water and absorbing the impacts of storm and flood. Saltwater crocodiles roam these wetlands and are a magnet for Top End tourists and underpin a $25million crocodile farm industry. In the 1970s, hunting brought crocodiles close to extinction, but they are now protected because of their environmental, cultural and economic importance.

The Top End coasts and seas have many, often remote sites of international conservation significance that are generally in very good to near-pristine condition. But they are under threat from climate change, invasive species, habitat loss, fire, mine pollution and, in some places, overfishing. They may face future impacts from water resource projects, seabed mining and the oil and gas industry. Territorians have a unique opportunity to learn from the mistakes made in other parts of Australia and the world, and to be active custodians of the Top End's healthy coasts and seas.

3. How much are the coasts and seas worth?

The third section in this report assesses the worth of the Top End's coasts, not just in terms of the production values of the resource sectors using them, but also the value their ecosystem services provide.

Recreational and commercial fishing, aquaculture and fishing tourism are all reliant on the continuing good health of coasts and seas and are important economic drivers in the Top End, with a production value around $180million. The economic impact of angling is felt very strongly in the regional parts of the Top End, where 70% of recreational fishing occurs.

But there is much more to account for when estimating the worth of the Top End's coasts and seas. Valued at $1.8 billion a year, domestic, interstate and international tourism is now the Territory economy's third-largest sector, well ahead of mining, and generates 15,500 jobs (compared to only 4,800 in the mining and resource sector, and 1,700 in agriculture, forestry and fishing combined)[1]. A large portion of that tourism is based on the Top End's coasts and seas.

When added to the estimated $428million annual value of the ecosystem services provided by mangroves, seagrasses and nearshore waters, the numbers really do begin to stack up, with the Top End's coasts and seas worth more than $2billion each year.

However, tourism growth is slower in the Territory than elsewhere in Australia. In the decade after the Great Barrier Reef Marine Park had its green zone protection increased from 5% to 33% in 2004, tourist numbers increased by 30%. Similarly, tourism growth in the Territory could be improved by the protection of the Territory's tourism assets, including marine national parks, saltwater country Indigenous Protected Areas and recreational fishing areas. Research in the Kimberley indicates that tourists will stay longer, spend more and help create new jobs, especially in the remote regions that currently have limited economic opportunities.

4. Connecting culture and lifestyle to the coasts and seas

Lianthawirryarra Sea Rangers help manage saltwater country in the Top End. Photo: David Hancock

Section 4 of this report considers the relationship between Indigenous communities and saltwater country, and the wider community's unique Top End lifestyle that is adapted to climate and connected to the region's coasts and seas.

Indigenous communities in the Top End have an extraordinarily rich and continuing culture going back at least 65,000 years. This connection and commitment to caring for saltwater country continues through today's economy, with Indigenous people working in government, Indigenous bodies, park management, mining and tourism, and becoming increasingly involved in tourism-based hospitality, accommodation and ecotourism that focus on the relationships between culture and ecology.

Traditional Owners have never relinquished their right to manage and protect their saltwater country, and continue to reclaim that role through the courts and other actions. Contemporary aspects of saltwater country management are jointly managed national parks and Indigenous ranger groups, and ranger work is briefly discussed in this section.

The unique Top End lifestyle shared by the wider community is adapted to the region's tropical climate – it is the major selling point used to attract residents and visitors alike to the Top End. Focus group research has revealed that people love living in Darwin and the Top End because it's different from the south, with great weather, fascinating wildlife, and the chance to explore the great outdoors and go fishing. Catching the iconic barramundi is at the heart of the Top End's lifestyle.

5. Conclusions and recommendations

The first report in the Keep Top End Coasts Healthy series, *Health check of our Top End coasts*, outlined the many threats facing the Top End's coasts and seas that if not addressed would impact poorly on the region's environment, culture and lifestyle. The report can be download at www.topendcoasts.org.au/resources.

This second report, *Valuing our Top End coasts and seas*, concludes with a set of recommendations to ensure the good health of the Top End's coasts and seas and their continuing support of culture, lifestyles, economies and livelihoods in the region. These recommendations will be presented and discussed in detail in the third and final report of the series, *Securing the Top End's coasts and seas*.

Each of these reports has been prepared as advice to the Gunner Government in the preparation of the Coastal and Marine Management Strategy it committed to in the lead-up to the 2016 Territory election. This commitment acknowledges that the Top End's coasts and seas have great value, while the strategy itself will be the first major step towards tackling the pressures they increasingly face.

To be effective, the strategy will need to ensure that the unique cultural, conservation and fishing lifestyle values of the Top End's coasts and seas are secured. If it achieves that, then significant benefits will flow to the Territory's people and the tourism economy, just as it has in such iconic and now-thriving places as Ningaloo, the Kimberley and the Great Barrier Reef. There are proven solutions on offer – including saltwater country Indigenous Protected Areas, national parks in the sea and recreational fishing areas – that can be tailored to Territory needs and be the heart of the plan for the Top End's coasts and seas.

1. INTRODUCTION

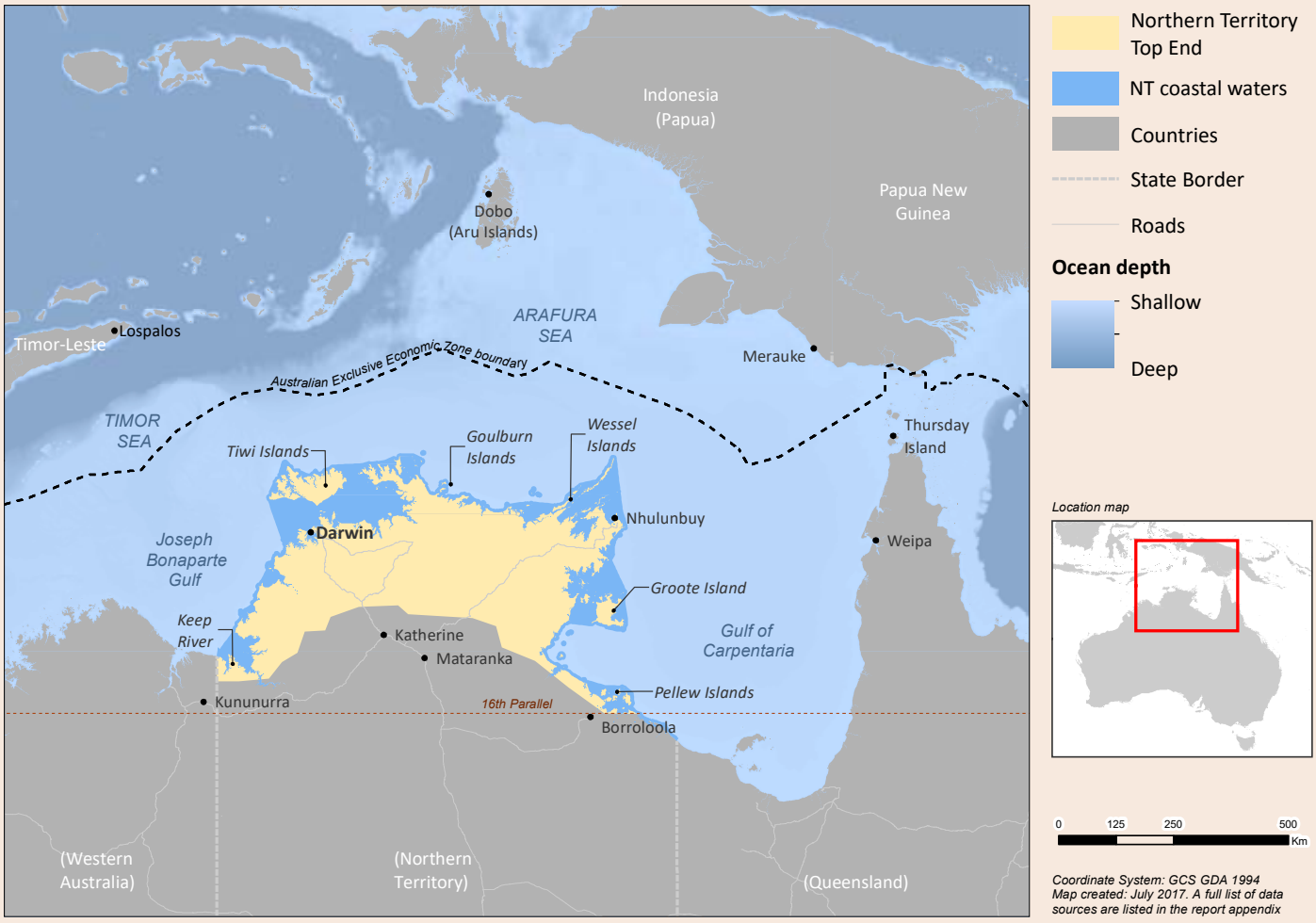


Figure 1. The Top End and the world around it

The Top End is located above the sixteenth parallel in tropical northern Australia, with its nearest neighbours Timor-Leste, Indonesia and Papua New Guinea.

Australia's Top End has become synonymous with 'global biodiversity hotspot', 'tourist mecca', 'angler's paradise' and where Indigenous communities maintain a continuing connection with saltwater country.

The Top End coastline and its more than 800 islands stretch for 11,000 kilometres from the Keep River mouth in the west to the Pellew Islands in the east. Along it, like a string of priceless pearls, are 27 sites of international conservation significance that include Australia's most diverse and largest areas of mangroves, extensive tidal mudflats and seagrass meadows, myriad islands covered in seabird rookeries, broad coastal floodplains supporting huge waterbird colonies, and significant numbers of globally threatened shorebirds, sharks, rays, sawfish, sea snakes, dugong, dolphins, turtles, pipefish and seahorses. Many species are only found in the Top End.

The Top End's coasts and seas are part of the global centre for marine biodiversity[2]. According to an international team of scientists, they represent some of the least impacted marine waters in the world[3] or, to put it another way, some of the last healthy tropical waters on the planet. Healthy coasts and seas provide many ecosystem services including coastal stabilisation, oxygen production, carbon storage, filtering of sediments and key habitats for a diverse range of marine species, including those targeted by fisheries.

Spectacular sunsets are a big bonus in the Top End's outdoor lifestyle. Photo: Danielle Ryan, Bluebottle Films

The many Indigenous communities along the Top End coastline are intimately connected to saltwater country. With 85% of the coast owned by Indigenous communities, and coupled to their responsible management over the millennia, much of the saltwater country is in near-pristine condition. The unsurpassed ecological and cultural knowledge of Indigenous communities confirms the global significance of the Top End's coasts and seas.

Marine-based commercial and recreational fishing and aquaculture are strong economic drivers in the Top End. The Territory tourism industry each year welcomes a million visitors on the lookout for crocodiles, cruises, culture and a spot of barramundi fishing, rubbing shoulders with many Territorians doing the same – 30% of the locals regularly go fishing in rivers and offshore waters, part of a unique lifestyle critical to the regional economy.

Qualitative and quantitative research for this Keep Top End Coasts Healthy series of reports revealed that '"lifestyle" was the word most used by respondents to describe why they love living in Darwin, and was closely tied to their ability to enjoy the "great outdoors"'[4], going fishing, wildlife watching, boating, camping, diving and much more.

The marine and coastal habitats of the Top End are a natural treasure trove, their good health essential to maintain culture, economy, lifestyle and livelihoods. With similar environments decimated in neighbouring Asian countries due to resource extraction, pollution and habitat clearance, they take on even greater significance and, for many species, the Top End could become their last refuge.

Until recently, the Top End's remoteness, climate and topography protected its coasts and seas from the worst of human impacts felt elsewhere. But habitat clearance, industrialisation and mining, overfishing and invasive species are taking their toll, while climate change and proposals to disrupt the natural flows of Top End rivers could severely impact their future.

Territorians have a strong connection to coasts and seas and are becoming increasingly aware and concerned about threats to the Top End's environment – and their lifestyle. Research conducted for this series of reports identified general concerns for local environmental health and the impacts on the marine environment from industrial development and recreational use – 73.6% of survey respondents agreed or strongly agreed that the Territory's coast and seas are not as healthy as they once were. Those surveyed said the amount of rubbish and pollution in the local marine environment worried them, and spoke about the negative impacts from increasing development along the coast[5].

The first report in this Keep Top End Coasts Healthy series, *Health check of our Top End coasts*, observed:

> 'Development has spilled over into tidal areas and vital mangroves have been lost. Darwin Harbour is, sadly, being loved to death. Industry is rapidly expanding and if there's a big accident, the pollution damage could be devastating and permanent for NT waters. Development along the coast is growing quickly, and there are few, if any, buffers in place against the damage this could lead to. In the face of a rapidly changing climate, the Territory is already being affected, including the recent unprecedented die-off of mangrove forests' [6].

Without improved protection and management, the Top End could go the same way as many other coastal areas in Australia and around the world. That would be a devastating blow to the region's coasts and seas but also undermine the Territory lifestyle, Indigenous culture, the tourism industry and the regional economy.

This second report in the three-part Keep Top End Coasts Healthy series considers the environmental, social, cultural and economic values of the Top End. These would be lost if the increasing use and development of the region goes unchecked and its coasts and seas remain inadequately protected and managed. The third and final report in the series will discuss ways to prevent such loss to enhance the health of the Top End's coasts and seas.

2. WHAT IS VALUABLE ABOUT THE TOP END'S COASTS AND SEAS?

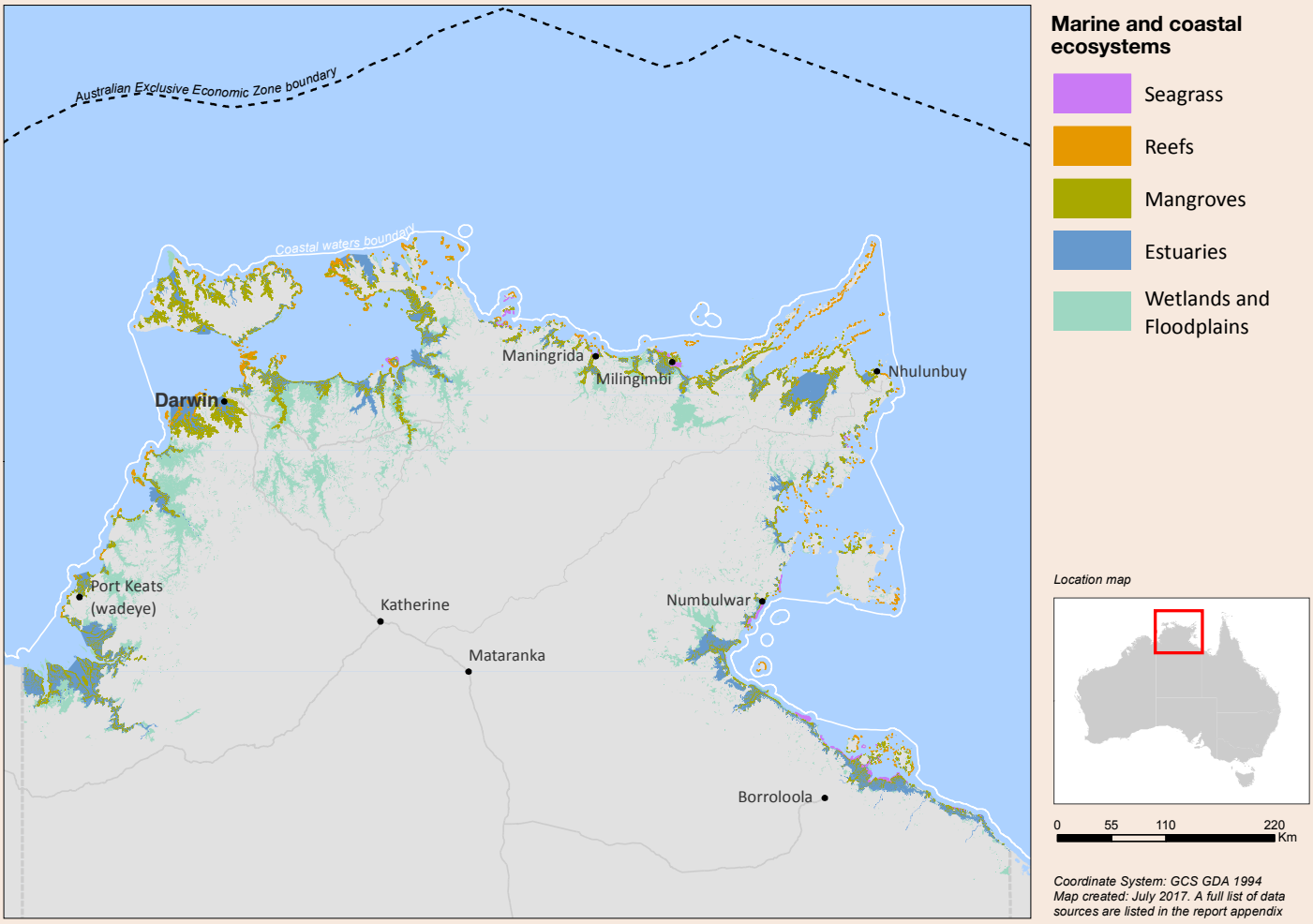


Figure 2: Marine and coastal ecosystems in the Top End

The Top End's coasts and seas are a rich mix of reefs, islands, mangrove forests, seagrass meadows, estuaries, wetlands and floodplains in near-pristine condition.

Sitting astride our northern coast above the sixteenth parallel, the Top End is a unique part of Australia, a remarkable mix of natural and cultural values with powerful social and lifestyle connections cherished by Territorians and visitors alike. It is a unique place, one of the world's last intact tropical coast and sea regions.

Wildlife and people in the Top End are heavily influenced by the rhythmic beat of the seasons and the tides. Ninety-five per cent of river flows occur during the wet season. The Alligator, Adelaide, Mary and Daly rivers pour into Van Diemen and Joseph Bonaparte gulfs, the McArthur, Gregory and Roper rivers into the Gulf of Carpentaria, bringing sediments that build floodplains, mudflats and beaches, and carrying nutrients that support marine and coastal food chains. Life explodes in wetlands, billabongs, mangrove forests, estuaries, seagrasses and nearshore waters.

As well as breath-taking scenery, long sandy beaches, richly textured rocky shorelines, colourful coral communities, vast wetlands and extensive mangrove forests, the Top End is the stronghold for globally threatened species such as dolphins, marine turtles and the iconic dugong, and a vital layover for migratory shorebirds. The Top End is uniquely Australian but it is of international consequence.

Mangrove at high tide. Photo: Katie Fuller

Mangroves and muddy waters

The Top End's high rainfall, flat shorelines and low wave energy are ideal for mangroves that flourish on sheltered mudflats, in estuaries and along riverbanks. With more than 50 species, Top End mangrove forests are more diverse than any others in Australia, representing 40% of the nation's mangrove cover and stretching for 4,000 kilometres along the Territory shoreline.

Mangroves are multifunctional. They protect the shoreline from storm surges and wave attack, are the source of nutrients for inshore marine life, filter and purify water flows from the catchment, provide nursery areas for barramundi and banana prawns, and are an important resource for Indigenous communities. The Top End's iconic big fish, the barramundi, makes good use of mangroves and rivers during a lifetime that can span 20 years.

In the Top End, mangroves are at their most extensive in Darwin Harbour and the Adelaide and West Alligator rivers. One species, *Avicennia integra*, is only found in the region, recorded at just 15 sites and numbering fewer than 5,000 trees[7].

Although *Avicennia integra* is now threatened by urban development in the Darwin area, Top End mangrove forests are generally far less impacted than elsewhere in the world where port, urban and aquaculture developments have caused huge losses. Even so, the massive mangrove die-off in 2016 along 1,000 kilometres of the southern coast of the Gulf of Carpentaria, due to rising temperatures and reduced rainfall associated with climate change, awoke Territorians to the vulnerability of their coasts and seas.

Tidal mudflats and rivers are also preferred by the elusive speartooth and northern river sharks, two of the rarest shark species in the world, and the green, narrow, largetooth and dwarf sawfishes. All of these fish are threatened by recreational fishing, trawling, gill netting and habitat degradation. The green sawfish is now restricted to Buffalo Creek in Darwin Harbour and possibly the Cobourg Peninsula and Groote Eylandt, while only 250 of the critically endangered northern river shark may be left in the wild[8].

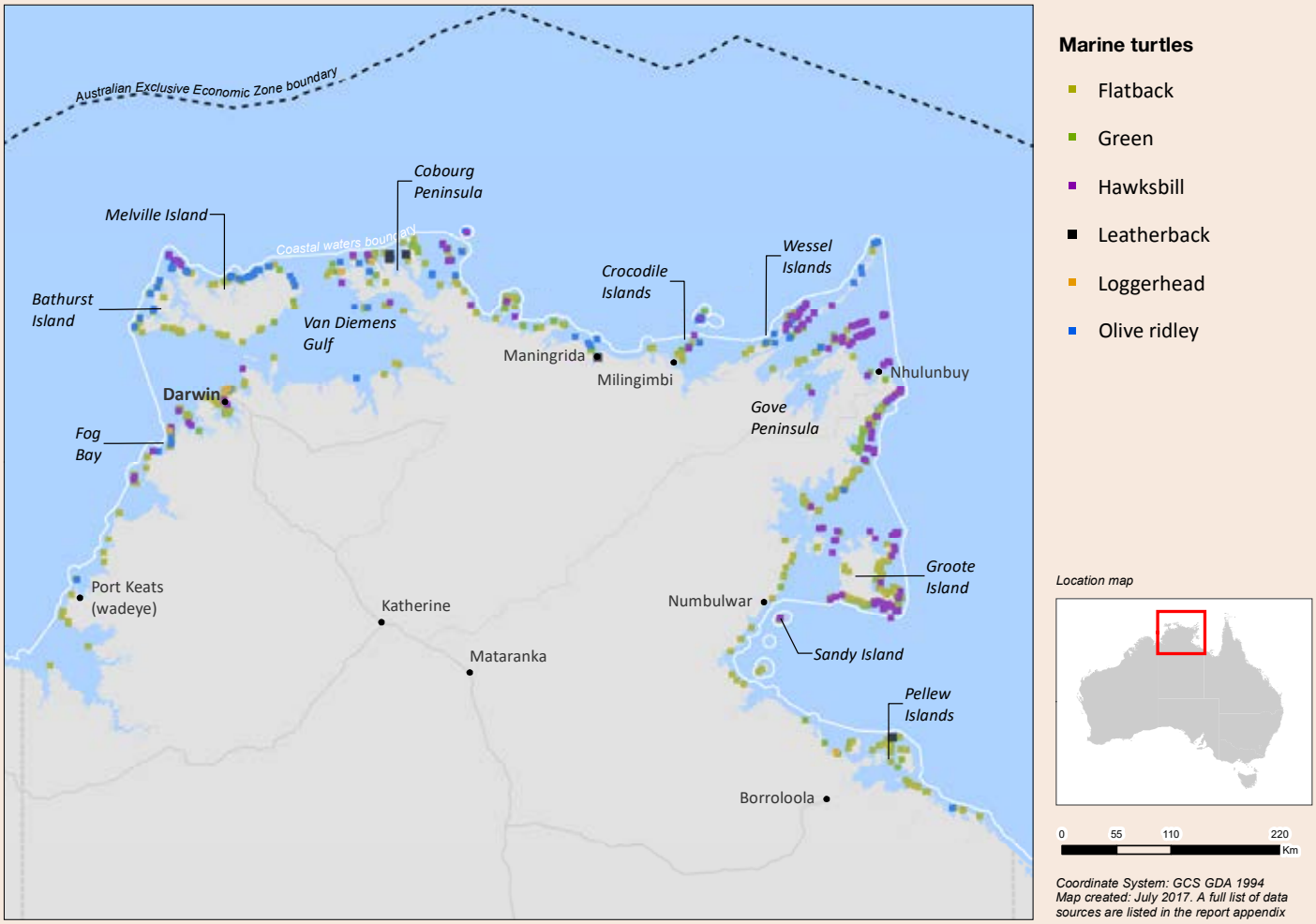


Figure 3: Marine turtle nesting sites in the Top End

The Top End hosts six of the world's seven marine turtle species, with nesting sites scattered along the beaches of the north and east coasts. The flatback, northern Australia's endemic turtle, has the most nesting sites; the endangered leatherback and loggerhead turtles have few.

Top End: turtle central

Marine turtles have lived in the oceans for more than 100 million years but are now experiencing serious threats to their survival – the leatherback, loggerhead and olive ridley are endangered. However, these much-loved animals are in good numbers across northern Australia. As host to six of the world's seven turtle species, and with healthy coasts and seas, the Top End is in a remarkably rare position to help them flourish.

Marine turtles nest and lay their eggs on sandy beaches, providing a wonderful opportunity for locals and tourists to take a closer look at these ancient animals. Ecotourism operator, Sea Darwin, in collaboration with the Kenbi Traditional Owners, is offering that experience to visitors with tours to Bare Sand Island in Bynoe Harbour, an important nesting site for flatback and olive ridley turtles.

Marine turtles have a significant place in the culture of Indigenous communities in the Top End. They are 'important components of Aboriginal cosmology, belief systems, identity and environmental knowledge'[9], and their conservation an important part of saltwater country management programs:

> 'What we want to do is look after these turtles. Not just for the benefit of us, this time, but for our children's children. Turtle is an important food for Aboriginal people. Most balanda (non-Aboriginal) scientists, along with the Traditional Owners of this land, could learn and work in relationships together'[10].
>
> Nanikiya Mununggurritj of Dhimurru Land Management Aboriginal Corporation, quoted in *Living on Saltwater Country.*

Turtle tracks tour to Bare Sand Island. Photo: Sea Darwin

Ghost nets, entanglement in fishing gear, habitat degradation and loss, boat strike, climate change and feral animals are the main challenges for turtles in the Top End. The Territory's Department of Tourism and Culture has released Marine Turtle Watching Community Guidelines to help people avoid and minimise their impacts on turtles[11].

Marine pastures

Seagrass meadows in the Top End are significant hotspots for biodiversity and prime feeding areas for turtles and dugong. Although ranging widely across tropical waters, the meadows in northern Australia are seen as the dugong's last refuge against habitat loss, unsustainable harvesting, and drownings in fishing nets. They are also rated as the third-most valuable ecosystem for ecosystem services e.g. water quality regulation, shoreline protection, habitat for prawns and other marine life, and a refuge from predation. In a recent study, seagrass meadows were also found to reduce bacteria harmful to both people and marine life by up to 50%[12].

Without seagrass meadows, the productivity of marine ecosystems and the numbers of marine species would plummet; commercial fisheries like the Northern Prawn Fishery would also suffer. Their good health, and that of mangrove forests and estuaries, is dependent on the continuing large and clean flows from the Top End's rivers.

Dugong feeding on seagrass.

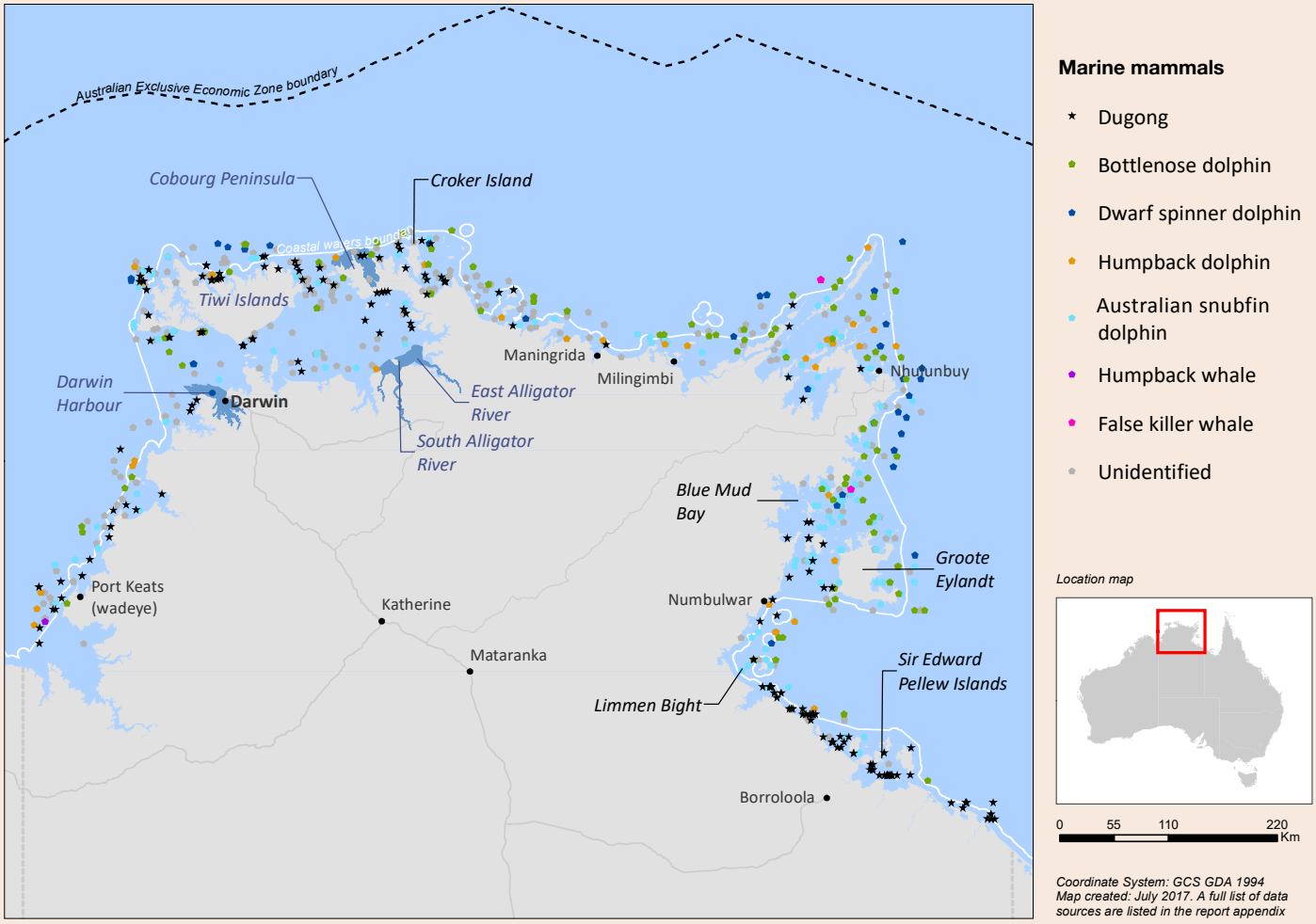


Figure 4: Marine mammal sightings during an aerial survey of the Top End

Sightings of marine mammals are scattered across the Top End coasts and seas, with the dugong, bottlenose dolphin and Australia's own snubfin dolphin the most frequently seen.

Charismatic marine life

Along with dugongs, a number of whale and dolphin species and the whale shark are some of the Top End's most charismatic marine life. Six species of dolphins and whales were spotted in a 2015 aerial survey (see Figure 4). The presence of another 10 species has been recorded in the region but mainly based on strandings – the largest being 53 short-finned pilot whales on Centre Island in the Pellew Group[13] in the Gulf of Carpentaria.

However, there have been recent sightings of orcas (killer whales), and marine scientist Carol Palmer says they may be genetically distinct from ocean-going populations[14]. Humpback whales are also being seen more frequently on the west coast. Whale expert, Kurt Jenner, believes 'the Peron Islands [near the mouth of the Daly River] area could be a new breeding ground or an extension of a camping ground'[15]. Whale and dolphin watching is a growing industry in Australia, with an emerging potential for tours in the Top End.

The snubfin – the only Australian endemic dolphin. Photo: Dr Deb Thiele

The Australian snubfin dolphin lives only in Australian coastal rivers, estuaries and nearshore waters. Although the number of sightings in Figure 4 might suggest their numbers are high, the opposite is the case. In the Top End, there are three known clusters of around 100 individuals each at Cobourg Peninsula, Darwin Harbour and Blue Mud Bay/Pellew Islands, with total numbers across northern Australia likely to be in the low thousands. It is important that this rare Top End species is protected from key threats that include the loss of mangroves and seagrasses, sedimentation, increased boat traffic, chemical pollution and gill netting.

The whale shark, the world's largest fish, is occasionally seen in Top End waters. Although found throughout tropical and warm temperate seas, outside of Australian waters it is threatened by commercial fishing and unregulated hunting, while inside, the loss of food resources, disturbance by tourists and illegal fishing are of concern.

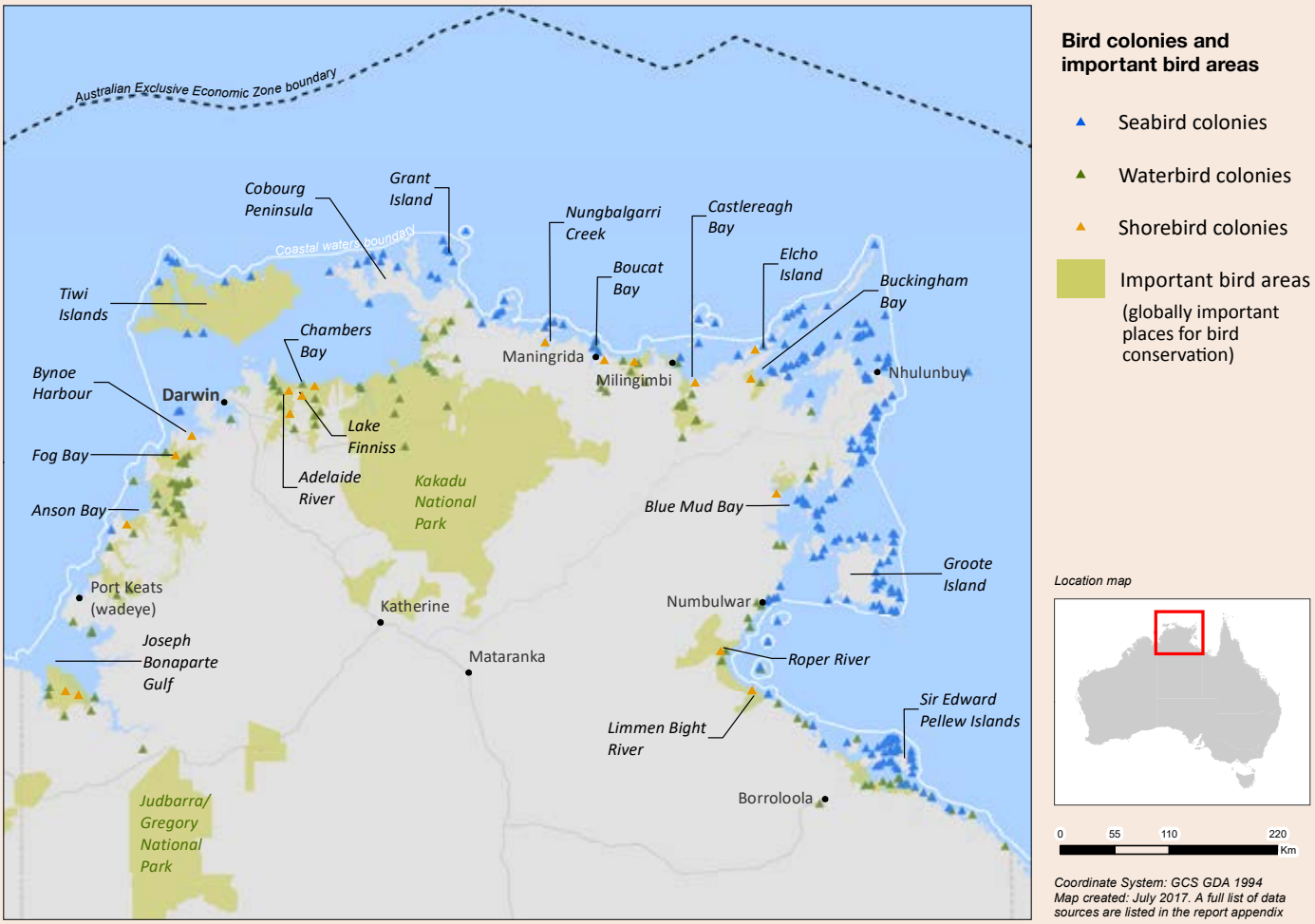


Figure 5: Important coastal locations of seabirds, migratory shorebirds and waterbirds

The Top End's coast and seas are critically important for seabirds, shorebirds and waterbirds. The islands of the rocky north and east coast are favoured by seabirds, the wetlands and floodplains in the west by waterbirds, and tidal mudflats in the north-west and north-east by migratory shorebirds.

For the birds

Every year millions of small shorebirds fly between the Arctic, Asia and Australia, and then back again, travelling up to 25,000 kilometres return along their frequent-flyer freeway. They gather in their thousands on the Top End's extensive mudflats to enjoy the warm weather and feast on snails, worms and crustaceans.

Figure 5 shows the Top End's important shorebird sites where greater than 1% of a species global population has been recorded. The largely unaffected tidal flats of the Top End are crucial to the survival of many species that use the flyway, as much of their habitat elsewhere in Australia and in other countries has been destroyed or degraded.

The Top End is also important for seabirds, with key nesting sites for nationally and internationally significant populations on many of the small islands. A major seabird survey carried out in 2001 found 147 active colonies in the Top End, with another 68 unconfirmed, ranging in size from just a few birds to tens of thousands[16].

Those species with the highest numbers and most rookeries were the crested tern – it had two colonies of more than 50,000 each, its largest in the world – and the black-naped, roseatte, bridled and little terns.

The Top End islands have a long history of isolation from the mainland; their general lack of exploitation makes them important areas for seabird conservation and refuges for species threatened by the spread of mainland developments. Feral pests such as the cane toad and the mimosa weed have found their way to some islands but generally most are pest free.

The Territory's largest waterbird breeding colony is on the Adelaide River floodplain, where 30,000 egrets and other waterbirds[17] roost in mangrove forests. Up to 400,000 magpie geese can gather on the wetlands of the Mary River[18]. Further east, the Arafura Swamp, one of the largest wooded swamps in the Territory, can host more than 300,000 birds including black-necked storks (jabiru) and brolgas[19].

Migratory shorebirds, seabirds and waterbirds are the focus of many birdwatchers who visit the Top End and spend money in regional communities. Both Kakadu and Arnhem Land have dedicated bird weeks in October each year, catering for experienced and beginner birdwatchers.

Other popular spots are Casuarina Coastal Reserve near Darwin, Gayngaru Wetlands near Nhulunbuy and Garig Gunak Barlu National Park (Cobourg Peninsula), with a number of companies offering tours.

'The fauna of the Top End of the Northern Territory is in a very unique position. Not only is there an immense amount of habitat which supports large populations of many species, but most of the area is very remote and has not been subject to many of the pressures associated with large human populations. Although this is likely to remain the case for the short-term at least, it is equally likely that the pressures of human expansion within Australia, especially in coastal areas, will see some of this area targeted for development at some stage in the more distant future. It is for this eventuality that we must be prepared. We must therefore ensure the security of the more significant of these areas before problems arise'[20].

Ray Chatto, Wildife Ranger, Northern Territory Parks and Wildlife, 2003.

The great knot is one of many threatened migratory birds that visit the Top End.

Crocodiles rock

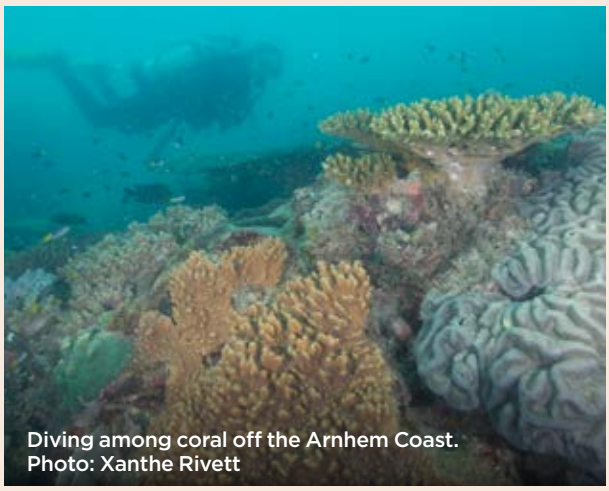
Let the records show that there is roughly one saltwater crocodile for every Territorian, with 100,000 estimated to be living in the wild and a similar number in wildlife parks and crocodile farms – one farm alone has 36,000[21].

But in the 1970s, 'salties' were close to extinction. At that time, governments introduced strict international regulations to curb the skin trade, and crocodiles are now protected under Territory and national laws.

At up to six metres in length and one tonne in weight, saltwater crocodiles are the largest reptile on the planet, living on it for the past 100 million years mainly among mangroves and along coastal rivers. Mary River can have up to 20 crocodiles per kilometre[22], the densest wild population, with other concentrations in the Adelaide River and the South Alligator River – a European explorer mistook the resident crocodiles for alligators when he named the river in 1820.

Saltwater crocodiles are part of Indigenous art, stories, song and dance, totems in some communities, and their meat and eggs are used as an important food source.

Crocodiles are also a very big drawcard for Top End tourists. Tour companies offer crocodile watching cruises and museum-wildlife parks have a crocodile focus, underpinning a $25million crocodile farm industry that began in 1979 and now includes seven farms exporting 90% of their skins to Japan, France, Italy and Asia.



Diving among coral off the Arnhem Coast.
Photo: Xanthe Rivett

Coral reefs, sponge gardens, giant clams and pearls

The Top End's coastal and nearshore landscapes might be dominated by wetlands, muddy tidal flats, mangrove forests and seagrass meadows, but below the surface offshore is a spectacularly colourful world of coral reefs, sponge gardens, and giant clams.

The hard and soft corals in the Top End colonise sand and rubble seabeds and form fringing reefs. They are at their best in north-east Arnhem Land and the Wessel Islands, where the water is clearer, but are also found in Darwin Harbour, the Vernon Islands and Fog Bay. On the bottom of Darwin Harbour, they colonise rocky reefs and shipwrecks, and the artificial reefs created by the Territory Government to encourage angling and diving. Some hard and soft corals are collected by the Territory's aquarium fishery, which also harvests rainbowfish, catfish, scats, hermit crabs, snails, whelks and marine plants for sale to pet and aquarium shops.

The Top End is also a haven for sponges, with more than 800 species[23] recorded in Darwin Harbour alone. Many of the Top End's sponge species may be found nowhere else. Sponges dominate seabed communities, form fabulously coloured gardens and can filter up to 20,000 litres of water each day, capturing organic matter that would otherwise cloud the water. They are also the source of compounds that have potential for use in pharmaceuticals and cosmetics.

Four of the world's 11 giant clam species live in the Top End's marine waters. They too are filter feeders, important to reef structures and as food for fish. In the wild they can live for more than a century, growing up to 120 centimetres wide and weighing as much as 200 kilograms.

The giant clams are targeted by illegal foreign fishing vessels, a continuing major problem in Australian and Territory waters that is likely to increase[24]. Illegal, unreported and unregulated small-scale fishing is believed to have arisen 'because of long-term fisheries over-exploitation in South East Asia[25].

Although clams can produce pearls, it is another bivalve mollusc that is at the heart of the Top End's pearling industry: the silver-lipped pearl oyster. Pearling has long been associated with the Top End. Indigenous people were diving for pearl oysters well before Europeans sighted Australian shores, trading the shell with neighbouring inland communities and later with Makassans from what is now the Indonesian island of Sulawesi.

A commercial pearling industry began in the Territory in the late 19th century. Today the annual production is valued at around $10million, with Paspaley the dominant producer. The company's founder, Nicholas Paspaley, once said that: 'It is our duty to preserve our wonderful Australian environment. It is also the only way to achieve superior aquaculture results'[26]. This was echoed by the Pearl Producers Association in its 2008 *Pearling in Perspective* report:

> 'The industry is dependent on the highest quality environment to produce the highest quality pearls as acknowledged by the world markets. The pearling industry therefore has an intrinsic self interest in maintaining a high level of environmental stewardship' ... 'Australian South Sea pearls are synonymous with an image of "rare, natural and from a pristine environment" – resulting in the ability to command premium prices'[27].

This diversity and the value of the commerical pearling industry are further reasons why we should look after the Top End's coasts and seas.

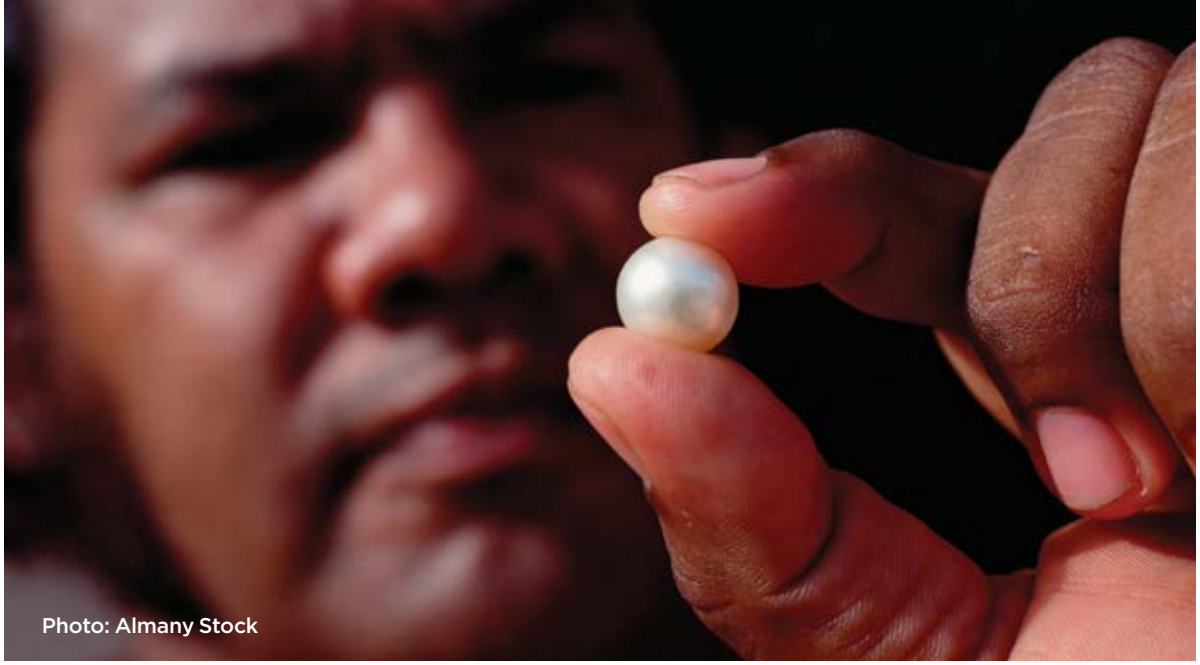


Photo: Almany Stock

Sites of conservation significance

Like a string of pearls, there are 27 sites of international conservation significance along the Top End coasts and seas, including Kakadu, Cobourg Peninsula, Anson, Fog and Shoal bays, Howard sand plains, Darwin Harbour, the Wessel Islands, Arafura Swamp and Limmen Bight. Recorded across the sites are at least 45 threatened animal species and 33 threatened plant species. Few sections of the Top End's coasts fail to be significant. Many of the significant sites are in remote coastal areas and in generally very good condition, but they face a number of threats including invasive species, urban encroachment and drainage.

The Top End has the most diverse mangrove forests in Australia. They support many threatened and commercial species. Photo: Glenn Walker

3. HOW MUCH ARE THE COASTS AND SEAS WORTH?

Marine and coastal calculations of worth

Commercial, recreational and tourism fishing

The Top End's commercial and recreational fishing, fishing tourism and aquaculture sectors, all reliant on the good health of the region's coasts and seas, are significant contributors to the NT economy.

According to the 2009-10 survey of anglers: NT residents spent an estimated $51 million on goods and services related to recreational fishing during the 12 month survey period, of which $47 million (92%) was directly attributable to recreational fishing – an average of over $1500 per fisher. Annual attributable expenditure on boats and trailers represented the largest expenditure category ($33 million), followed by travel expenses ($7 million) and fishing/diving gear ($3 million). The vast majority of all fishing-related expenditure (93%) occurred within the NT[28].

The Top End is too valuable to let slip through our fingers. Photo: James Sherwood, Bluebottle Films

Recreational fishing is a strong economic driver in the Top End. Photo: Cobourg Fishing Safaris

Fishing tourism is driven mostly by fishers from Victoria, New South Wales and Queensland, who account for 40% of recreational fishing effort in the Territory. In response, there are now more than 130 operator licences, mostly in the Darwin area, and 20-plus fishing stays in places like the Tiwi Islands, western and central Arnhem Land and the Daly River region. Fishing tourism contributes an estimated $26million to the Territory economy, with $15million of that spent with fishing tour operators[29].

The economic impact of angling is felt very strongly in regional parts of the Top End, where 70% of recreational fishing occurs. In places like King Ash Bay, the Daly and Roper rivers and Dundee Beach, it is the primary economic driver, while it provides important development opportunities in the Indigenous communities on the Tiwi Islands and Groote Eylandt, and in Arnhem Land[30].

Commercial fishers target mud crabs, goldband and saddletail snappers, spanish and grey mackerels, king threadfin, barramundi, prawns, squid and sea cucumbers, while farmers grow pearls, prawns, barramundi and crocodiles. In 2014–15, the commercial finfish catch was valued at $26.2million, mud crabs $4.6million, the Territory prawn catch $24million (part of the $100million Northern Prawn Fishery), and aquaculture $24.1million[31] – a total of $79.2million. Interstate and overseas markets are very important to the Territory's fishing industry, but so too are domestic consumers and tourists who buy seafood from fish shops, supermarkets, restaurants, cafes, pubs and bars where it is promoted as local and freshly caught in near-pristine waters.

All up, the annual production values of the commercial and recreational fishing, fishing tourism and aquaculture sectors is around $180million.

Tourists take in the sunset on a 'Tumlaren' cruise. Photo: Darwin Harbour Cruises

Tourism

The Territory Government recognises that the Territory's 'unique natural environment is one of our greatest assets'[33]. In its *Tourism Vision 2020,* one of the Territory's recognised competitive strengths is 'based on its unique nature, culture and outback experiences'[33]. According to research by Tourism Australia, seeing aquatic animals is the number one experience sought by international visitors to Australia. The Top End's very charismatic aquatic life includes marine turtles, dugongs, dolphins, seabirds, sharks – and crocodiles. Seeing saltwater crocodiles is very much on the to-do list for visitors to the Top End.

Domestic, interstate and international tourism is now the Territory economy's third-largest sector, with 15,500 jobs (the mining and resources sector numbered 4,800)[34] in the Territory's 2014-2015 workforce of 111,700[35]. Eighty-four per cent of international visitors to the Top End are looking for nature-based activities, many of which are coastal. The Centre for Conservation Geography estimates that Top End marine tourism is annually worth $924million[36] and, if every dollar of that generates another 87 cents in the regional economy, then marine tourism in the Top End could be worth $1.7billion each year[37]. Much of that expenditure is on hospitality and dining, where menus feature local seafood, meat and bush foods, all of which are reliant on healthy environments.

We can expect tourism numbers to grow once the Top End's coasts and seas are given greater protection, as has occurred in the Great Barrier Reef Marine Park region. The marine park's 2004 rezoning increased green zone protection (the equivalent of the conservation zone in the Cobourg Marine Park) from 5% to 33%. In the 2002-2003 financial year, 12 months prior to the rezoning, domestic overnight visitors to the region numbered four million and international overnight visitors 875,000[38]. A decade later, domestic overnight visitors had increased to 5.328 million and international ones to 1.134 million[39]. This 30% increase in tourist numbers had come during a period when the Global Financial Crisis occurred, where cyclones, flooding, coral bleaching, catchment pollution and the crown of thorns starfish impacted reef health, and UNESCO considered adding the reef to its World Heritage sites in danger list. The reef's increased protection has increased its resilience to the threats it faces, and it also appears to have increased its resilience as a key tourist destination. But a recent survey[40] of reef visitors suggests that many of them are part of what is called 'last-chance tourism', wishing to see the reef before it disappears. Last-chance tourism is not a future we want for the Top End's coasts and seas. Better to protect them now while we can and avoid the damage that has occurred along the eastern and southern coasts.

Ecosystem services

Marine scientists and economists have identified many ecosystem services provided to the community by the Top End's seagrasses, reefs, mangrove forests, estuaries and coastal waters. These 'unaccounted for' services include coastal stabilisation, oxygen production, carbon storage, filtering of sediments and key habitats for a diverse range of marine species. They are estimated to be worth more than $420 million each year[41], and their values are summarised in tables 1 and 2[42] ('accounted for' services are commercial fishing, mining and tourism for which official figures are available).

Ecosystem Services defined

The Millennium Ecosystem Assessment defines ecosystem services as the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services, such as nutrient cycling, that maintain the conditions for life.

Table 1: Unaccounted for ecosystem services from the Top End's coasts and seas

Provisioning Services	Regulating Services	Habitat Services	Cultural Services
Food Fresh water supply Raw materials Genetic resources Medicinal resources Ornamental resources	Influence on air quality Climate regulation Moderation of extreme events Regulation of water flows Waste treatment / water purification Erosion prevention Nutrient cycling and maintenance of fertility Pollination Biological control	Lifecycle maintenance (esp. nursery services) Gene pool protection (conservation)	Aesthetic information Opportunities for recreation Inspiration for culture, art and design Spiritual experience Information for cognitive development

Table 2: Estimated annual value of unaccounted for ecosystem services from the Top End's coasts and seas

Habitat	Area (ha) in the Top End	Estimated ($per ha/per annum) value of ecosystem services	Estimated $per annum value of ecosystem services
Seagrasses	29,200	318	$9,285,600
Reefs	62,700	258	$16,176,600
Mangroves	374,600	48	$17,980,800
Estuaries	1,286,700	48	$61,761,600
Coastal waters	6,726,500	48	$322,872,000
Total			$428,076,600

Marine conservation areas

Iconic marine conservation areas are the pick of the crop for tourists who presume they will be healthy, clean, well-managed and brimming with life. The benefits of protected areas to rural communities were outlined in a Department of Environment, Climate Change and Water NSW report, which concluded that:

> 'Protected areas attract visitors into these regions who buy goods and services such as accommodation, food and beverages, and souvenirs, and spend money on motor vehicles and recreational activities. Businesses that directly and indirectly provide services to park managers and park visitors also employ labour and make payments to households. These households then also purchase local goods and services. Thus expenditure on goods and services made by park managers and park visitors has direct and flow-on impacts on the economies around national parks'[43].

Recreational fishing areas, marine national parks and saltwater country Indigenous Protected Areas (IPAs) can also provide these benefits, including jobs in management, service provision, tourism-related businesses and other economic development opportunities, especially in the more remote areas where such options are limited.

A recent analysis by Deloitte Access Economics[44] concluded that the Great Barrier Reef Marine Park generated 64,000 jobs nationally and was worth $6.4billion in the 2015–2016 financial year. Ninety per cent of that was generated by tourism; fishing and recreational and scientific activities also made significant contributions. The economic analysis estimated that the reef's economic, social and iconic asset value was $56 billion, 12 times the value of the Sydney Opera House. And those numbers exclude any valuation of the reef's ecosystem services like storm and erosion protection and fish nursery areas. In 2014, a team of international economists[45] estimated the value of coral reef ecosystem services at $440,000 per hectare. If applied to the 2.4 million hectares of coral reef in the marine park, then the value of the park's coral reef ecosystem would be around one trillion dollars.

An economic report about the Kimberley found that marine park management programs in the region already generated 147 jobs (including 50 Indigenous ranger positions) and a total annual output of $43million. When the increased length of visitor stays that would result from new Kimberley marine parks were factored in, those job numbers would increase to 220 and total output to $91million[46].

The Kimberley report also found that the establishment of marine parks could help integrate conservation and Indigenous cultural traditions, the benefits of which could include:

- recognition of Aboriginal culture, rights and title
- support for strong, vibrant, sustainable communities
- meaningful work, good livelihoods and sustainable enterprises
- conserving and restoring the environment and caring for country[47].

There is great potential to increase IPA coverage in the Top End's coasts and seas with Aboriginal freehold land covering 85% of the coastline. There are already seven IPAs with coastal boundaries (Yanyuwa, Anindilyakwa, Laynhapuy, Djelk south-east Arnhem Land, Marthakal and Marri-Jabin), one marine and coastal IPA (Dhimurru) and one co-managed marine park (Garig Gunak Barlu).

Further benefit from IPAs and marine national parks in the Top End are discussed in more detail in section 4, *Connecting culture and lifestyle to the coasts and seas.*

Emerging marine economies

A number of emerging marine and coastal based activities have been identified with potential for an increasing economic contribution[48]. One with great prospects for the Top End is the 'blue' carbon economy. Saltmarshes, mangrove forests and seagrass beds, all of which are plentiful along the coast, absorb large quantities of carbon dioxide at a rate at least double that of terrestrial forests. On land, savanna fire management is being used to generate carbon credits and, in turn, is paying for conservation and land management. Management of blue carbon could do the same.

Each year anglers spend millions in Top End economies on boats and trailers, travel and fishing gear. Photo: James Sherwood, Bluebottle Films

4. CONNECTING CULTURE AND LIFESTYLE TO THE COASTS AND SEAS

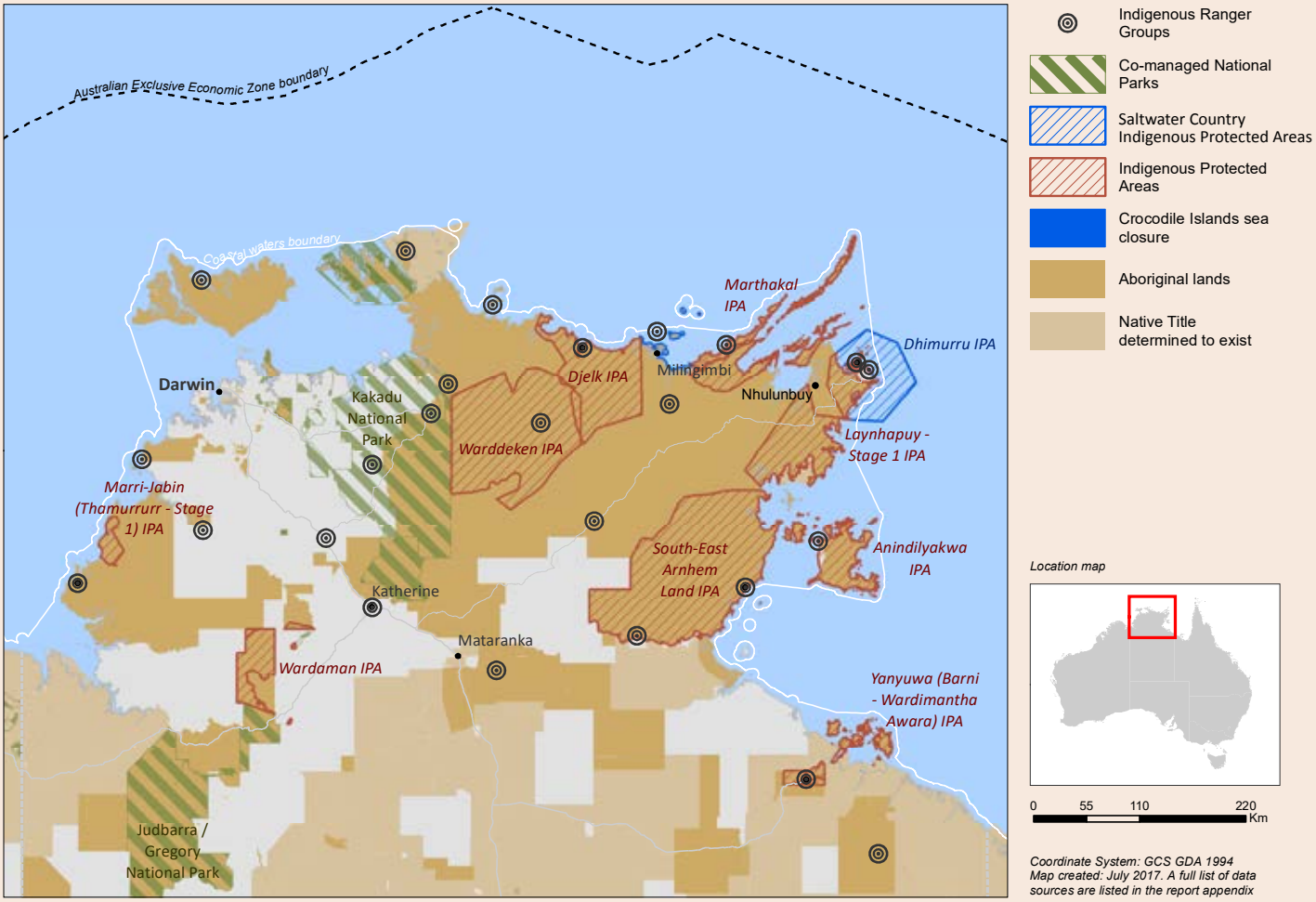


Figure 6: The lands of Traditional Owners in the Top End

Indigenous communities are intimately involved in the management of their saltwater country, including Dhimurru, Australia's first saltwater country Indigenous Protected Area (IPA) off Nhulunbuy, the sea closure at Crocodile Islands, several coastal IPAs, and the co-managed Kakadu and Garig Gunak Barlu national parks. There are also many Indigenous ranger groups engaged in saltwater country management.

The Dhimurru IPA was the first in Australia to cover marine waters. Photo: Dhimurru Aboriginal Corporation

Saltwater country's continuous culture

> 'The sea belongs to the country. It is the hunting country of the owners. When you see the morning glory on the horizon, that is as far as you can see. We live on the land and hunt on the sea. We cannot live without the sea.'
>
> Andrew Marmies, Wellesley Islands native title claim, 1997[49], quoted in *Living on Saltwater Country.*

In the Milingimbi area, the list of marine resources used by Yolngu people has included '34 species of shellfish, crustaceans and mangrove worms, 5 species of turtle, dugong and dolphins, and over 60 species of fish, stingrays and sharks. Research on the diet of a nearby coastal outstation found that seafood contributes between 48% and 65% by weight of people's overall diet, depending on the season, comprising between 69% and 94% of the meat component of the diet'[50].

But saltwater country is much more than just a source of food:

> 'The sea dominates Yolngu life. More of our totems come from the sea than from the land. There are sacred sites in the sea which, although they have been under water for thousands of years now, are still sung about. Our dances are about the sea. We dance the creatures of the sea – the shark, the crocodile, the whale, we dance the octopus. Our creation spirits, even those of people inland to whom we are ceremonially connected, began in the sea. The rainbow serpent, the Djang'kawu Sisters, which are important right throughout the Northern Territory – both of these came up out of the sea.'
>
> Terry Yumbulul and Keith Djiniyini, Manbuynga ga Rulyapa Steering Committee[51], quoted in *Living on Saltwater Country*.

Indigenous communities in the Top End have an extraordinarily rich and continuing culture, and the region is one of Australia's most linguistically diverse[52]. The connections and commitment to caring for saltwater country continue while living in a modern economy. Indigenous people are working in government, Indigenous bodies, park management, mining and tourism, and becoming increasingly involved in tourism-based hospitality, accommodation and ecotourism that focus on the relationships between culture and ecology.

Commercial fishing and aquaculture are also of growing interest to Indigenous communities. A number of Aboriginal Coastal Fishing Licences, which allow the catch and sale of fish, have been taken up by communities as a low-cost introduction to the commercial seafood industry. It may eventually lead to gaining a licence in an existing commercial fishery. On Groote Eylandt and South Goulburn Island, giant clams and sandfish are 'ranched' in trials. The project aims to sell small clams to the aquarium sector – their bright blue colour is attracting interest – and the larger ones as meat or to enhance tourist experiences[53]. Juvenile sandfish are reared in Darwin hatcheries and then released into suitable habitat, with harvesting occurring after 12–18 months when they have reached 20 centimetres in length.

Caring for Country

Indigenous communities in the Top End have never relinquished their struggle to manage and protect saltwater country, and continue to reclaim their role through the courts and other actions. Today, around 85% of the Top End's coastline, including large areas of the intertidal zone, is owned and managed by Indigenous communities under inalienable freehold title.

The Dhimurru Land Management Aboriginal Corporation of the Yolngu people was successful in having Australia's first marine Indigenous Protected Area (Dhimurru) established in 2000, and co-managing it with the Northern Territory Parks and Wildlife Commission. For the Yolngu people, the Yolnuwu Monuk Gapu Wäna Sea Country Plan, which covers the IPA and adjoining waters:

- 'lets everybody know what our sea country means to us and explains how we look after it, both in keeping with traditions and through our contemporary work at Dhimurru;
- makes clear the concerns we have for our sea country and its management;
- suggests to others with interests in our sea country how we can work together for sustainable management in ways that respect and acknowledge our rights and interests and those of other users'[54].

Indigenous ranger groups are another important feature of saltwater country management. There are more than 20 across the Top End and include sea ranger groups like the Tiwi Marine Rangers, Djelk Sea Rangers in Maningrida, the Gumurr Marthakal Sea Rangers on Elcho Island and the Anindilyakwa Sea Rangers on Groote Eylandt. Most sea ranger groups seek to develop capacity with appropriate boats, training and other skills, working under the supervision of and with the consent – and often the participation – of senior Traditional Owners. For example, the Djelk Rangers prepared the *Djelk Sea Country Plan 2015–2025* to 'focus our work on priority strategies that will make the most difference to the health of our land and sea country as directed by our Landowners'[55].

The work of Indigenous ranger groups combines traditional knowledge with conservation training to manage and protect saltwater country and culture. Their work is diverse and has included research on snapper, mud crabs, fishing patterns and the loss of species such as dugongs and turtles, the retrieval of ghost nets, looking out for illegal fishing and educating the community about appropriate use. Weed removal, feral animal control, fire management, beach patrols, sacred site protection and the monitoring of sawfish, dugongs, water quality and seagrass health can also be part of their duties.

Sea country management and social and economic returns

Land and sea management, particularly through key community-owned approaches such as IPAs and Indigenous ranger groups, is providing concrete economic and social benefits for local communities. Developing capacity and governance around land and sea management helps broker relationships with various external stakeholders such as government agencies, industry and non-profit organisations, and can generate additional returns to local Traditional Owners. In some terrestrial IPAs, including in West Arnhem Land, a 3:1 return on investment can be achieved when there are well developed and supported local Indigenous institutions delivering natural and cultural resource management[56].

The history of 'caring for country', which was pioneered by many Northern Territory Indigenous organisations, provides a strong foundation on which to build and strengthen partnerships along the Top End coastline. This will be supported by the continuing active engagement of Indigenous organisations of Traditional Owners, such as Land Councils, regional or local resource centres and land and sea management agencies, the pre-existing experience with IPA and Ranger programs, and local enterprises being developed with a view to establishing sustainable local economies.

Sharing saltwater country seasonal knowledge

Much of what we now know about the ecology of the Top End's coasts and seas is from the accumulated ecological knowledge of Indigenous communities. Over the past decade, CSIRO has been working with language groups in northern Australia to develop seasonal calendars that illustrate this knowledge[57].

For CSIRO, the calendars have 'informed the scientific understanding of the relationships between people and the seasonal cycles of resource availability. In the future, the calendars may provide an important baseline for detecting ecological change associated with climate change'[58]. For the Indigenous communities, the calendars are a 'powerful cultural learning aid to help share Indigenous knowledge with the next generation, while also providing relevant entry points for students into the science curriculum'[59].

Figure 7: Tiwi Islands seasonal calendar (right)

In collaboration with CSIRO, the Tiwi Islanders developed this seasonal calendar to illustrate their ecological knowledge and the subtleties of the Top End's climate, and educate future generations. Tiwi Island seasonal calendar available at www.csiro.au/en/Research/Environment/Land-management/Indigenous/Indigenous-calendars/Tiwi

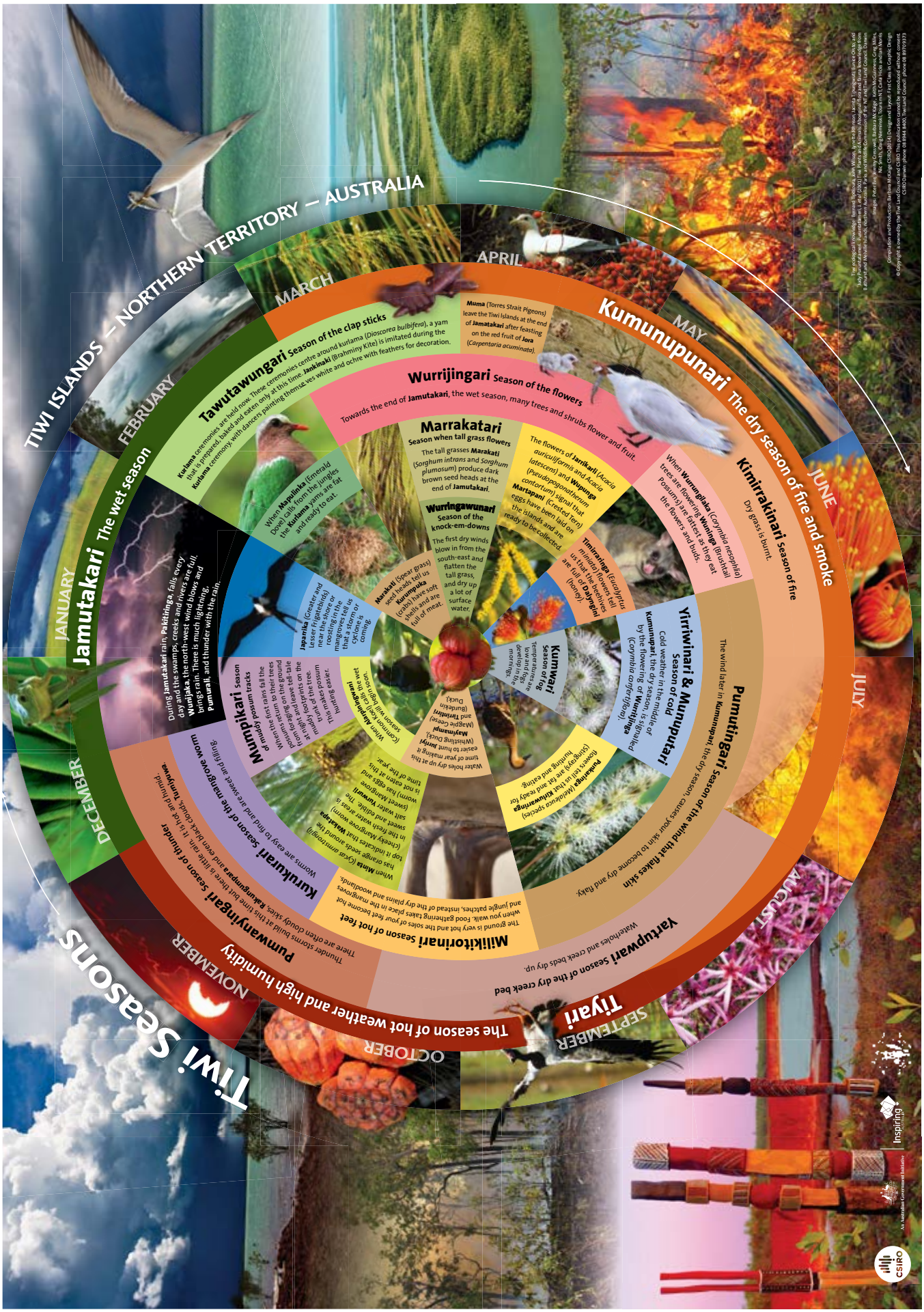


Figure 8: Wordle on the Top End lifestyle

These are the words that came to mind when Territorians were asked about the Top End's unique lifestyle and why they loved living there.

Top End lifestyle – nothing 'down south' comes close

There's no doubt that the Top End has a unique personality and flavour – the tropical climate and the great outdoors are at the heart of the Top End lifestyle, and healthy coasts and seas are central to it. Seaside living contributes to the region's slow pace and laid-back feel, with most Territorians living in the coastal city of Darwin.

Predictable blue skies in the dry season mean that every day is perfect for a beach walk, picnic or a spot of fishing. In the wet season, storms roll in over the ocean and bring awe-inspiring lightning shows in what is one of the most lightning-prone areas on Earth. In one wet season storm in 2016, Darwin was struck by lightning 9,624 times.

Recreational fishing is important for tourism and regional economies but it is also integral to the Territory lifestyle. The last time Territory anglers were surveyed[60], they revealed that each year they spent almost two million hours fishing. More than 80% of that effort was directed at estuaries and inshore and offshore waters, with most of that in regional areas. They caught nearly 150,000 barramundi, more than 20% of their catch, followed by golden snapper, small baitfish, catfish and mullet, plus 45,000 mud crabs.

But catching fish is not their main reason to go fishing, it is more about relaxing and unwinding or to be outdoors; only a small percentage are there for the fish[61]. This was also borne out by qualitative and quantitative research for this series of reports: 'The environment in general is clearly a key value for Territorians. "Lifestyle" was the word most used by respondents to describe why they love living in Darwin, and this was closely tied to their ability to enjoy the "great outdoors"'.

Here are some of the comments by Territorians about what they love about their unique Top End lifestyle:

- 'I love the relaxed lifestyle, the heat here and it doesn't take long to get out bush and see the waterfalls.'
- 'The Ski Club, the Sailing Club, everyone understands we have something special. The foreshore is fairly undeveloped with good food, good sunsets, right on the foreshore.'
- 'I'm enjoying it more up here, I worked in Melbourne in a stressful corporate environment and I kept thinking about how relaxed it was up here. Darwin is unique.'
- 'It's (the environment) why we live in the NT. If we didn't love the environment, we'd live in Melbourne.'
- 'The rarity of our wildlife. You can be off Channel Island and see turtles, sharks and crocodiles.'
- 'Really like the fishing and the freedom up here, there are rules for everything down south, up here you can have a few beers on the boat.'
- 'You lose a bit of vanity here. The environment can change your personality, it can change what you think is important. Living here has changed the way I view things. This is influenced by the heat and what you can and can't do.'

Supporting the lifestyle is also uppermost in the Territory Government's mind, with its 2017–18 budget providing 'additional funding to enhance the Territory lifestyle, with investment in sport, active recreation, arts and environmental protection so all Territorians can enjoy a healthy and balanced lifestyle'[62].

Barramundi, the fish of a lifetime

The Top End is Australia's barramundi capital, and the iconic big fish has become the number one target for anglers, whether they are locals or from interstate and overseas. As the ABC reported in 2016:

> 'Barramundi, or barra, which measure more than 100 centimetres are known locally as "metre-y" fish and are the prize catch for anglers who flock to the Northern Territory, with the Government estimating fishing tourist numbers at 40,000 annually. The NT Government launched a tourism promotion in 2015 to capitalise on the barras' popularity which saw the release of tagged barra, with one fish carrying a $1million bounty. While several $10,000 tagged fish have been caught, the "million dollar barra" remains at large'[63].

Some 43,000 tourists from 62 different countries registered in the million-dollar campaign[64].

A small commercial barramundi fishery, which also catches king threadfin, is restricted to waters seaward of the coast and river mouths. To increase opportunities for anglers, it is also excluded from the waters between Little Finnis and Wildman rivers, including Bynoe and Darwin harbours and Shoal Bay, and Kakadu National Park [65].

Under threat

The Top End's tropical coasts and seas are a biodiversity hotspot, closely connected with Indigenous culture, an angler's paradise and part and parcel of the Territory lifestyle. This report has tried to measure the region's natural, cultural, social and economic values in dollar terms – the estimate was in the billions – but a more accurate assessment would be that they are priceless. When something is of inestimable value, it should be looked after, but the Top End's coasts and seas are under serious threat.

Prime wetlands have been invaded by water buffalo, feral pigs, cane toads and weeds. High-density housing and industry in sensitive areas, the clearing of tidal flats and mangroves, the draining of swamps, and extraction of sand and gravel have removed and fragmented habitats in the Darwin Harbour, Shoal Bay and Howard sand plains.

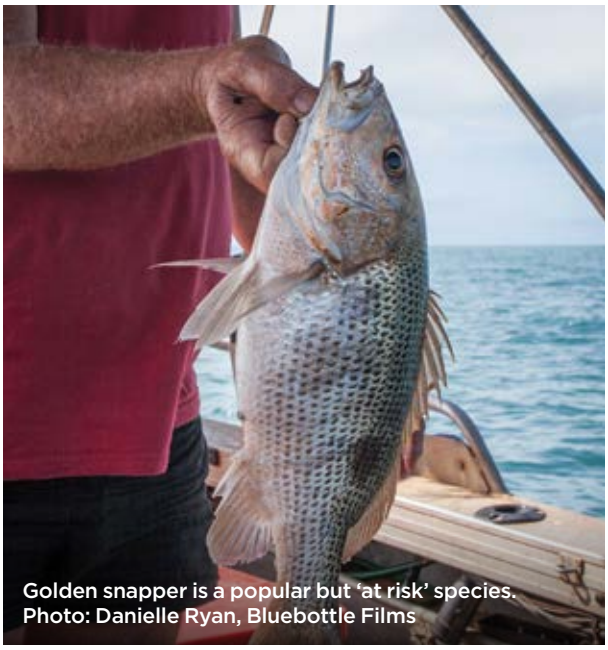
Legacy and existing mines are impacting on the water quality and aquatic life in rivers, estuaries and inshore areas. The now-closed legacy mines are scattered across the Top End and could cost $1billion to clean up[66], while their wastes continue flowing into rivers and seas affecting wildlife and people's lives. In 2014, *Australian Mining* reported on the impacts of an existing mine:

> 'Yesterday the Independent Mine Monitor's report was released which confirmed long-held fears about heavy metal contamination in edible fish species, caused by the Glencore-operated McArthur River zinc mine, located in the Northern Territory gulf region... Of major concern was the resulting concentrations of heavy metal in the river's fish stocks, which until several years ago were a source of food for local residents, who stopped eating the fish because of health concerns.'[67]

Nearshore and offshore waters are increasingly facing threats from seismic testing, seabed mining, shipping, port expansion and the risk of oil spills, while proposals for the damming of the Top End's rivers are also of great concern. In *Our North, Our Future: White Paper on Developing Northern Australia* released in 2015, the Australian Government proposed dams for the Victoria, Finnis and Adelaide rivers. This would expand the area of irrigated crops tenfold to 30,000 hectares in the Darwin region, and allow 140,000 hectares to be irrigated in the Victoria River catchment[68]. But research by Jared Dent and Michael Ward found that 'the costs of turning northern Australia into an irrigated food bowl are likely to exceed any benefits'[69]. The environmental consequences of altered river flows could be devastating to the Top End's coasts and seas.

Fishing in the Territory is amazing, but places like Darwin Harbour are not what they used to be and anglers are travelling further to get the same quality of catch. Popular reef fish have seriously declined due to overfishing in key areas. Scientists have identified golden snapper and black jewfish as being at risk of collapse. The problem of reef fish decline was known and action should have been taken earlier[70].

These existing and future threats are a stark reminder that the Territory is not immune to the problems experienced elsewhere, and that environmental pressures are increasing. But Territorians have a unique opportunity to learn from mistakes made elsewhere and become custodians of the Top End's coasts and seas.



Golden snapper is a popular but 'at risk' species. Photo: Danielle Ryan, Bluebottle Films

5. CONCLUSIONS AND RECOMMENDATIONS

Mud crabs are a key target for anglers in the Top End. Photo: James Sherwood, Bluebottle Films

Scratch a Territorian, and they might just bleed a mix of salt and fresh water – rivers, estuaries and seas are the Top End's lifeblood. Without healthy coasts and seas, the Top End's culture, lifestyle and economy will suffer. And while these environments are in good shape now, their future is less certain, development pressure is growing and climate change is becoming a very real and present threat.

This second report in the Keep Top End Coasts Healthy series has identified the Top End as a unique part of Australia, a rich and vibrant mix of tropical marine and coastal habitats, animals and plants that underpin the future for the Territory's economic development and the maintenance of its culture and lifestyle. The report reveals that:

- Indigenous communities have a long and enduring connection with their saltwater country. For saltwater people all aspects of social, cultural, and economic life are intimately connected to the health of their coastal lands and seas;
- Territorians have an innate connection to healthy marine and coastal ecosystems that sustain their lifestyle, such as recreational fishing, wildlife watching, boating, camping, diving and more;
- the Top End's coasts and seas have some of the last relatively pristine tropical waters on the planet, with high species diversity and the Top End providing the last stronghold for many species;
- the Top End's coasts and seas provide many ecosystem services to the community including coastal stabilisation, oxygen production, carbon storage, protection from cyclone and storm surge, filtering of sediments and key habitats for a diverse range of marine species, and they are estimated to be worth $428 million each year;
- with 85% of the coast owned by Indigenous communities, Indigenous occupation of saltwater country, together with the application of traditional ecological and cultural knowledge, can greatly assist today's management of the Top End's coasts and seas;
- intact and healthy marine and coastal ecosystems are of significant economic benefit for industries such as ecotourism, commercial fisheries, angling and fishing tourism;
- Indigenous Protected Areas, marine national parks and recreational fishing areas have a key role to play in helping ensure the future health of the Top End's coasts and seas and maintain the Territory lifestyle.

But we can no longer take the future of the Top End's coasts and seas for granted. We need to get to work. The signs are already there that all is not well.

Recommendations

The first report in this three-part Keep Top End Coasts Healthy series – *Health Check of our Top End Coasts* – reviewed the threats to the Northern Territory's coast and marine environment, finding that successive administrations had neglected the Northern Territory's coasts, and that considerable work is still required to adequately safeguard the coast and marine environment from current and future threats.

This second report has focused on the natural, cultural, social and economic values that make the Top End a unique part of Australia – the values that will be lost if the region's coasts and seas are given inadequate protection. It is recommended that:

1. Top End coasts and seas must be well managed and protected to ensure that:
   - the connection that Indigenous communities have to their saltwater country is maintained;
   - their status as a magnet for tourism is enhanced – more than one million people come to the Territory each year, mainly to enjoy experiences based on nature and Indigenous culture;
   - the central role that fishing plays in the Top End is not lost;
   - jobs and businesses supported by sustainable commercial fishing, recreational fishing, tourism, conservation and aquaculture grow.
2. The Northern Territory Government develop key protection and management strategies for the Top End's coasts and seas with a particular emphasis on developing an innovative system of marine protected areas tailored to the Territory that include:
   - saltwater country Indigenous Protected Areas, which recognise Traditional Ownership and provide jobs and training for Indigenous people;
   - jointly managed marine national parks that allow marine life to recover, rebuild and become more resilient, and preserve and protect important places and significant species, ecological communities and cultural sites;
   - recreational fishing areas and other measures that support the Top End's fishing lifestyle.

These recommendations will be discussed in detail in the third and final report of this Keep Top End Coasts Healthy series, *Securing our Top End coasts and seas*, along with other actions to protect the natural, cultural, social and economic values of the Top End, a unique part of Australia and the world.

Each of these reports has been prepared as advice to the Gunner Government in the preparation of the Coastal and Marine Management Strategy it committed to in the 2016 Territory Election. The commitment acknowledges that the Top End's coasts and seas have great value, while the strategy itself will drive the measures necessary for tackling the pressures they increasingly face.

Further, to be effective, the strategy will need to ensure that the unique cultural, conservation and fishing values of the Top End's coasts and seas are secured. It cannot achieve that alone; it must be part of a broader marine and coastal policy, planning, protection and management framework that embraces the principles of ecologically sustainable development, ecosystem-based management and marine spatial planning, and the integral role of Indigenous communities in saltwater country. The new framework should aim to:

- establish an agreed, whole-of-government strategic vision that seeks to maintain, restore and improve the health of Top End coasts and seas and ensure that their natural, cultural, social and economic values are secured;
- introduce transparent reporting mechanisms to ensure that the work of government agencies and marine and coastal industries are consistent with the vision, principles, objectives and targets of the framework, the marine and coastal strategy and other reforms;
- ensure ecologically sustainable use and ecosystem-based planning and management of resources in the region's coasts and seas;
- initiate reform of the laws and regulations that apply to Top End coasts and seas;
- establish integrated cross-sectoral planning and management linking catchments, coasts and seas;
- establish effective engagement, consultation and capacity-building mechanisms with Indigenous communities that strengthens their partnerships with government agencies and other bodies in the planning, protection and management of saltwater country;
- enable effective community engagement in marine and coastal planning, management and conservation activities, and improve public awareness of the values of Top End coasts and seas;
- increase security of access and certainty of process for marine-based and coast-based industries, while fostering stewardship;
- ensure that Traditional Owners are supported to apply their knowledge as managers of the sea in combination with contemporary scientific knowledge by working with localised management such as ranger groups , indigenous protected areas and other community supported structures;
- effectively respond to climate change and its impacts on coastal communities with long-term strategic adaptation approaches;
- prepare a well-resourced implementation plan with clearly allocated responsibilities, targets and timelines.

The Territory has often promised to move forward on more sustainable coastal and marine management and we now have the opportunity to do so.

The Gunner government can build on work that has been done previously and take steps now to ensure that we have a Territory built solution to ensure a healthy future for our treasured marine and coastal areas. It's not too late to avoid the mistakes other places have made but we can't be complacent.

REFERENCES

Executive Summary

[1] Northern Territory Government (2017), *Our Economic Future, Increasing private sector investment to grow Territory jobs. Northern Territory Economic Development Framework*. Northern Territory Government, Darwin.

Introduction

[2] Seagrass-Watch (2008), 'Seagrasses of northeast Arnhem Land, Northern Territory: Review of current knowledge', in *Seagrass-Watch: Proceedings of a Workshop for Mapping and Monitoring Seagrass Habitats in North East Arnhem Land, Northern Territory*, 18-20 October 2008, McKenzie, L.J. (2008), Seagrass-Watch HQ, Cairns, p.1.

[3] ibid.

[4] Australian Marine Conservation Society (2016) *Survey and focus group research of perceptions toward Marine Parks and Sanctuaries in the Northern Territory*, Australian Marine Conservation Society, Darwin, p.3.

[5] ibid.

[6] Environmental Defenders Office (2016) *Health Check of our Top End Coasts*, A report to the Keep Top End Coasts Healthy Alliance, Australian Marine Conservation Society, Brisbane, p. 1.

2. What is valuable about the Top End's coasts and seas?

[7] Duke, N. (2010) *Avicennia integra. The IUCN Red List of Threatened Species 2010*: e.T178844A7624677. http://dx.doi.org/10.2305/IUCN.UK.2010-2.RLTS.T178844A7624677.en.

[8] IUCN (2017) *Glyphis garricki*, IUCN Red List of Threatened Species, iucnredlist.org, IUCN, Gland.

[9] ibid. p.59.

[10] ibid., p. xviii.

[11] Department of Tourism and Culture (2016) Marine Turtle Watching Community Guidelines, Department of Tourism and Culture, Darwin.

[12] NT News (2017) 'Seagrass meadows protect reefs and people', NT News, 20 February, 2017.

[13] Mackarous, K and Griffiths, A.D. (2014) *Northern Territory Marine Megafauna Strandings: 2012 to 2014*, Report to Department of Land Resource Management, Darwin, p.28.

[14] Faggion, M. and La Canna, X. (2015) 'Killer whales filmed circling boat in tropical waters off NT coast, scientists stunned by rare sighting', *ABC News* 23 April 2015.

[15] Rawlinson, C. (2012) 'Humpback Whales leave fishos in awe', *ABC News* 23 August 2012

[16] Chatto, R. (2001) *The Distribution and Status of Colonial Breeding Seabirds in the Northern Territory*, Technical Report 70, Parks and Wildlife Commission of The Northern Territory, Palmerston, p.11.

[17] Department of Natural Resources, Environment, The Arts and Sport, Northern Territory Government, *Adelaide River Coastal Floodplain*, Sites of Conservation Significance, Northern Territory Government, Darwin.

[18] Department of Natural Resources, Environment, The Arts and Sport, Northern Territory Government, *Mary River Coastal Floodplain*, Sites of Conservation Significance, Northern Territory Government, Darwin.

[19] ibid.

[20] Chatto, R. (2003) *The Distribution and Status of Shorebirds Around the Coast and Coastal Wetlands of the Northern Territory*, Parks and Wildlife Commission of the Northern Territory, Darwin, p.11

[21] Northern Territory for Everyone (2017) 'Darwin crocodile farm, australiaforeveryone.com.au.

[22] Northern Territory Tourism Central (2017) 'Saltwater crocodile', nttc.com.au, Northern Territory Tourism Central, Darwin.

[23] Coleman, L. (2014) Sea sponges a soak for sewage', enews, Charles Darwin University, Darwin.

[24] Field, I.C., Meekan, M.G., Buckworth, R.C. & Bradshaw, C.J. (2010), 'Protein mining the world's oceans: Australasia as an example of illegal expansion-and-displacement fishing', *Fish and Fisheries*, 2009, 10, 323-328, p.323.

[25] ibid.

[26] Pearl Producers Association (2008) Pearling in Perspective: *An Overview of the Australian Pearling Industry and its Environmental Credentials*, Pearl Producers Association, Perth, p. ii.

[27] ibid., p.50.

3. How much are the coasts and seas worth?

[28] West, L. D., Lyle, J. M., Matthews, S. R., Stark, K. E. and Steffe, A. S. (2012). *Survey of Recreational Fishing in the Northern Territory*, 2009-10. Northern Territory Government, Australia. Fishery Report No. 109, p.iv.

[29] NT Tourism, *Fishing Tourism: Fishing Segment Profile*, NT Tourism, Darwin, p. 13.

[30] Northern Territory Government (2012), *Recreational Fishing Development Plan (2012-2022)*, Northern Territory Government, Darwin, p.2.

[31] Department of Primary Industry and Fisheries (2016) *Overview and Outlook 2015*, Department of Primary Industry and Fisheries, Darwin. pp 25–6.

[32] Territory Labor (2016) *Healthy Environment, Strong Economy*, Territory Labor Policy Paper, Territory Labor, Darwin, p.4.

[33] Tourism NT (2013) *Tourism Vision 2020: Northern Territory's Strategy for Growth*, Tourism NT, Alice Springs, p. 9.

[34] Department of Trade, Business and Innovation (2017) Our Economic Future, Northern Territory Economic Development Framework, Northern Territory Government, Darwin, p. 23 and p. 26.

[35] Australian Bureau of Statistics (2017) 'Table 10 Labour Force Status by Sex – Northern Territory –Trend and Original', 6202.0 – Labour Force, Australia, Australian Bureau of Statistics, Canberra.

[36] Centre for Conservation Geography (2016) *CCG Briefing Paper on the Economics of the Territory Marine and Coastal Environment: Tourism*, Centre for Conservation Geography, Sydney, p.2.

[37] ibid.

[38] Great Barrier Reef Marine Park Authority (2003) *Summary Report of the social and economic impacts of the rezoning of the Great Barrier Reef Marine Park*, Great Barrier Reef Marine Park Authority, Townsville.

[39] Currnock, M., Marshall, N., Tobin, R., Stone-Jovicich, S., Bohensky, E., Pert, P., Goldberg, J., Gooch, M., Heindler, F., Parker, J., Gillet, S., Scherl, L. (2014) The Social and Economic Long Term Monitoring Program (SELTMP) 2014, Tourism in the Great Barrier Reef. Report to the National Environmental Research Program. Reef and Rainforest Research Centre Limited, Cairns.

[40] Annah E. Piggott-McKellar, A. E. and McNamara, K. E. (2017) Last chance tourism and the Great Barrier Reef, Journal of Sustainable Tourism Vol. 25(3) 2017.

[41] Centre for Conservation Geography (2016) *CCG Briefing Paper on the Economics of the Territory Marine and Coastal Environment*: Non-Market Based Economics, Centre for Conservation Geography, Sydney, p.1.

[42] ibid., pp 3–4.

[43] Department of Environment, Climate Change and Water NSW (2009) *Economic Benefits of National Parks and Other Reserves in New South Wales: Summary Report*, Department of Environment, Climate Change and Water NSW, Sydney, p.1.

[44] Deloitte Access Economics (2017), The economic, social and icon value of the Great Barrier Reef. https://www.barrierreef.org/the-reef/the-value

[45] Costanza, R, de Groot, R., Sutton, P., van der Ploeg, S., Anderson, S. J., Kubiszewski, I., Farber, S. and Turner, R. K (2014) 'Changes in the global value of ecosystem services', *Global Environmental Change*, Volume 26, May 2014, Pages 152–158.

[46] ibid, p.4.

[47] Carlsen, J. (2015) *The Economic Benefits of Creating a 'World Class' Great Kimberley Marine Park*, Report prepared by Tourism Research Services for The Wilderness Society and Environ Kimberley, Western Australia. Tourism Research Service, Canberra, p.21.

[48] Australian Institute of Marine Science (2016). The AIMS index of the marine industry.

4. Connecting culture and lifestyle to the coasts and seas

[49] National Oceans Office (2004) *Living on Saltwater Country. Review of Literature about Aboriginal Rights, Use, Management and Interests in Northern Australian Marine Environments*, National Oceans Office, Hobart, p.12.

[50] ibid. p.52.

[51] ibid., p.13.

[52] ibid., p. 30.

[53] Department of Primary Industry and Resources (2017) 'Indigenous aquaculture, dpir.nt.gov.au, Department of Primary Industry and Resources, Darwin.

[54] Dhimurru (2006) *Yolnuwu Monuk Gapu Wäna Sea Country Plan: A Yolnu Vision and Plan for Sea Country Management in North-east Arnhem Land, Northern Territory*, Dhimurru Land Management Aboriginal Corporation, Nhulunbuy, Northern Territory, p. 4.

[55] Djelk Rangers (015) *Djelk Healthy Country Plan 2015-2025*, Djelk Rangers, Western Arnhem Land, p. 8

[56] Department of the Prime Minister & Cabinet (2016). 'Social Return on Investment analysis of the Girringun Indigenous Protected Area and associated Indigenous ranger programme'. https://www.pmc.gov.au/sites/default/files/publications/SROI-Consolidated-Report-IPA_1.pdf

[57] CSIRO (2017) 'Indigenous seasons calendars', csiro.au, CSIRO, Darwin.

[58] ibid.

[59] ibid.

[60] West, L. D., Lyle, J. M., Matthews, S. R., Stark, K. E. and Steffe, A. S. (2012). Survey of Recreational Fishing in the Northern Territory, 2009-10. Northern Territory Government, Australia. Fishery Report No. 109.

[61] Coleman, A. P. M. (2003) *The National Recreational Fishing Survey: The Northern Territory*, Northern Territory Department of Business, Industry and Resource Development. Fishery Report 72, p. iii.

[62] Northern Territory Government (2017), *Northern Territory Budget 2017-18 Lifestyle and Tourism Fact Sheet*, budget.nt.gov.au, Northern Territory Government, Darwin.

[63] ABC News (2016) 'Angler's dream realised as two huge barramundi caught on same night in NT', *ABC News*, 6 January 20

[64] Amateur Fishermen's Association of the NT, Submission to Productivity Commission Issues Paper for Marine Fisheries and Aquaculture, AFANT, Casuarina, p.1.

[65] Northern Territory Government (2017) https://nt.gov.au/marine/commercial-fishing/barramundi-fishery-and-licences

[66] http://www.abc.net.au/radio/programs/am/nt-begins-clean-up-of-billion-dollar-legacy-mine/7062954

[67] Australian Mining, (2014) 'Glencore under fire for zinc and lead mining pollution', Australian Mining, 23 October 2014.

[68] Australian Government (2015) Our North, Our Future: White Paper on Developing Northern Australia, Australian Government, Canberra, p.44.

[69] Dent, J. and Ward, M. (2014) Food Bowl or Folly? The Economics of Irrigating Northern Australia, Monash Business School, Melbourne, p.1.

[70] AFANT (2013). 'Protecting our Reef Fish: AFANT Submission on the second consultation paper November 2013'.http://afant.com.au/wp-content/uploads/2013/11/AFANT-Protecting-our-reef-fish-submission-2013.pdf

5. Conclusions and Recommendations

[71] Northern Territory Government (2009), Submission to the House of Representatives Inquiry into Climate Change and Environmental Impacts on Coastal Communities, Northern Territory Government, Darwin, August 2009.

MAPS AND FIGURES

Map	Data	Dataset name	Credit	
Figures 1-6	Australian EEZ	Treaties - Australian Maritime Boundaries 2014a (AMB2014a) - Geodatabase	Commonwealth of Australia (Geoscience Australia)	www.ga.gov.au/
Figures 1-6	Roads	GEODATA TOPO 250K Series 3	Commonwealth of Australia (Geoscience Australia)	www.ga.gov.au/
Figures 1-6	Coastline	GEODATA COAST 100K 2004	Commonwealth of Australia (Geoscience Australia)	www.ga.gov.au/
Figures 1-6	State border	GEODATA TOPO 250K Series 3	Commonwealth of Australia (Geoscience Australia)	www.ga.gov.au/
Figures 1-6	Cities/towns	GEODATA TOPO 250K Series 3	Commonwealth of Australia (Geoscience Australia)	www.ga.gov.au/
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Figure 1	Top End	Based on: NT NRM regions	Territory Natural Resource Management	www.territorynrm.org.au
Figure 1	Countries	World Countries	Esri, DeLorme Publishing Company, CIA World Factbook	www.arcgis.com/
Figure 1	Ocean Depth	The GEBCO_2014 Grid	The GEBCO_2014 Grid, www.gebco.net'	www.gebco.net
Figure 2	Mangroves	Mangroves of the Northern Territory, 1:100,000	Department of Environment and Natural Resources © Northern Territory of Australia	www.ntlis.nt.gov.au/
Figure 2	Seagrass	Seagrass meadows of Arnhem Land and Gulf of Carpentaria (2009) http://www.ntlis.nt.gov.au/metadata/export_data?type=html&metadata_id=7553EF80CEBC2D57E040CD9B214416DC	Department of Environment and Natural Resources © Northern Territory of Australia	www.ntlis.nt.gov.au/
Figure 2	Reefs	GEODATA TOPO 250K Series 3	Commonwealth of Australia (Geoscience Australia)	www.ga.gov.au/
Figure 2	Estuaries	Northern Territory Coastal Waterways Geomorphic Habitat Mapping. Version 2	Commonwealth of Australia (Geoscience Australia)	www.ga.gov.au/
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Figure 5	Waterbirds	Waterbird Colonies of the Northern Territory	Department of Environment and Natural Resources © Northern Territory of Australia	www.ntlis.nt.gov.au/
Figure 5	Seabirds	Seabird Colonies of the Northern Territory	Department of Environment and Natural Resources © Northern Territory of Australia	www.ntlis.nt.gov.au/
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The red-tailed tropicbird feeds on fish in the Top End's offshore waters.

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