

Table 2. Life history parameters for marine turtles in the Great Barrier Reef World Heritage Area and eastern Queensland.

Parameter	Loggerhead	Green	Hawksbill	Flatback	Leatherback	Olive Ridley
Breeding season	late October to early March, peaks in December	late October to February	year round, conc. November to February, peaks in January	October to February	December & January	not known to breed in the GBRWHA
Years between breeding	3-4	2-8	2-5	1-5	not measured, 2-4 years in other breeding parts of the world	-
Hatchling emergence season	December through April	December to May	year round, conc. from February to April	December to April	February & March	-
Average hatching success (% of eggs in a clutch producing hatchlings to the beach surface)	80%	84%	79%	80%	low	-
Feral predators of eggs/hatchlings	Foxes, pigs	Foxes, pigs	Pigs	Foxes, pigs	Foxes	-
Foraging habitat	subtidal & intertidal coral & rocky reefs, seagrass meadows deeper soft-bottomed habitats of the continental shelf	subtidal & intertidal coral & rocky reefs, & seagrass meadows of the continental shelf	subtidal & intertidal coral & rocky reef, habitats of the the continental shelf	subtidal soft-bottomed habitats of the continental shelf	temperate waters, have been recorded as far south as Bass Strait & through the Gulf of Carpentaria to Arnhemland	continental shelf waters
Food / prey items	benthic gastropod & bivalve molluscs, crabs & echinoderms	seagrass, red algae, mangrove fruit, & jellyfish	benthic invertebrates (sponges, soft corals, sea cucumbers)	benthic soft-bodied invertebrates (soft corals, sea-pens, holothurians), & jellyfish	macroplankton (jellyfish, salps)	molluscs, crabs, echinoderms & gastropods
Recoveries outside the Great Barrier Reef Marine Park of animals tagged while nesting or foraging in Queensland	Gulf of Carpentaria, Arnhemland, Torres Strait, & PNG	Gulf of Carpentaria, Arnhemland, Torres Strait, PNG, Indonesia Solomon Islands, Vanuatu & New Caledonia*	Indonesia, PNG, Solomon Islands, & Vanuatu	Indonesia (southern Irian Jaya)	No tags have been recovered	No tags have been recovered
References	Dodd, 1988, Limpus 1985, Limpus et al. 1992, Limpus et al. 1994a	Brand-Gardner et al. 1999, Forbes 1994, Garnett et al. 1985, Hirth 1997, Limpus 1995, Limpus et al. 1992, Limpus et al. 1994b, Limpus & Limpus 2000	Bell et al. 1997, Dobbs et al. 1999, Limpus and Miller 2000, Miller 1994, Miller et al. 1998, Parmenter 1983, Witzell 1983,	Limpus et al. 1983, Parmenter 1994	Limpus & McLachlan 1994, Limpus 1997	Harris 1994, Limpus pers. comm. in Harris 1994

PNG = Papua New Guinea

*Genetic studies of harvested animals indicate that the Solomon Islands harvest does not represent a substantial threat to the viability of the Australian breeding populations (i.e. they do not contain significant proportions of either GBR stocks). Genetic studies from turtles harvested in Bali indicate they come from four breeding populations, including the nGBR stock. Genetic studies from turtles harvested in Torres Strait and evidence from tag returns indicate they are primarily from the nGBR breeding stock. All tags returned from Queensland East Coast Indigenous communities (e.g. Hope Vale, Yarrabah, Palm Island Group) have been from green turtles tagged while nesting on sGBR rookeries. Tags returned from Indigenous communities harvesting sGBR green turtles in New Caledonia are approximately half of the number being returned from Indigenous hunters of the same stock in Queensland. This assumes that the number of tags not returned is equal between the two groups.

Table 3. Potential adverse impacts of human activities on marine turtles in the Great Barrier Reef World Heritage Area.

Human Activity	Potential Types Of Impacts													
	Marine Debris	Deliberate or Reckless Killing & Injuring	Disease	Explosions	Food Depletion	Harassment	Incidental Catch in Fishing Gear	Live Capture	Noise	Physical Displacement	Physical Habitat Degradation or Destruction	Pollution	Predation by Feral Animals	Vessel Strike
Boats, Ships & Other Vessels		•				•			•	•	•	•		•
Coastal & Land-based Actions	•	•	•		•	•				•	•	•	•	
Defence Activities	•			•	•				•	•	•	•		•
Feeding			•		•					•				•
Fishing, Shark Control Program, Aquaculture	•		•		•		•			•	•	•		•
Indigenous Hunting		•				•		•	•	•	•			•
Live Display, Headstarting, Ranching & Captive Breeding		•	•					•		•				•
Marine Construction	•	•		•	•	•			•	•	•	•		•
Filming & Photography		•				•				•	•			•
Research & Monitoring		•				•		•	•	•	•	•		•
Tourism & Recreation	•	•	•			•			•	•	•	•		•
Trade of Turtles & Turtle Products		•				•		•	•	•				•

APPENDIX 1

Management (M) and research (R) actions involving the Great Barrier Reef Marine Park Authority and criteria for their success.

Excerpted from the Draft *National Marine Turtle Recovery Plan* (Environment Australia 2000).

NB. Lead agencies are the environment management agencies in different Commonwealth/State and the Northern Territory jurisdictions. Only actions in which the Great Barrier Reef Marine Park Authority is involved have been listed. There are many other actions prescribed in the Draft *National Marine Turtle Recovery Plan* (Environment Australia 2000).

Prescribed Action	Manager	Criteria for Success
A.3.1. In consultation with lead agencies, the Department of Defence to: <ul style="list-style-type: none"> ensure that all Environmental Impact Assessments and Environmental Management Plans developed for Defence activities recognise the importance of marine turtle conservation and minimise any possible effects on populations and habitats; (M) cooperate with Lead agencies to develop management strategies for affected marine turtle stocks including the identification of opportunities to continue and/or establish research or monitoring sites on selected Defence estate. (M/R) 	<p>Department of Defence</p> <p>Lead agencies</p>	<p>Assessments and Plans recognise marine turtle conservation.</p> <p>Management strategies are developed.</p>
A.4.1. Lead agencies to: <ul style="list-style-type: none"> monitor the level of mortality of marine turtles due to entanglement in marine debris; and identify the source of marine debris causing the mortality. (See also action C.1.3.) (R) 	Lead agencies	The level of mortality is quantified and the source is identified.
A.4.3. Lead agencies to undertake remedial action to prevent/reduce marine turtle mortality in stranding events caused by marine debris. (M)	Lead agencies	Lead agencies will respond to debris events.
B.1.1. Lead agencies to support indigenous communities to develop management agreements that: <ul style="list-style-type: none"> recognise customary law and the cultural significance of marine turtles; (M) quantify existing harvest; (R) identify and implement negotiated mechanisms that will ensure that customary harvest does not threaten the recovery of marine turtles; (M) control marine turtle use within the communities' area; (M) recognise the apparent drastic decline of Loggerhead turtles in Australia and implement a zero take where possible; (M) identify the research requirements of indigenous communities regarding marine turtle conservation; (M) and increase awareness of marine turtle conservation issues through information exchange. (M) 	<p>Aboriginal and Torres Strait Islander communities</p> <p>Lead agencies</p> <p>AFMA</p>	Community management agreements are in place in each jurisdiction.
C.1.1. Lead agencies to cooperatively develop an agreed minimum set of key protocols for: <ul style="list-style-type: none"> monitoring key nesting beaches; and collecting mortality data from stranded marine turtles or other sources. (M) 	Lead agencies	Protocols are developed, agreed and implemented nationally.

Prescribed Action	Manager	Criteria for Success
C.1.2. Lead agencies to monitor key nesting beaches for marine turtle stocks identified in Table 17 to develop population models in the longer term. (R)	Lead agencies	Complementary monitoring programs are established in each jurisdiction.
C.1.3. Lead agencies to: <ul style="list-style-type: none"> monitor marine turtle mortality to determine the levels, distribution and causes of that mortality; and conduct or support research on the prevalence and frequency of disease in potential risk areas. (R) 	Lead agencies Lead fishing agencies	Lead agencies have established a marine turtle mortality database. Mortality data is collected through bycatch quantification programs and compulsory reporting requirements identified in accordance with fisheries management legislation. Prevalence and frequency of disease in wild marine turtles is identified.
C.2.2. Develop a population viability model for the within southern Great Barrier Reef (GBR) green turtle stock that: <ul style="list-style-type: none"> identifies the stock behaviours that give the model its predictive power; determines the risk in applying the model to other stocks and species of marine turtle; and determines the limits to the interpretation on the outputs from such a model. (R) 	EA QPWS GBRMPA	Such a model is developed the second year of the plan
D.1.1. Identify nesting beaches affected by urban or industrial lighting. (R)	Lead agencies	Nesting beaches affected by lighting are identified.
D.1.2. Lead agencies to: <ul style="list-style-type: none"> encourage local government to employ existing urban and industrial light management practices that do not adversely affect marine turtles, near affected nesting beaches; (M) address lighting problems on affected beaches with local government responsible for their management; (M) implement existing management practices such as zoning anchorage areas for boats; (M) support research into suitable lighting technology for boats; (R) support research into improved lighting technology and the impact of lights on loggerhead, hawksbill, green and flatback turtles. (R) 	Lead agencies Local governments Transport/Boating authority	Suitable lighting technology is developed and employed.
D.2.1. Lead agencies to: <ul style="list-style-type: none"> identify tour operators that currently access marine turtle nesting beaches; (M) identify nesting beaches that have uncontrolled access; (R) develop management arrangements for access and beach activities with other relevant local government authorities and landowners to ensure conservation of marine turtles; (M) develop a nationally agreed code of conduct for tour operators with the Australian Eco-Tourism Association; and (M) 	Lead agencies	Nesting beaches and tour operators are identified. Management arrangements for access and beach activities are developed. A code of conduct is developed and implemented with tourism industry representatives.

Prescribed Action	Manager	Criteria for Success
<ul style="list-style-type: none"> implement these actions with particular reference to loggerhead turtles as a priority. (M) 		
D.3.1. For significant nesting beaches, lead agencies to: <ul style="list-style-type: none"> manage vehicle access to areas within their jurisdictions; and negotiate the management of access with local government and other land managers. (M) 	Lead agencies	Arrangements are developed to manage access to significant nesting beaches.
D.4.1. Lead agencies, in consultation with landowners, to identify sites where predation is a problem and initiate or continue appropriate management actions. (R & M)	Lead agencies	More than 70% of nests, for affected stock, produce hatchlings.
E.1.2. Each jurisdiction to identify the impact of development on marine turtles through administrative processes such as Environmental Impact Statements. (M)	Lead agencies	The impact of development is identified.
E.2.2. The Queensland East Coast Otter Trawl management plan to establish mechanisms to ensure that trawling is ecologically sustainable in the Great Barrier Reef World Heritage Area.(M)	QFMA GBRMPA	Trawling in the Great Barrier Reef Marine Park is conducted in an ecologically sustainable manner.
E.3.1. Lead agencies to respond to oil spills in accordance with the National Plan to Combat Pollution of the Sea by Oil and Other Noxious and Hazardous Substances. (M)	Lead agencies AMSA	Contingency plans are implemented in accordance with the national plan.
E.3.2. Lead agencies to provide advice on the impact of proposals for oil and mineral exploration and exploitation permit applications on marine turtles within their jurisdiction. (M)	Lead agencies	Advice provided as required in each jurisdiction.
E.3.3. Lead agencies to provide AMSA with information relating to significant nesting sites for marine turtles. (M)	Lead agencies	Information is provided to AMSA for distribution.
F.2.1. Lead agencies to encourage the participation and training of volunteers in agency monitoring programs. (M)	Lead agencies	Volunteers are trained and involved as practicable and needed in each jurisdiction.
F.2.4. AMSA and lead agencies to promote awareness of the effects of pollution on marine life compliance with laws restricting pollution from vessels.	AMSA Lead agencies	Material is developed and distributed to fishers and other boat operators.
F.3.1. EA and lead agencies to support the establishment of an indigenous coastal community network to support communities' management of marine turtles with lead agencies. (M)	EA Lead agencies	The network is established.