[1] "\r\n\r\n\t\r\n\r\n\r\n \r\n \r\n \r\n Eretmochelys imbricata\r\n — Hawksbill Turtle\r\n \r\n \r\n \r\n \r\n \r\n Glossary\r\n \r\n\r\n\r\n\r\n\r\n\r\n \r\n SPRAT\r\n Profile\r\n \r\n\r\nFor information to assist regulatory considerations, refer to Policy Statements and Guidelines, the Conservation Advice, the Listing Advice and/or the Recovery Plan. \r\n\r\n\r\n\r\n \r\n EPBC Legal Status and Documents\r\n \r\n \r\n Top\r\n \r\n\r\n\r\nEPBC Act Listing Status\r\n \r\n\t \r\n\t\t\t\r\n\t\t\t Listed as Vulnerable\r\n\t\t\t \r\n\t\t\t \r\n\t\t\t\t(Date effective 16-Jul-2000)\r\n\t\t\t \r\n\t\t\t Listed marine\r\n\t\t\t \r\n\t\t\t \r\n\t\t\t \r\n\t\t\t\r\n\t\t\t\r\n\t\t\t Listed migratory -\r\n\t\t\t \r\n\t\t\t\tEPBC Act, \r\n\t\t\t \r\n\t\t\t\tBonn\r\n\t\t\t \r\n\t\t\t\r\n\t\t\t\r\n\t\t\t\r\n\t\t\r\n\t\t\r\n \r\n \r\n\t\t Approved Conservation Advice\r\n\t\t\r\n\t\t\r\n\t\t \r\n\t\t\tThere is no approved Conservation Advice for this species\r\n\t\t \t \r\n\t\t\r\n \r\n\t\t Listing Advice\r\n\t\t\r\n\t\t\r\n\t\t\r\n\t\t\t\r\n\t\t\tThere is no Listing Advice for this species\r\n\t\t\r\n\t\t\r\n\t\t\r\n \r\n\t\t Recovery Plan Decision\r\n\t\t\r\n\t\t\r\n\t\t \r\n\t\t Recovery Plan required, this species had a recovery plan in force at the time the legislation provided for the Minister to decide whether or not to have a recovery plan (19/2/2007).\r\n\t\t\t \r\n\t\t \r\n\t\t\r\n \r\n\t\t Adopted/Made Recovery Plans\r\n\t\t\r\n\t\t\r\n\t\t \r\n\t\t\t \r\n\t\t\t Department of the Environment and Energy (2017). Recovery Plan for Marine Turtles in Australia. Australian Government, Canberra. Available from: http://www.environment.gov.au/marine/publications/recovery-plan-marine-turtles-australia-2017. In effect under the EPBC Act from 03-Jun-2017.\r\n\t\t\t\t \r\n\t\t\t \r\n\t\t \r\n\t\t\r\n \r\n\t\t Adopted/Made Threat Abatement Plans\r\n\t\t\r\n\t\t\r\n\t\t\t\r\n\t\t\t \r\n\t\t\t \r\n\t\t\t\tDepartment of the Environment (2015). Threat abatement plan for predation by feral cats. Canberra, ACT: Commonwealth of Australia. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/tap/threat-abatement-plan-feral-cats. In effect under the EPBC Act from 23-Jul-2015.\r\n\t\t\t\t \r\n\t\t\t \r\n\t\t\t\tDepartment of the Environment and Energy (2017). Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa) (2017). Canberra, ACT: Commonwealth of Australia. 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In effect under the EPBC Act from 27-Aug-2012.\r\n\t\t\t \r\n\t\t \r\n\t\t\r\n \r\n\t \r\n\t\tOther Commonwealth Documents\r\n\t \r\n\t \r\n\t\tTop\r\n\t \r\n\t\r\n\r\n\t\r\n\t\r\n\t\t Other EPBC Act Plans\r\n\t\t\r\n\t\t\r\n\t\t \r\n\t\t \r\n\t\t \r\n\t\t\tSouth-east marine region profile: A description of the ecosystems, conservation values and uses of the South-east Marine Region (Commonwealth of Australia, 2015) [Information Sheet].\r\n\t\t\t \r\n\t\t \r\n\t\t\r\n \r\n\t Policy Statements and Guidelines\r\n\t\r\n\t\r\n\t \r\n\t \r\n\t National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (Department of the Environment and Energy, 2020) [Admin Guideline].\r\n\t \r\n\t \r\n\t Seagrass - A Vulnerability Assessment for the Great Barrier Reef (Great Barrier Reef Marine Park Authority (GBRMPA), 2011) [Admin Guideline].\r\n\t \r\n\t \r\n\t\r\n \r\n\t Information Sheets\r\n\t\r\n\t\r\n\t \r\n\t \r\n\t Information Sheet - Harmful marine Debris (Environment Australia, 2003) [Information Sheet].\r\n\t \r\n\t \r\n\t\r\n \r\n\t Federal Register of Legislative Instruments\r\n\t\r\n\t\t\r\n\t\t\tMarine:Declaration under section 248 of the Environment Protection and Biodiversity Conservation Act 1999 - List of Marine Species (Commonwealth of Australia, 2000c) [Legislative Instrument]Migratory:List of Migratory Species (13/07/2000) (Commonwealth of Australia, 2000b)

[Legislative Instrument]Recovery Plan:Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2007y) [Legislative Instrument]Recovery Plan:Instrument Jointly Making the National Recovery Plan for Marine Turtles in Australia (Commonwealth of Australia, 2017f) [Legislative Instrument]Threat Abatement Plan:Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (Sus scrofa) (2017) (Commonwealth of Australia, 2017c) [Legislative Instrument]Threat Abatement Plan:Instrument under section 270B of the Environment Protection and Biodiversity Conservation Act 1999 to make a Threat Abatement Plan (Commonwealth of Australia, 2018i) [Legislative Instrument]Threatened:Declaration under s178, s181, and s183 of the Environment Protection and Biodiversity Conservation Act 1999 - List of threatened species, List of threatened ecological communities and List of threatening processes (Commonwealth of Australia, 2000) [Legislative Instrument]\r\n \r\n\t State Government Documents and Websites\r\n\t\r\n\t\r\n\t NT:Threatened Species of the Northern Territory - Hawksbill Turtle Eretmochelys imbricata (Taylor, R., R. Chatto, J. Woinarski, S. Whiting & S. Ward, 2012) [Information Sheet].QLD:Hawksbill turtle (Department of Environment and Heritage Protection (DEHP), 2013ae) [Database].TAS:Eretmochelys imbricata (Hawksbill Turtle): Species Management Profile for Tasmania's Threatened Species Link (Threatened Species Section (TSS), 2014vz) [State Action Plan].\r\n State Listing Status\r\n\t \r\n\t NT:\r\n\t\t\t\r\n\t\t\t\tListed as Vulnerable\r\n\t\t\t\t (Territory Parks and Wildlife Conservation Act 2000 (Northern Territory): 2012 list)\r\n\t\t\t\t\r\n\t\t \r\n\t QLD:\r\n\t\t\t\r\n\t\t\t\tListed as Endangered\r\n\t\t\t\t (Nature Conservation (Animals) Regulation 2020 (Queensland): August 2020 list)\r\n\t\t\t\t\r\n\t\t \r\n\t TAS:\r\n\t\t\t\r\n\t\t\t\tListed as Vulnerable\r\n\t\t\t\t (Threatened Species Protection Act 1995 (Tasmania): November 2020 list)\r\n\t\t\t\t\r\n\t\t \r\n\t WA:\r\n\t\t\t\r\n\t\t\t\tListed as Vulnerable\r\n\t\t\t\t (Biodiversity Conservation Act 2016 (Western Australia): September 2018 list)\r\n\t\t\t\t\r\n\t\t \r\n\t\t \r\n Non-statutory Listing Status\r\n\t \r\n\t IUCN:\r\n\t\t\t\r\n\t\t\t\tListed as Critically Endangered\r\n\t\t\t\t (Global Status: IUCN Red List of Threatened Species: 2020.2 list)\r\n\t\t\t\r\n\t\t\t\r\n\t\t \r\n \r\n \r\n Naming\r\n \r\n \r\n Top\r\n \r\n\r\n\r\nScientific name\r\n \r\n Eretmochelys imbricata [1766]\r\n \r\n Family\r\n \r\n Cheloniidae:Testudines:Reptilia:Chordata:Animalia\r\n \r\n \r\n Species author\r\n (Linnaeus,1766)\r\n \r\n Infraspecies author\r\n \r\n Reference\r\n \r\n \r\n \r\n Distribution Map\r\n \r\n \r\n Top\r\n \r\n\r\n\r\nDistribution map\r\n \r\n \r\n\t\tThe distribution shown is generalised from the Departments Species of National Environmental Significance dataset. This is an indicative distribution map of the present distribution of the species based on best available knowledge. Some species information is withheld in line with sensitive species polices. See map caveat for more information.\r\n\r\n \r\n \r\n \r\n \r\n Illustrations\r\n \r\n \r\n Top\r\n \r\n\r\n\r\n\r\n\r\nIllustrations\r\n \r\n Google Images\r\n \r\n \r\n Other Links, Including Superseded Commonwealth Documents\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n \r\n Australian Government Department of the Environment and Heritage (AGDEH) (2005p). NON-CURRENT Threat Abatement Plan for Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/tap/pig.html. In effect under the EPBC Act from 18-Jul-2005. Ceased to be in effect under the EPBC Act from 01-Oct-2015.\r\n \r\n Commonwealth of Australia (2000). Declaration under s178, s181, and s183 of the Environment Protection and Biodiversity Conservation Act 1999 - List of threatened species, List of threatened ecological communities and List of threatening processes. F2005B02653. Canberra: Federal Register of Legislative Instruments. Available from: http://www.comlaw.gov.au/Details/F2005B02653. In effect under the EPBC Act from 16-Jul-2000.\r\n \r\n Commonwealth of Australia (2000b). List of Migratory Species (13/07/2000). F2007B00750. Canberra: Federal Register of Legislative Instruments. Available from: http://www.comlaw.gov.au/Details/F2007B00750.\r\n \r\n Commonwealth of Australia (2000c). Declaration under section 248 of the Environment Protection and Biodiversity Conservation Act 1999 - List of Marine Species. F2008B00465. Canberra: Federal Register of Legislative Instruments. Available from: http://www.comlaw.gov.au/Details/F2008B00465.\r\n \r\n Department of the Environment and Heritage (DEH) (2006ih). Eretmochelys imbricata in Species Profile and Threats (SPRAT) database. Unpublished species profile. Canberra, ACT: DEH. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1766.\r\n \r\n Department of the Environment, Water, Heritage and the Arts (2009t). Threat abatement plan for the impacts of marine debris on vertebrate marine life. Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/marine/publications/threat-abatement-plan-impacts-marine-debris-vertebrate-marine-life. In effect under the EPBC Act from 01-Jul-2009. Ceased to be in effect under the EPBC Act from 21-Jul-2018.\r\n \r\n Environment Australia (2003ai). Recovery Plan

for Marine Turtles in Australia. Prepared by the Marine Species Section, Approvals and Wildlife Division, Environment Australia in consultation with the Marine Turtle Recovery Team. Available from: http://www.environment.gov.au/coasts/publications/turtle-recovery/index.html. In effect under the EPBC Act from 21-Jul-2003.\r\n \r\n \r\n\r\n\r\n\t\r\n\r\n\r\n \r\n Newsletters\r\n \r\n \r\n Top\r\n \r\n\r\n\r\n\r\n\r\n\r\nEPBC Act email updates can be received via the Communities for Communities newsletter and the EPBC Act newsletter.\r\n\r\n\r\n\r\n\r\n \r\n Caveat\r\n \r\n \r\n Top\r\n \r\n\r\n\r\n\r\nThis database is designed to provide statutory, biological and ecological\r\ninformation on species and ecological communities, migratory species, marine\r\nspecies, and species and species products subject to international trade and\r\ncommercial use protected under the Environment Protection and Biodiversity\r\nConservation Act 1999 (the EPBC\r\nAct). It has been compiled from a range of sources including\r\nlisting advice, recovery plans, published literature and individual experts.\r\nWhile reasonable efforts have been made to ensure the accuracy of the\r\ninformation, no guarantee is given, nor responsibility taken, by the\r\nCommonwealth for its accuracy, currency or completeness. The Commonwealth\r\ndoes not accept any responsibility for any loss or damage that may be\r\noccasioned directly or indirectly through the use of, or reliance on, the\r\ninformation contained in this database. The information contained in this\r\ndatabase does not necessarily represent the views of the Commonwealth. This\r\ndatabase is not intended to be a complete source of information on the\r\nmatters it deals with. Individuals and organisations should consider all the\r\navailable information, including that available from other sources, in\r\ndeciding whether there is a need to make a referral or apply for a permit or\r\nexemption under the EPBC\r\nAct.\r\n\r\n\r\nCitation: Department of the Environment\r\n(2022).\r\nEretmochelys imbricata in Species Profile and Threats Database,\r\nDepartment of the Environment,\r\nCanberra.\r\nAvailable from:\r\nhttps://www.environment.gov.au/sprat.\r\nAccessed Tue, 18 Jan 2022 21:00:24 +1100.\r\n\r\n\r\n\r\n\r\nWhere available the sections below provide a biological profile for the species. Biological profiles vary in age and content across species, some are no longer being updated and are retained as archival content. These profiles are still displayed as they contain valuable information for many species. The Profile Update section below indicates when the biological profile was last updated for some species. For information to assist regulatory considerations, please refer to Conservation Advice, the Recovery Plan, Policy Statements and Guidelines.\r\n\r\n\r\n\r\n \r\n \r\n Profile Update\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n The following detailed profile was last updated on 25 September 2008.\n\r\n \r\n \r\n \r\n Australian and State/Territory Government Legal Status\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n The current conservation status of the Hawksbill Turtle, Eretmochelys imbricata, under Australian Government legislation and international conventions is as follows:\nNational: Listed as a Vulnerable, Marine and Migratory species under the Environment Protection and Biodiversity Conservation Act 1999.\n\n\r\n \r\n \r\n \r\n \r\n Taxonomy\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n Scientific name: Eretmochelys imbricata\nCommon name: Hawksbill Turtle\n\r\n \r\n \r\n \r\n \r\n Description\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n Hawksbill Turtles have a parrot-like beak. Adults have an olive-green or brown carapace (upper shell) with reddish-brown, brown or black markings in a tortoiseshell pattern. The carapace is highly domed and heart shaped with imbricate (overlapping) scale and is cream to yellowish underneath (Cogger 1994; Limpus 1995a). Adult females weigh 50 kg and have a mean curved carapace length of approximately 82 cm (Dobbs et al. 1999).\nHatchlings are brown to black above and light underneath (Cogger 1994). They weigh around 14 g and have a straight carapace length of approximately 4 cm (Dobbs et al. 1999).\n\r\n \r\n \r\n \r\n \r\n Australian Distribution\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n Major nesting of Hawksbill Turtles in Australia occurs at Varanus Island and Rosemary Island in Western Australia (Pendoley 2005), and in the northern Great Barrier Reef and Torres Strait (Dobbs et al. 1999; Limpus et al. 1989), Queensland. The key nesting and inter-nesting areas (where females live between laying successive clutches in the same season) in Australia are (DEH 2005b): QueenslandMilman Island and the inner Great Barrier Reef Cays north from Cape GrenvilleCentral Torres Strait islandsCrab IslandMurray IslandsDarnley IslandWoody IslandRed Wallis and Woody Wallis IslandsBramble Cay and Johnson Islet (Torres Strait) Western Cape York PeninsulaNorthern TerritoryCoburg PeninsulaBetween Nhulunbuy and northern Blue Mud Bay (East Arnhem Land) Groote IslandSir Edward Pellew IslandsWessel and English IslandsWestern AustraliaThe Dampier ArchipelagoThe Ningaloo and Jurabi CoastsThevenard, Barrow, Lowendal and Montebello IslandIn Queensland, Milman Island and the inner Great Barrier Reef Cays north from Cape Grenville are important foraging grounds and juvenile habitat for Hawksbill Turtles (DEH 2005b). In Western Australia, reefs west of Cape Preston and south to Onslow are important feeding grounds for the species (Pendoley 2005). Groote Eylandt appears to be the most significant area for Hawksbill nesting in the Northern Territory (DEWHA 2008). A globally important rookery

occurs on an archipelago to the north-east of Groote Eylandt (Hoenner et al. 2016).\n\r\n \r\n \r\n \r\n \r\n Global Distribution\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n Hawksbill Turtles are found in tropical, subtropical and temperate waters in all the oceans of the world. Nesting is mainly confined to tropical beaches (Marquez 1990). While scattered, low density nesting still occurs throughout the tropics, only five geographic regions host more than 1000 nesting females annually: Mexico, Seychelles, Indonesia and two in Australia (Meylan and Donnelly 1999; Limpus et al. 2000 both cited in Hoenner et al. 2016)\n\r\n \r\n \r\n \r\n \r\n Population Information\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n The total population of Hawksbill Turtles in Australia is unknown. However, Australia supports the largest hawksbill turtle nesting aggregations worldwide, with estimates of over 4000 females nesting annually in Queensland, over 2500 in the Northern Territory, and ~2000 in Western Australia (Miller et al. 1995; Meylan and Donnelly 1999; Limpus 1997; Limpus et al. 2000 all cited in Hoenner et al. 2016).In Australia, there are two genetically separate subpopulations; one in the northern Great Barrier Reef, Torres Strait and Arnhem Land; and the other on the North West Shelf of Western Australia. This genetic distinctiveness means that individuals from the two subpopulations interbreed very rarely (Broderick et al. 1995). 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).There have been serious population declines of Hawksbill Turtles worldwide. In Australia, long-term monitoring of nesting turtles at Milman Island in the Torres Strait has shown that the number of Hawksbill Turtles has been declining by 3% to 4% per year for at least ten years. On the northern Great Barrier Reef, the body size of nesting females has decreased, and the hatching success on Raine Island has been poor since 1996 (DEH 2005a).\n\r\n \r\n \r\n \r\n \r\n Land Tenure of Populations\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n Hawksbill Turtles occur in the following marine reserves (DEH 2005a). These reserves are managed to protect feeding grounds, nesting grounds and inter-nesting habitat (where females occur during non-breeding times) for marine turtles in Australia, including the Hawksbill Turtle: QueenslandGreat Barrier Reef Marine Park\n Moreton Bay Marine Park\n Mon Repos Conservation Park\n Capricornia Cays National Park and Capricornia Cays National Park Scientific\n Great Sandy National Park\n Swain Reefs National Park\n Bushy Island National Park\n Barubbra Island Conservation Park\n Mouth of Baffle Creek Conservation Park 1 and 2\n Mouth of Kolan River Conservation Park\n Percy Islands National Park\n Raine Island Nature Refuge\n Sandbanks National Park\n Denham Group National Park\n Saunders Islands National Park\n Sir Charles Hardy Group National Park\n Clairmont Isles National Park \n Howick Group National ParkWestern AustraliaAshmore and Cartier Nature Reserves\n Ningaloo Marine Park\n Shark Bay World Heritage Area\n Dampier Archipelago Nature Reserve\n Thevenard Island Nature Reserve\n Barrow Island Nature Reserve\n Montebello Conservation Park\n Cape Range Conservation Park\n Muiron Islands Nature ReserveNorthern AustraliaKakadu National Park\n Gurig Gunalc Barlu National Park\n Coburg Marine Park\n Dhimurru Indigenous Protected AreaCoral Sea Islands TerritoryCoral Sea National Nature ReserveCocos IslandsCocos (Keeling) IslandsFeeding grounds west of Cape Preston and south to Onslow are protected within Sandy Island Nature Reserve (Pendoley 2005).\n\r\n \r\n \r\n \r\n \r\n Habitat\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n Hawksbill Turtles spend their first five to ten years drifting on ocean currents (Carr 1987a; Limpus et al. 1994e). During this pelagic (ocean-going) phase, they are often found in association with rafts of Sargassum (a floating marine plant that is also carried by currents) (Carr 1987a).\nOnce Hawksbill Turtles reach 30 to 40 cm curved carapace length, they settle and forage in tropical tidal and sub-tidal coral and rocky reef habitat. They primarily feed on sponges and algae (Whiting 2000a). They have also been found, though less frequently, within seagrass habitats of coastal waters, as well as the deeper habitats of trawl fisheries (Poiner & Harris 1996; Robins et al. 2002).\nHawksbill Turtles have been seen in temperate regions as far south as northern NSW (Limpus 1992; Robins 2002; Whiting 2000).\n\r\n \r\n \r\n \r\n \r\n Life Cycle\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n Hawksbill Turtles grow very slowly. Growth and timing of sexual maturity vary between populations (Chaloupka & Limpus 1997). Sexual maturity is not reached until after 31 years of age (Limpus 1992).To develop successfully, marine turtle eggs must be buried in sand that is aerated (but not exposed), low in salt, high in humidity (but not flooded), and between 25° and 33° C (DEH 2005b). \nBreeding male and female Hawksbills move from their feeding grounds to areas near nesting beaches for mating. The males then return to their feeding grounds and the females come up onto the beach to lay their eggs, usually on several different nights (Robins et al. 2002). Nesting occurs in the northern Great Barrier Reef and the Torres Strait between January and April (Dobbs et al. 1999; Loop et al. 1995); in the Northern Territory during the second half of the year (Chatto 1997, 1998); and in Western Australia, all year with a peak between October and January (Robinson 1990, cited in Limpus 1995a). \nOn Milman Island on the northern Great Barrier Reef, Hawksbill Turtles lay between one and six clutches of eggs per season, each

with an average of 122 eggs. The inter-nesting interval (the time between successive clutches) is 14.5 days. Individual females reproduce every two to four years (Dobbs et al. 1999). The sex of the hatchlings is determined by the temperature of the nest; warmer nests (above 29° C) produce more females than males (Mrosovsky et al. 1992).\n\r\n \r\n \r\n \r\n \r\n Feeding\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n In the Caribbean, Hawksbill Turtles mainly eat sponges (Meylan 1984, 1988). In Australia and elsewhere, they are omnivorous, eating a variety of animals and plants including sponges, hydroids, cephalopods (octopus and squid), gastropods (marine snails), cnidarians (jellyfish), seagrass and algae (Carr & Stancyk 1975; Whiting 2000a). During their pelagic phase (while drifting on ocean currents), young Hawksbill Turtles eat plankton (Meylan 1984).\n\r\n \r\n \r\n \r\n \r\n Movement Patterns\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n The Hawksbill Turtle migrates up to 2400 km between foraging areas and nesting beaches (Miller et al. 1998). The 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, as cited in DEWHA 2008). Individual turtles foraging in the same area do not necessarily take the same migration route (Limpus 1992). Nesting populations in eastern Queensland migrate from the Solomon Islands, Indonesia, Papua New Guinea, and Vanuatu (Miller et al. 1998; Parmenter 1983). Captures of tagged turtles have also shown that individual Hawksbills also move between Papua New Guinea and the Solomon Islands (Vaughan & Spring 1980). Satellite tracking has shown that Hawksbill Turtles nesting on Varanus Island and Rosemary Island in Western Australia feed between 50 km and 450 km from their nesting beaches (Pendoley 2005). Captures of marked turtles in their foraging habitats at Heron Island in Queensland (Limpus 1992) and Fog Bay in the Northern Territory (Whiting 2000a) indicate that individuals remain in a small area of the reef for many years. Hatchlings swim actively out to sea, and are then carried passively by currents during their pelagic phase. Juvenile Hawksbill Turtles must swim long distances against the current to get back to the reef habitats where they live as adults (Luschi et al. 2003).\n\r\n \r\n \r\n \r\n \r\n Survey Guidelines\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n Distinctiveness: \nThe tracks of Hawksbill Turtles, Green Turtles and Flatback Turtles are distinguishable from one another. Hawksbill Turtles have front flipper marks equal or slightly wider than back flipper marks, back flipper marks widely spaced and curled, and the back flippers, belly and tail produce a zigzag pattern due to the turtle's alternating gait. Green turtle tracks have front flipper marks overlapping those made by the back flippers, paired, symmetrical front flipper marks, and a short distance between flipper marks. Flatbacks have only a slight overlap between front and back flipper marks, a straight central line in the sand from dragging the tail tip, and a broad central belly mark (Pendoley 2005).\nRecommended methods:\nMarine Turtles are generally surveyed during the nesting season, when they emerge from the sea at night (DEH 2005b).\n\r\n \r\n \r\n \r\n \r\n Threats\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n In Australia, the main current threats to Hawksbill Turtles are disturbance and habitat damage due to coastal development; by-catch from fisheries and shark control; predation on nests; boat strikes; entanglement and ingestion of marine debris; and unsustainable levels of indigenous harvest in some areas. Potential threats include climate change, chance disasters (e.g. oil spills) and feral predator invasions (DEH 2005a; Environment Australia 2003ai). Disturbance of hatchlings by artificial lights\nHatchling Sea Turtles emerge from their nests at night and are attracted to the brighter, lower elevation sea horizon and away from shadows from dunes and vegetation. Hatchlings that move towards artificial lights instead of the sea are likely to be killed by predators or exposure, or burned if they are attracted to fire (Pendoley 2005). \nA study on the impact of artificial lights on turtles nesting on Barrow Island, the Lowendal Islands and the Montebello Islands complex on the North West Shelf of Western Australia confirmed that sea turtle hatchlings can see ultraviolet and visible light, and respond most strongly to short wavelengths (blue and green) (Pendoley 2005). The threat to hatchlings from light depends on its wavelength and strength, and the amount of moonlight. Hawksbill Turtle hatchlings are generally attracted to sources of light that are 100 to 200 m away from the nest, and generally moved towards the ocean if the lights were 500 to 800 m away. 500 Watt lights of all types affect hatchlings at a distance of 200 m. Hatchlings were found to be attracted to short-wavelength lights at lower light intensities than to high pressure sodium vapour lights (e.g. streetlights, which emit yellow-orange light) and gas flares (open flames that burn excess gas, emitting mainly long wavelengths). Single 250 W sodium vapour lights that are 200 m away or further have no detectable effect, while 500 W fluorescent lights can attract hatchlings at a distance of 800 m. Some distant offshore lights from pearling vessels and drilling rigs (for example an offshore drilling rig 3.3 km away) were bright enough to affect hatchling movements. Oil and gas processing facilities and offshore vessels on the North West Shelf use mercury vapour, metal halide and fluorescent lamps that emit light concentrated in the short wavelength range that attracts hatchling turtles. On moonlit nights, hatchlings will selectively move to the ocean rather

than to gas flares, but flares may attracted them on moonless nights (Pendoley 2005). Other aspects of coastal development and industry\nHawksbill Turtles migrate close to the ocean surface along the coast and in shipping channels between their breeding and feeding grounds. In eastern Queensland, at least 65 turtles were killed between 1999 and 2002 when they were hit by vessels, a mortality risk comparable to that of trawling without Turtle Excluder Devices in the region. However, Hawksbills are not as frequently struck by boats in Queensland as some other species of turtles (Hazel & Gyuris 2006). The Dampier Archipelago in Western Australia is an important migration route for Hawksbill Turtles and one of the busiest ports in Australia. Migratory pathways north of the Dampier Archipelago are unprotected by conservation reserves, as are those between Scott Reef and the Joseph Bonaparte Gulf in the Northern Territory. Turtles may also be harmed by seismic discharges during mining and exploration, and habitat damage as a result of pipeline installation, dredging and construction (Pendoley 2005). \nDisruptions to nesting beaches can prevent females nesting and can kill hatchlings. Disruptions include erosion and erosion control measures such as drift fencing, rubbish, recreational vehicles, shoreline developments, marina and jetty developments, beach cleaning, sand compaction and beach nourishment (adding sand) (Robins et al. 2002; US Fish & Wildlife Service 1999). By-catch\nTrawling is responsible for more sea turtle deaths than any other human-related factor (Bisong 2000). In the late 1980s, 5000 to 6000 sea turtles were caught each year as by-catch in the Australian Northern Prawn Fishery (off the north coast of Australia), with a mortality rate of up to 39% (14% from drowning in the net, and 25% from injury or drowning after being returned to the ocean comatose) (Poiner & Harris 1996). Around 2% of turtles caught in the Northern Prawn Fishery are Hawksbills (Robins et al. 2002). Robins (1995) found that around 5300 turtles are caught in the Queensland East Coast Prawn Fishery each year. Only 1% to 7% of these turtles die, because the duration of trawls is generally short enough not to drown them (less than 80 minutes). The use of Turtle Excluder Devices (TEDs) was made compulsory in Queensland in 1999, and in the Australian Northern Prawn Fishery in 2000. Before TEDs were introduced, an average of 0.24 turtles were caught per Banana Prawn trawl, and 0.30 turtles per Tiger Prawn trawl. Since the introduction, the capture rate has dropped to 0.007 and 0.009 turtles per Banana Prawn and Tiger Prawn trawl respectively. Some turtles are still caught because the TED becomes blocked (e.g. with starfish), small turtles pass through it, or the net is winched up before the turtle has reached the TED. Turtles are also caught in the 'try gear' (small trawls to sample prawn density before the main trawl, and not fitted with TEDs), but the duration of these captures is short and unlikely to drown them (Robins et al. 2002). \nSubstantial numbers of turtles die during pound netting, gill-netting, purse seine netting and lobster and crab pot trapping, because they are hooked or become entangled in lines. The Australian Tuna and Billfish Longline Fisheries also catch around 400 turtles per year, but very few are Hawksbills (DEH 2005b). Shark nets and hook lines around swimming beaches also kill turtles (Robins et al. 2002). Between 1962 and 1998, the Queensland Shark Control Program caught 4300 turtles and about 20% died before release (DEH 2005b). Predation\nLarge numbers of Hawksbill Turtle eggs are eaten by dingos and goannas in the Northern Territory and Queensland. Feral pigs destroy nests in Queensland (Environment Australia 1998b). Marine debris and pollution\nEating discarded plastic or other debris (e.g. plastic bags, styrofoam beads, packing tape and rope fragments) can cause internal blockage, ulcers, poisoning and suffocation in Hawksbill Turtles. Turtles may also be injured or killed if they become entangled in debris. Oil and tar on beaches and on the water surface can choke or poison turtles, or inhibit swimming. Other potentially harmful pollutants include pesticides, heavy metals, organochlorides, and sewage from the land or from boats. These can pollute feeding grounds and increase disease in turtles (Robins et al. 2002). Floating debris particularly affects juvenile turtles, because they spend their first years drifting in convergences (rips, fronts and driftlines formed by ocean currents). Debris and young turtles are both drawn into these convergences by down-wellings in the open ocean (Carr 1987a). \nDiscarded fishing nets ('ghost fishing') are responsible for a substantial number of deaths of turtles in Australia (Chatto et al. 1995; Guinea & Chatto 1992). Ghost nets are an especially serious problem in the Gulf of Carpentaria, where currents draw them in from the north then circulate them indefinitely. A study in 2005 found around 170 kg of marine debris per kilometre of coast, including more than 400 ghost nets over the whole area. Hawksbill Turtles are one of the most frequently caught species in ghost nets (DEH 2005b; White 2005, as cited in DEH 2005b). Changing temperature of nesting beaches and the marine habitat\nIn Hawksbill Turtles, the temperature of the nest affects the sex ratio of hatchlings. Cooler, more shaded beaches produce more males, while warmer, sunny beaches produce more females. Beaches are heated by clearing of coastal forest, importing heat-absorbing sand for 'beach nourishment' in tourist areas, and global climate change. These changes can result in female-biased populations. Human alteration to the temperature of nest sites can also increase parasites and diseases in the eggs and make some beaches unsuitable for nesting (DEH 2005b; US Fish & Wildlife Service 1999). Climate change scenarios predict reduced nesting habitat for sea turtles through rising sea levels and

increased storm erosion. Changing ocean circulation may disrupt the ocean-going phase of juvenile sea turtles, and the predicted increased coral bleaching and burning of seagrass habitats will reduce their food resources (DEH 2005b). Sea surface temperature also has major effects on the frequency of sea turtle breeding (Solow et al. 2002). Hunting\nHawksbill Turtles are hunted for food and for their shell, which is used to make tortoiseshell (bekko) objects (Limpus 1998). Indigenous harvest of adults, juveniles and eggs is substantial in northern Australia and neighboring countries. Hunting and egg collection have depleted populations of Hawksbill Turtles in Indonesia, Malaysia, Thailand, Philippines, Cuba and the Solomon Islands (Limpus 1995b). There are serious concerns that the collective indigenous harvest of these species within the Eastern marine region is not sustainable (DEW 2007a).\n\r\n \r\n \r\n \r\n \r\n Threat Abatement and Recovery\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n Reducing bycatch and harm to marine turtles\nNo commercial harvesting of sea turtles is permitted in Australia (DEH 2005b). The Queensland Commercial Fisherman's Organisation, the Queensland Department of Primary Industries, the Australian Fisheries Research and Development Corporation, and the Australian Nature Conservation Agency have together published a code of fishing ethics regarding the accidental capture of sea turtles (Robins et al. 2002). The recommendations of this code include:Not trawling within two to three nautical miles of major nesting beaches during the turtle nesting season.\n Limiting the duration of trawls to less than 90 minutes in areas with high turtle numbers to minimise the number of netted turtles that drown.\n If turtles are caught, handling live and active individuals gently, and returning them to the water as soon as possible. Applying the recommended recovery procedure to comatose turtles.\n Participating in research programs on the incidental capture rate and the effectiveness of turtle excluder devices, and forwarding information on any tagged turtles caught to the Queensland Southern Fisheries Centre.\nShorter trawls reduce the chance of turtles drowning and being injured, and Turtle Excluder Devices reduce the number of turtles caught. Since the use of Turtle Excluder Devices was made compulsory in the Australian Northern Prawn Fishery in 2000, the catch of sea turtles has declined from around 5000 to around 200 per year. The death rate of captured turtles has also nearly halved, from around 40% to 22%, because of improved turtle handling procedures and the fact that most turtles are now caught when the net is winched up, and spend little time in the net (Robins et al. 2002). \nA recovery procedure has been developed to revive sea turtles that have been caught in nets and brought on board in a comatose state. Comatose turtles (which appear to be lifeless and not breathing) will drown if returned to the water. They may recover if the rear flippers are raised about 20% off the deck, and the turtle is supported, kept damp and shaded for 24 hours. This allows water to drain from the lungs. A 'turtle recovery procedure' brochure published by the Queensland Commercial Fisherman's Organisation and the Queensland Department of Primary Industry explains how to do this. A modification of the procedure involves placing a small plastic pipe into the turtle's windpipe and blowing gently. Around half of the turtles tested with this technique when they appeared to be dead recovered (Robins et al. 2002). \nCommonwealth By-catch Action Plans state that the catch of marine turtles must be reported, and By-catch Reduction Devices (e.g. Turtle Excluder Devices) must be used. By-catch Action Plans have been developed for the following fisheries (DEH 2005b):Australia's Tuna and Billfish Longline and minor line fisheries\n Northern Prawn Fishery\n Torres Strait Prawn Fishery\nIn Western Australia, By-catch Action Plans have also been developed for the following fisheries:Shark Bay Scallop Fishery\n Shark Bay Prawn Fishery\n Exmouth Gulf Prawn Fishery\n Nickol Bay Prawn Fishery\n Onslow Prawn Fishery\n Kimberley Prawn Fishery\n Broome Prawn Fishery\n Abrolhos Islands and Mid-West Trawl Fishery\nIn Australia, longline fishermen have been issued with de-hooking devices to release turtles that have been hooked in the mouth with minimum injury (DEH 2005b). Changing the size and shape of longline hooks, and the type of bait can reduce turtle by-catch while still being commercially viable. For example, 4.9 cm circle hooks baited with fish caught fewer turtles than 4 cm J-shaped hooks in one longline fishery in the Atlantic Ocean. Turtles that were caught were also less likely to swallow the hooks (they were hooked in the mouth instead). \nOther strategies being assessed that might reduce turtle by-catch are: Submerging hooks more deeply. \n Retrieving lines faster from the water during the day. \n Avoiding areas with the greatest risk of by-catch through communication programmes. \n Seasonal fishery closures (Gilman et al. 2006). \nMany traditional owner groups, community rangers, and Native Title representative organisations in Northern Australia are involved in projects to assess and reduce marine debris. These include the Dhimurru Land Management Aboriginal Corporation of the Gulf of Carpentaria, and more than ten other communities in the Gulf of Carpentaria and Torres Strait (DEH 2005a, b).\nGnaraloo Station\nFeral animal control has been implemented along the Gnaraloo coast (which is part of Ningaloo Reef) each season between 2008/09 and 2011/12. The program targeted Foxes, Cats and Dogs with 1080 baiting immediately behind coastal rookeries, in surrounding hinterland, beaches adjacent to the rookeries and general targeted baiting in the remainder of Gnaraloo Station (i.e. around water sources) (Butcher & Hattingh 2012). In 2011/12, this

program achieved zero mortalities from animal predation (Butcher & Hattingh 2012). It is recommended that the program continues in the future, with annual baiting during the turtle breeding season (November-April) and prior to the fox breeding season (May) (Butcher 2008, 2009, 2009a, 2010, 2011; Butcher & Hattingh 2012).\n\r\n \r\n \r\n \r\n \r\n Mitigation Approach\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n Artificial Lights\nPendoley (2005) recommended the following methods to reduce harm to turtle hatchlings from light pollution: \n Replacing short-wavelength lights with longer wavelength lights.\n Shielding, lowering or directing light sources onto work areas.\n Filtering existing lights to increase the wavelength (e.g. encasing fluorescent lights in yellow filter material).\n Relocating lights away from nesting beaches.\n Painting equipment and vessels with dark, non-reflective paint to reduce light reflected into the sky.\n Embedding street lighting.\n Using motion sensors or timers in the vicinity of turtle nesting beaches so that lights are not constantly turned on.Limpus (2002) proposed a 1.5 km buffer zone to protect sea turtle hatchlings from artificial lights. \nEmbedding light-emitting diodes in the roadway pavement instead of using overhead lighting near turtle nesting beaches has been found to be effective (Bertilotti & Salmon 2005). Reducing egg and hatchling loss\nFox baiting near Hawksbill rookeries (nesting aggregations) at North-west Cape, Western Australia, has reduced nest predation by more than 90% (DEH 2005b). Protective cages over nests are sometimes used, however galvanized steel cages are magnetic and could alter turtles' subsequent ability to navigate back to their nesting beach as adults (Irwin et al. 2004). Therefore, the use of non-magnetic materials is recommended (Irwin et al. 2004).\n\r\n \r\n \r\n \r\n \r\n Marine Bioregional Plans\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n Marine bioregional plans have been developed for four of Australia's marine regions - South-west, North-west, North and Temperate East. Marine Bioregional Plans will help improve the way decisions are made under the EPBC Act, particularly in relation to the protection of marine biodiversity and the sustainable use of our oceans and their resources by our marine-based industries. Marine Bioregional Plans improve our understanding of Australia's oceans by presenting a consolidated picture of the biophysical characteristics and diversity of marine life. They describe the marine environment and conservation values of each marine region, set out broad biodiversity objectives, identify regional priorities and outline strategies and actions to address these priorities. Click here for more information about marine bioregional plans.\nThe Hawksbill Turtle has been identified as a conservation value in the Temperate East (DSEWPaC 2012aa), North (DSEWPaC 2012x) and North-west (DSEWPaC 2012y) marine regions. See Schedule 2 of the North-west Marine Bioregional Plan (DSEWPaC 2012y) and the North Marine Bioregional Plan (DSEWPaC 2012x) for regional advice. Maps of Biologically Important Areas have been developed for hawksbill turtle in the North-west (DSEWPaC 2012y) and North (DSEWPaC 2012x) marine regions and may provide additional relevant information. Go to the conservation values atlas to view the locations of these Biologically Important Areas. The \"species group report card - marine reptiles\" for the North-west (DSEWPaC 2012y), North (DSEWPaC 2012x) and Temperate East (DSEWPaC 2012aa) marine regions provide additional information.\n\r\n \r\n \r\n \r\n \r\n Management Documentation\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n The following three management plans provide guides to threat abatement, conservation and research strategies for the Hawksbill Turtle:\nNorthern Prawn Fishery Bycatch Action Plan (Northern Prawn Fishery Management Advisory Committee 2003).\n Draft Recovery Plan for Marine Turtles (Environment Australia 1998b).\n Recovery Plan for Marine Turtles in Australia (Environment Australia 2003ai). \r\n \r\n\r\n\r\n\r\n \r\n \r\n Species Profile References\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n \r\n Bisong, S. (2000). 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