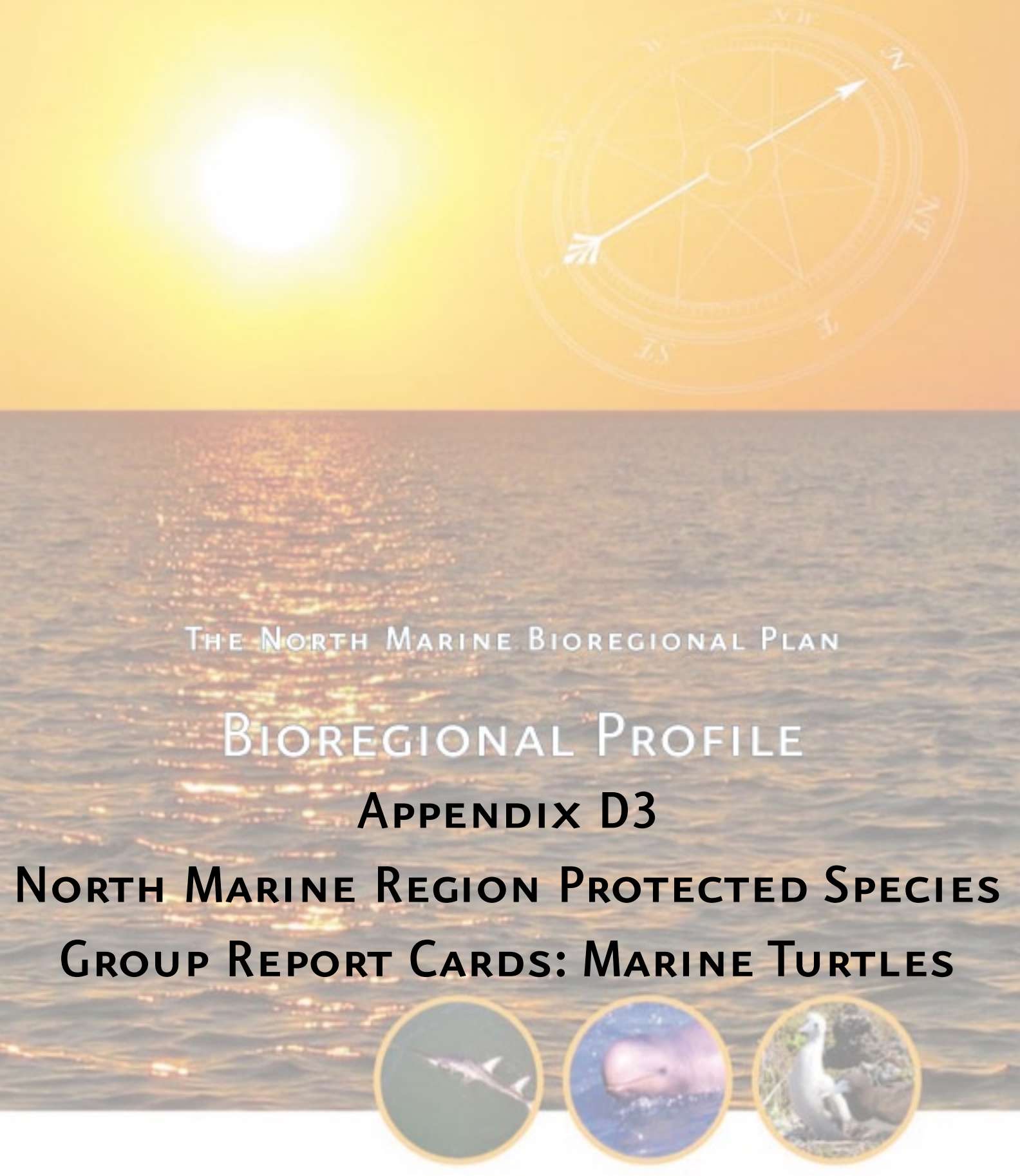

THE NORTH MARINE BIOREGIONAL PLAN

BIOREGIONAL PROFILE

APPENDIX D3

NORTH MARINE REGION PROTECTED SPECIES GROUP REPORT CARDS: MARINE TURTLES

A DESCRIPTION OF THE ECOSYSTEMS, CONSERVATION VALUES AND USES OF THE NORTH MARINE REGION

Australian Government
Department of the Environment, Water, Heritage and the Arts

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D3 North Marine Region Protected Species Group Report Card – Marine Turtles

Current at February 2008. For updates see <www.environment.gov.au/coasts/mbp/north>.

General information

Marine turtles are reptiles, and as such have lungs and must surface to breathe. Marine turtles are typically associated with tropical seas; however, some species are also known to inhabit subtropical and temperate oceanic waters. Much of the information in this report card is drawn from *A Biological Review of Australian Marine Turtles* (Limpus, in press). A draft publication containing information on the important areas for marine turtles in the Northern Territory is currently under internal review by The Northern Territory Government Department of Natural Resources, Environment and the Arts and will soon be available for wider circulation.

There are two families of marine turtles, Cheloniidae and Dermochelyidae. Five species from five genera (*Caretta*, *Chelonia*, *Eretmochelys*, *Lepidochelys* and *Natator*) found within the Region are from the family Cheloniidae, with one species from one genus *Dermochelys* from the family Dermochelyidae.

Nationally protected species

Six of the seven species of marine turtle in the world are known to inhabit the Region (table D II). All six species of marine turtle are listed under the EPBC Act as threatened, migratory and marine species. The Region supports globally significant breeding populations of green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*) and flatback (*Natator depressus*) turtles.

Hawksbill turtle. Photo: Department of the Environment, Water, Heritage and the Arts.

Table D II Marine turtles listed as threatened or migratory under the EPBC Act that are known to occur in the North Marine Region

Species	Conservation status	Australian Government conservation plans or strategies for the species
Loggerhead turtle (*Caretta caretta*)	Endangered, Migratory [also listed under CMS (Appendix II) and CITES (Appendix I)]	• *The Action Plan for Australian Reptiles* (1993) • *Recovery Plan for Marine Turtles in Australia* (2003) • *Sustainable Harvest of Marine Turtle and Dugongs in Australia – National Partnership Approach* (2005)
Green turtle (*Chelonia mydas*)	Vulnerable, Migratory [also listed under CMS (Appendix I, II) and CITES (Appendix I)]	
Leatherback turtle, leathery turtle (*Dermochelys coriacea*)	Vulnerable, Migratory [also listed under CMS (Appendix I, II) and CITES (Appendix I)]	
Flatback turtle (*Natator depressus*)	Vulnerable, Migratory, [also listed under CMS (Appendix I, II) and CITES (Appendix I)]	
Olive ridley, Pacific ridley turtle (*Lepidochelys olivacea*)	Vulnerable, Migratory [also listed under CMS (Appendix I, II) and CITES (Appendix I)]	
Hawksbill turtle (*Eretmochelys imbricata*)	Vulnerable, Migratory [also listed under CMS (Appendix I,II) and CITES (Appendix I)]	

Ecology of protected species in the North Marine Region

Marine turtles

Important breeding, nesting and feeding areas for marine turtles are found throughout and adjacent to the Region. The Indonesian Throughflow influences pelagic dispersal and transport of marine turtles but the exact influence of this ocean current on the Region is unknown (Limpus, C., 2007, pers. comm.).

All species of marine turtle have similar life cycles and are susceptible to impacts because of their biological characteristics. All marine turtle species are long lived and take many years, even decades, to reach sexual maturity. Adult marine turtles migrate from feeding habitats to the area of their birth to breed. Females lay their eggs on sandy beaches and migrate back to their feeding areas after the nesting season. Each female lays several clutches of eggs in a nesting season but does not necessarily nest every year. In any one year, only a proportion of the adult population will visit a breeding area.

Once the turtles hatch the hatchlings scramble down the beach to the sea. Although many are eaten by predators before they even reach the sea, a large proportion reach open waters (beyond the three nautical mile coastal waters limit) where they drift and feed in ocean currents for some time. On reaching the juvenile stage of their life cycle, most turtles move to shallower waters, where they begin to feed on benthic organisms. The leatherback turtle is the exception, as it remains a pelagic species and continues to feed on soft-bodied animals.

As marine turtles can migrate thousands of kilometres between nesting beaches and feeding areas, regional and international cooperation is necessary for their conservation. To promote marine turtle conservation in the Indian Ocean and South-East Asian regions, the Australian Government is a signatory to the Indian Ocean South-East Asian Marine Turtle Memorandum of Understanding (IOSEA Marine Turtle MoU) which was established under the Convention on Migratory Species. Information about the IOSEA Marine Turtle MoU is available at <www.ioseaturtles.org>.

Further information about the ecology of the species known to occur in the Region is provided below.

Loggerhead turtle

Loggerhead turtles are found in the Region; however evidence suggests that this species does not breed in the Region or in coastal areas adjacent to the Region. Large immature and adult-sized loggerhead turtles from

Leatherback turtle. Photo: C. Jenner.

eastern Australian populations are known to forage in the eastern Arafura Sea, the Gulf of Carpentaria and the Torres Strait (Limpus, in press), and they have been sighted in Northern Territory coastal waters from Fog Bay to north-east Arnhem Land (Chatto 1998). Loggerhead turtle populations from Western Australia are thought to migrate to north-east Arnhem Land and share foraging areas with eastern populations of the species (Limpus, in press).

Loggerhead turtles enter benthic foraging habitats at a larger size than other marine turtles (other than the leatherback). Adults and large juveniles with shell sizes of more than 70 cm in length inhabit environments with both hard and soft substrates, including rocky and coral reefs, muddy bays, sand flats, estuaries and seagrass meadows. Loggerheads are carnivorous, feeding primarily on benthic invertebrates in nearshore waters to depths of 55 m. In their juvenile stage, they feed on algae, pelagic crustaceans, and molluscs and have also been recorded as ingesting flotsam and anthropogenic debris.

Green turtle

The Region supports at least two different genetic breeding stocks of green turtles (Gulf of Carpentaria and North Great Barrier Reef) (Limpus and Chatto 2004; Limpus, in press). Preliminary estimates of numbers of nesting green turtles in eastern Arnhem Land alone suggest that several thousand green turtles breed there annually (Limpus, in press).

Post-hatchling and juvenile green turtles with shell sizes up to 30 cm length are pelagic, drifting on the surface of the water, and are usually associated with driftlines and floating Sargassum rafts. When their shells are between 30–40 cm length, they move to shallow benthic foraging habitats such as coral and rocky reefs, seagrass beds and algal mats, where they feed primarily on seagrass and algae. Green turtles also occur in the deeper waters of the Gulf of Carpentaria (Poiner and Harris 1996; Robins *et al*. 2002). Research undertaken by the Dhimurru Land Management Aboriginal Corporation in Nhulunbuy, in which turtles were fitted with satellite tracking devices, indicate that most (and possibly all) of the green turtles that nest in north-east Arnhem Land remain in the Gulf to feed (Kennett *et al*. 1998).

Leatherback turtle

No major breeding sites of leatherback turtles have been recorded in Australia (Limpus, in press), however low numbers of nesting females have been recorded around Wreck Rock Beaches and Rules Beaches in southern Queensland and at Cobourg Peninsula in north-west Arnhem Land (Limpus, in press). Leatherback turtles were sighted on the Queensland coast of the Gulf of Carpentaria in 1997, with nesting tracks observed that were possibly made by leatherbacks. Several large turtles, possibly leatherbacks, were sighted again in this area in 2007 (Marsh, H., 2007, pers. comm.). Leatherback turtles are occasionally observed on the continental shelf in the Gulf of Carpentaria and near Cobourg Peninsula. Larger populations have been observed in temperate oceanic waters around Australia (Limpus, in press; Chatto 1998). Regionally, New Guinea and Irian Jaya have significant nesting populations while Java supports isolated nesting on the southern shore (Limpus 1997). It is thought that

most leatherback turtles found in Australian waters have migrated from nesting areas to Australia's north to feed in temperate Australian waters (Limpus 1995).

Leatherback turtles are the largest of all marine turtles, weighing up to 500 kg and with shells averaging 1.6 m in length (Limpus *et al*. 1994). Their large body size, high metabolism, thick fatty tissue layer and ability to regulate blood flows allows them to use cold water foraging areas (Department of the Environment and Water Resources 2007).

This species is primarily pelagic in both the juvenile and adult phases of its life history. Small juveniles seem to 'disappear' for several years but may concentrate around upwellings where food sources are abundant. Large juveniles and adult turtles are found in both pelagic and coastal waters from tropical to cold temperate areas. Foraging occurs throughout the water column, from close to the surface, to depths of more than 1200 m (Gulko and Eckert 2004). Leatherback turtles are able to dive comparatively deeply due to a flexible carapace (top shell) and plastron (bottom shell) that are made of cartilage embedded with miniature bones and which resist cracking under pressure, as well as the ability to retain large amounts of oxygen in their blood and muscles (Gulko and Eckert 2004).

Hawksbill turtle

There are two recognised genetic stocks of hawksbill turtles in Australia (Moritz *et al*. 2002; Dutton *et al*. 2002) and each of these stocks supports an annual nesting population of several thousand females. These are two of the largest remaining nesting populations of hawksbill turtles in the world (Limpus and Miller 2000). The breeding stock found within the Region at Arnhem Land is associated with the rookeries of the Torres Strait and the northern Great Barrier Reef (Limpus, in press). Australian stocks of hawksbill turtles are genetically different from the stocks that breed in neighbouring countries such as the Solomon Islands and Malaysia (Moritz *et al*. 2002).

Hawksbill turtle post-hatchlings are believed to follow an oceanic, surface-water dwelling, pelagic life, although the distribution and biology of this age class is poorly understood in Australian waters (Limpus, in press). Young turtles (with shell sizes around 35 cm length) settle in feeding areas on the continental shelf, foraging within rocky and coral reefs, and primarily feeding on sponges and algae (Whiting 2000). They have also been found, though less frequently, within seagrass habitats of coastal waters, as well as the deeper habitats of trawl fisheries (Poiner and Harris 1996; Robins *et al*. 2002).

Recovery of flipper tags suggests that hawksbill turtles are highly migratory, as animals that were tagged in the northern Great Barrier Reef have been recaptured in foraging areas in the southern Gulf of Carpentaria, south-eastern Indonesia and southern Papua New Guinea (Limpus, in press).

Flatback turtle

Flatback turtles are endemic to the northern Australian–southern New Guinea continental shelf, with all breeding occurring on Australian beaches (Limpus *et al*. 1988). Flatback turtles differ from other species of marine turtle in that post-hatchlings do not go through an oceanic dispersal but are believed to follow a surface-water dwelling, pelagic life over the continental shelf and remain within pelagic habitats (Walker 1994; Limpus *et al*. 1994).

There are a substantial number of medium and high density nesting sites of flatback turtles along the Northern Territory coastline (Chatto 1998), north-eastern Gulf of Carpentaria and western Torres Strait.

Flatback turtles forage over soft bottom habitats across the northern Australian continental shelf and as far north as New Guinea and Indonesia (Limpus, in press). Flatback turtles have been captured in inter-tidal regions but are more commonly found in depths up to 60 m (Poiner and Harris 1996). Post-hatchling diet mainly consists of macroplankton, gastropods, siphonophores, pelecypods and cuttlefish. Immature adults and adult flatbacks eat mainly sea cucumbers, sea-pens, cuttlefish and jellyfish (Limpus, in press).

Olive ridley turtle, Pacific ridley turtle

Olive ridley turtles are the most abundant marine turtle species globally but one of the least abundant in Australian waters. Australian nesting populations of olive ridley turtles are recognised as genetically different from breeds in Malaysia, India and the eastern Pacific (Bowen *et al*. 1998; Dutton *et al*. 2002). There are two main nesting aggregations adjacent to the Region: north-west Arnhem Land (including Melville Island, Bathurst Island, Cobourg Peninsula, McCluer Island group and Grant Island), and north-east Arnhem Land (including the English Pellew Group, Wessel Islands and Crocodile Islands) (Chatto 1998; Limpus and Miller 2000; Limpus, in press).

Olive ridley turtle hatchlings are among the smallest marine turtle hatchlings in Australia (Limpus, in press). There is currently no data on the distribution and diet of post-hatchling olive ridley turtles in the Australian region, but post-hatchlings are thought to drift in offshore continental shelf and oceanic surface waters, feeding on plankton (Bolten 2003). Immature and adult olive ridley turtles are carnivorous, feeding principally on gastropod molluscs and small crabs (Limpus, in press). Australian populations of olive ridley turtles spend a substantial part of their immature and adult lives foraging over benthic habitats of the continental shelf. This is in contrast to the eastern Pacific Ocean olive ridley turtle populations that spend their entire post-hatchling, immature adult and adult phases occupying oceanic pelagic waters. Studies of migration behaviour of adult olive ridley turtles in the Northern Territory reveal that post-nesting, olive ridley turtles utilise various foraging areas including coastal, continental shelf and continental slope habitats and have been recorded migrating up to 1050 km from nesting beaches (Whiting *et al*. 2007). Olive ridley turtles nesting on the same beach can use different foraging areas and are often widely spread from nesting beaches (McMahon *et al*. 2007, Whiting *et al*. 2007).

Important areas for marine turtles in the North Marine Region

Important areas in the Region are identified for those species listed as threatened or migratory under the EPBC Act. Marine turtles nest on coastal beaches and islands adjacent to the Region, and are known to feed within the Region as well as in State and Northern Territory waters adjacent to the Region. The areas that are known to be important for marine turtles include:

Joseph Bonaparte Gulf – a foraging area for olive ridley turtles.

North-west Arnhem Land (including Cobourg Peninsula, Melville and Bathurst Island) –nesting site for olive ridley and flatback turtles. Olive ridley foraging area. Leatherback nesting site at Cobourg Peninsula.

Wessel Islands – home to nesting populations of olive ridley and flatback turtles.

Groote Eylandt – this appears to be the most significant area for hawksbill turtle nesting in the Northern Territory.

Gulf of Carpentaria Blue Mud Bay to Mornington Island – prominent foraging area for olive ridley, flatback and green turtles.

Sir Edward Pellew Group – significant foraging area for marine turtles including green, hawksbill and flatback turtles and sightings of foraging loggerhead turtles. Nesting sites for green, flatback and olive ridley turtles.

Wellesley Islands – important nesting area for green and flatback turtles and low numbers of olive ridley turtles. The Bountifuls, Pisonia and Rocky islands make up one of the four major green turtle rookeries in Australia, and are one of only six significant breeding sites for flatback turtles in Australia. The coastal areas of the southern Gulf of Carpentaria are the only remaining sites in Australia where major inter-tidal basking of inter-nesting green turtles still occurs.

East coast of the Gulf of Carpentaria – foraging grounds for flatback turtles.

Crab Island and adjacent islands in western Torres Strait – this area supports the largest nesting aggregation of flatback turtles in Australia. It is also a nesting area for hawksbill turtles.

Flatback turtle hatchling at Field Island (Kakadu National Park). Photo: Scott Laidlaw, Department of the Environment, Water, Heritage and the Arts

Known interactions, threats and mitigation measures

Past commercial exploitation

Little is known generally of past commercial harvests of marine turtles in the Region although green turtles were commercially exploited in Western Australia until 1973 and in Queensland until 1968 (Limpus, in press). There are no known records of large scale commercial harvest of green turtles in the Northern Territory.

Indigenous harvest

Under Section 211 of the *Native Title Act 1993*, Indigenous people with a native title right can legitimately hunt marine turtles in Australia for communal, non-commercial purposes, subject to limited exceptions. Little information is currently available on levels of Indigenous harvest of marine turtles in the Northern Territory and Queensland waters of the Gulf of Carpentaria but they are believed to be relatively low.

The National Partnership Approach for the sustainable harvest of turtle and dugong is an initiative of the Natural Resource Management Ministerial Council. The partnership involves the Australian, Western Australian, Northern Territory and Queensland governments as well as relevant Aboriginal and Torres Strait Islander communities. The key objective of the partnership is to better understand the experiences and aspirations of Indigenous communities in relation to the sustainable management of marine turtles and dugongs and to use this to inform policy and programme development and implementation by Australian governments.

Commercial fishery interactions

Marine turtles are sometimes caught accidentally in gear operated by commercial fisheries in Australian waters, including trawl, longline and pot fisheries. In general, there is a low level of impact on marine turtle populations by commercial fisheries operating in the Region. Small numbers of marine turtles are caught in trawl nets operated by the Northern Prawn Fishery, though numbers have significantly declined since the introduction of turtle excluder devices in 2001. For example, in 1999, 780 turtles were caught and released by the Northern Prawn Fishery, with 96 turtle deaths. In 2006, following the introduction of turtle excluder devices, 31 marine turtles were caught and all released alive.

Concern has been expressed about the potential impact on marine turtles of entanglement in equipment used in pearl farming and aquaculture. There is no evidence to suggest that aquaculture activities are currently affecting marine turtles in the Region.

Light pollution

Light pollution has been identified as a factor that impacts on the success of marine turtle nesting (Environment Australia 2003). Light that attracts hatchlings or nesting marine turtles at land or sea is likely to contribute to increased mortality (Environment Australia 2003).

In the Region, lighting associated with aquaculture, oil and gas facilities and coastal and island developments may have the potential to disturb the nesting regimes of marine turtles. Adjacent to the Region on the North West Shelf, lighting from industrial complexes has been shown to affect flatback, green and hawksbill turtles (Environment Australia 2003). In Western Australia, preliminary results of an investigation into the impact of flares and facility lighting suggest that impacts are determined by the phase of the moon, with disorientation greatest in the new moon nights. Another factor is the brightness and wavelength of the light sources (Environment Australia 2003).

Nesting beaches adjacent to the Region are found predominantly in isolated areas where lighting associated with aquaculture, and lighting and flares associated with oil and gas facilities, are currently unlikely to be of concern.

Oil spills and operational discharges

In the Region, pollution from shipping and from oil and gas exploration may be a potential threat for marine turtles. The *Recovery Plan for Marine Turtles in Australia* indicates that:

- weathered petroleum emanating from heavy crude oil has been observed to seal the mouth and nostrils of turtles;
- tar balls are known to be mistaken for food items by marine turtles; and
- one incident in Australia of a marine turtle being affected by weathered petroleum has been reported (Environment Australia 2003).

Management practices have been adapted to minimise the chance of this occurring, and under the EPBC Act,

petroleum operations are assessed to ensure no adverse effects on marine turtles.

Shipping discharge is regulated by the *International Convention for the Prevention of Pollution from Ships 1973* and its 1978 Protocol (MARPOL). The *National Plan to Combat Pollution of the Sea by Oil and Other Noxious and Hazardous Substances* (Australian Maritime Safety Authority 1996) identifies the potential effects on wildlife, which would include turtles, and the operations and procedures that should be put into place in the event of an oil spill (Environment Australia 2003).

Seismic activity

The response of marine turtles to sound varies depending on the frequency and intensity of the sound. Under experimental conditions, marine turtles have been shown to be able to detect low frequency noise and are influenced by it. Green and loggerhead turtles have shown behavioural responses to tests on the effects of air gun seismic arrays used in seismic surveying (McCauley *et al*. 2000). Overseas, seismic testing and explosive removals of platforms have been identified as noise sources that impact on marine turtles, particularly where seismic surveys have occurred near mating grounds and nesting beaches during breeding season (Minerals Management Service 1997). In Australia, the method of platform removal is subject to the approval of the designated authority in each jurisdiction, with the authority making a judgement of the potential impact on the environment. Protective measures to mitigate the impact of seismic testing on marine turtles may also be applied under the EPBC Act.

Marine debris

The ingestion of, or entanglement in, harmful marine debris has been identified under the EPBC Act as a key threatening process causing injury and fatality to vertebrate marine life. Entanglement in marine debris such as discarded fishing gear can lead to restricted mobility, starvation, infection, amputation, drowning and smothering. The ingestion of plastic marine debris can cause physical blockages leading to starvation, or injuries to the digestive system leading to infection or death.

Marine turtles are particularly vulnerable to floating debris as some species of marine turtles are thought to mistake plastic bags and other items for their jellyfish prey, while others, especially hawksbills, eat encrusting organisms that grow on floating plastics and nets, and are likely to become ensnared when attempting to feed. A monitoring programme run by rangers from the Dhimurru Land Management Aboriginal Corporation in Arnhem Land (Northern Territory) since 1996 has recorded more than 360 hawksbill, olive ridley, flatback and green turtles stranded along a short stretch of coastline (Roeger *et al*. 2005). A marine wildlife stranding and mortality database maintained by the Queensland Environmental Protection Agency/Parks and Wildlife Service highlights that significant numbers of marine turtles are also ingesting and becoming entangled in marine debris in Queensland waters (Greenland *et al*. 2004).

The Australian Government is currently developing a threat abatement plan that aims to minimise the impacts of marine debris on threatened marine species. Further information is available at <www.environment.gov.au/biodiversity/threatened/publications/marine-debris.html>.

Other threats to marine turtles

Other threats to marine turtles in the Region could include (Environment Australia 2003):

- factors that reduce successful marine turtle nesting such as tourism and recreational activities, vehicle damage (particularly where there is recreational four-wheel drive beach access), and feral animal predation on marine turtle eggs;
- change in land use practices such as land clearing, urban and industrial development and associated impacts such as water quality degradation, loss of seagrass and other impacts on nesting habitats; and
- training activities undertaken by the Department of Defence, such as the use of explosives and landing craft on nesting beaches.

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