[1] "\r\n\r\n\t\r\n\r\n\r\n \r\n \r\n \r\n Caretta caretta\r\n — Loggerhead 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 Endangered\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\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\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 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. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/tap/feral-pig-2017. In effect under the EPBC Act from 18-Mar-2017.\r\n\t\t\t\t \r\n\t\t\t \r\n\t\t\t\tDepartment of the Environment and Energy (2018). Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (2018). Canberra, ACT: Commonwealth of Australia. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/tap/marine-debris-2018. In effect under the EPBC Act from 21-Jul-2018.\r\n\t\t\t\t \r\n\t\t\t \r\n\t\t\t\tDepartment of the Environment, Water, Heritage and the Arts (DEWHA) (2008). Threat abatement plan for predation by the European red fox. DEWHA, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/tap/predation-european-red-fox. In effect under the EPBC Act from 01-Oct-2008.\r\n\t\t\t\t \r\n\t\t\t \r\n\t\t\t \r\n\t\t\t\r\n \r\n\t\t Marine Bioregional Plans\r\n\t\t\r\n\t\t\r\n\t\t \r\n\t\t Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2012). Marine bioregional plan for the North Marine Region. Prepared under the Environment Protection and Biodiversity Conservation Act 1999. Available from: http://www.environment.gov.au/topics/marine/marine-bioregional-plans/north. In effect under the EPBC Act from 27-Aug-2012.\r\n\t\t\t \r\n\t\t Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2012). Marine bioregional plan for the Temperate East Marine Region. Prepared under the Environment Protection and Biodiversity Conservation Act 1999. Available from: http://www.environment.gov.au/topics/marine/marine-bioregional-plans/temperate-east. In effect under the EPBC Act from 27-Aug-2012.\r\n\t\t\t \r\n\t\t Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2012). Marine bioregional plan for the North-west Marine Region. Prepared under the Environment Protection and Biodiversity Conservation Act 1999. Available from: http://www.environment.gov.au/topics/marine/marine-bioregional-plans/north-west. In effect under the EPBC Act from 27-Aug-2012.\r\n\t\t\t \r\n\t\t Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2012). Marine bioregional plan for the South-west Marine Region. Prepared under the Environment Protection and Biodiversity Conservation Act 1999. Available from: http://www.environment.gov.au/topics/marine/marine-bioregional-plans/south-west. 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\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 NSW:Loggerhead Turtle- endangered species listing. NSW Scientific Committee - final determination (NSW Department of Environment, Climate Change and Water (NSW DECCW), 2001) [Internet].NSW:Death or injury to marine species following capture in shark control programs on ocean beaches - factsheet (NSW Department of Environment, Climate Change and Water (NSW DECCW), 2003b) [Information Sheet].NSW:Loggerhead Turtle - profile (NSW Office of Environment & Heritage (NSW OEH), 2012) [Internet].NT:Threatened Species of the Northern Territory - Loggerhead Turtle Caretta caretta (Taylor, R., R. Chatto & J. Woinarski, 2010) [Information Sheet].QLD:Loggerhead turtle (Department of Environment and Heritage Protection (DEHP), 2011l) [Database].TAS:Caretta caretta (Loggerhead Turtle): Species Management Profile for Tasmania's Threatened Species Link (Threatened Species Section (TSS), 2014tr) [State Action Plan].\r\n State Listing Status\r\n\t \r\n\t NSW:\r\n\t\t\t\r\n\t\t\t\tListed as Endangered\r\n\t\t\t\t (Biodiversity Conservation Act 2016 (New South Wales): February 2021 list)\r\n\t\t\t\t\r\n\t\t \r\n\t\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\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\t SA:\r\n\t\t\t\r\n\t\t\t\tListed as Endangered\r\n\t\t\t\t (National Parks and Wildlife Act 1972 (South Australia): January 2020 list)\r\n\t\t\t\t\r\n\t\t \r\n\t\t TAS:\r\n\t\t\t\r\n\t\t\t\tListed as Endangered\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\t WA:\r\n\t\t\t\r\n\t\t\t\tListed as Endangered\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 Vulnerable\r\n\t\t\t\t (Global Status: IUCN Red List of Threatened Species: 2020.2 list)\r\n\t\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\n\r\nScientific name\r\n \r\n Caretta caretta [1763]\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,1758)\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\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\n\r\nIllustrations\r\n \r\n Google Imageshttp://www.jcu.edu.au/school/tbiol/zoology/herp/fullsize/ST%20Caretta%20caretta.jpg\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, 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 Environment Australia (EA) (1999a). NON-CURRENT Threat Abatement Plan for Predation by the European Red Fox. Biodiversity Group, Environment Australia. Available from: http://www.environment.gov.au/archive/biodiversity/threatened/publications/tap/foxes/index.html. In effect under the EPBC Act from 16-Jul-2000.\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 \r\n Caveat\r\n \r\n \r\n Top\r\n \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\n\r\nCitation: Department of the Environment\r\n(2022).\r\nCaretta caretta 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 20:42:04 +1100.\r\n\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 \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 11 June 2009. Minor additional content was added in 2016.\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 The Loggerhead Turtle has a heart-shaped carapace (shell), with five pairs of costal plates that are dark brown in colour (Cogger 1996), and with reddish and darker brown patches (Limpus 2008a). Mature females have a curved carapace averaging 96 cm in length (Limpus et al. 1984b). Hatchlings are dark brown and measure 4.4 cm in straight carapace length and weigh approximately 19 g (Limpus et al. 1984b).\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 In Australia, the Loggerhead Turtle occurs in the waters of coral and rocky reefs, seagrass beds and muddy bays throughout eastern, northern and western Australia (Limpus 1995a; Limpus et al. 1992; Prince 1994b). While nesting is concentrated in southern Queensland and from Shark Bay to the North West Cape in Western Australia, foraging areas are more widely distributed. Females tagged at the south-east Queensland nesting areas have been recorded in waters off Indonesia, Papua New Guinea, Solomon Islands, New Caledonia, Northern Territory, Queensland and NSW (Limpus 2008a). The Western Australian stock forage from Shark Bay, Western Australia through to Arnhem Land, Gove and into the Java Sea of Indonesia (Baldwin et al. 2003; Prince 1998 cited in Limpus

2008a). The eastern and western Australian stocks are probably sharing feeding areas off Arnhem Land (Limpus 2008a) though no interbreeding of these two stocks is evident.\nNesting populations are known from southern Queensland and Western Australia (Cogger et al. 1993).\nLimpus (2008a) identifies three major nesting areas in Queensland:\nThe mainland coast of south-east Queensland (especially Mon Repos and adjacent beaches of the Woongarra Coast and Wreck Rock Beach).\r\nThe 13 islands of the Capricorn-Bunker Groups of the southern Great Barrier Reef (especially Wreck, Tryon and Erskine Islands).\r\nThe islands of the Swain Reefs (especially Pryce Island and Frigate, Bylund, Thomas and Bacchi Cays) and at Bushy Island off Mackay (which support lower density nesting activity).\r\nLow density and sporadic nesting also occurs along the Sunshine Coast beaches and on the northern ends of Fraser, Moreton and North Stradbroke Islands and southwards into northern NSW (Limpus & Limpus 2003 cited in Limpus 2008a).\nIn Western Australia nesting occurs from Shark Bay (including on the mainland near Steep Point) to the North West Cape with major nesting at Dirk Hartog Island (800 to 1500 females breeding per year); Gnaraloo Bay (estimated 61-84 (range 38-211) females breeding per year); Murion Island (150 to 350 females breeding per year); and the beaches of the North West Cape (50 to 150 females breeding per year) (Baldwin et al. 2003; Hattingh et al. 2011, 2012c, 2013, 2014; Prince 1993, 1994b). In addition, a single Loggerhead Turtle has been reported nesting at Ashmore Reef (Guinea 1995). Occasional late summer nesting crawls have also been recorded as far north as Barrow Island, the Lowendal Islands and Dampier Archipelago (WA DEC 2009).\nThe current area of occurrence is 1 414 990 km². There is no data to indicate that there has been a decline in extent of occurrence over the past three generations (Limpus 2008a). There is no empirical data to indicate future changes in the extent of occurrence. However, changes to air and sea temperatures, sea level rise and other physical aspects that may change with climate change have the potential to alter the species future occurrence (Hamann et al. 2007).\nThere is not enough data to separate occurrence from occupancy. There is no data to indicate that there has been a decline in the area of occupancy over the past three generations (Limpus 2008a). There is no empirical data to indicate future changes in the extent of occupancy. However, changes to air and sea temperatures, sea level rise and other physical aspects that may change with climate change have the potential to alter the species future occurrence (Hamann et al. 2007).\nThe main nesting locations for Queensland are well known - Mon Repos and Wreck Rock beaches on the mainland; Wreck Island, Erskin Island, Tryon Island, Heron Island and Lady Musgrave Island in the Capricorn Bunker Group; and Price, Frigate, Thomas and Bacchi Cays in the Swain Reefs (Dobbs 2007). Peripheral sites that have been identified as sites of interest with changing climate are Caloundra Beaches on the Sunshine coast and the islands offshore of Moreton Bay (Moreton and North and South Stradbroke) (Hamann et al. 2007).\nSimilar resolution is not known for Western Australia with the exception of Dirk Hartog Island, Muiron Islands and North west Cape.\nThere are no captive populations that have been re-introduced to the wild in Australia.\nThe species distribution is not severely fragmented, although there are two genetically distinct populations (western and eastern Australia).\n \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 The Loggerhead Turtle has a global distribution throughout tropical, sub-tropical and temperate waters (Bolten & Witherington 2003; Marquez 1990). \nNesting is mainly concentrated on sub-tropical beaches (Marquez 1990) with major aggregations occurring in Oman, eastern USA, southern Japan, Greece, Turkey, southern Queensland and Western Australia (Bolten & Witherington 2003; Cogger et al. 1993; Salm et al. 1993). Nesting populations also occur in South Africa (Baldwin et al. 2003; Hughes 1974b). \n\nGlobal Population Trends\nAtlantic Ocean (Ehrhart et al. 2003)\nWestern Atlantic ~1000 females nesting per year (trend unknown)Brazil - 4000 nests per year (trend stable)Caribbean - 1000\u00963000 nests per year (trends vary country to country)South-west Florida and Florida panhandle - 5000 to 6000 nests per year (trends increasing)Southern Florida - 62 000 nests per year (trend is stable or increasing)Northern Florida to North Carolina - 6200 nests per year (trend is stable or declining).Mediterranean Sea\nThere are between 3300 and 7000 nests laid per year in the Mediterranean region. Ninety percent of the nesting activity occurs in Greece and Turkey. It is not known whether the Mediterranean population is stable, increasing or declining (Margaritoulis et al. 2003).\nJapan (Northern Pacific)\nThere are approximately 2500 Loggerhead Turtle nests laid per year on nine major and six sub-major beaches. Trends vary between beaches (Kamezaki et al. 2003).\nIndian Ocean Trends\nSouth Africa - 256 females nesting per year (1964 to 1974) and 428 females nesting per year (1989 to 1999); an increase of 40% (Hughes 1999).\nOman - 20 000\u009640 000 females nesting per year (trends unknown).Based on the percentage of nesting females per year, approximately 2\u00964% of the total global population of Loggerhead Turtles occur in Australia, with the majority occurring in eastern and western Australia.\nAustralia has two genetically distinct populations (eastern Australia and Western Australia). It is currently believed that the eastern Australian population includes turtles that breed in New Caledonia. The numbers and status of the New Caledonia rookeries have not been assessed but are likely to

be in the order of 10 females breeding per year (Limpus & Limpus 2003). In addition both the western and eastern Australian genetic stocks have had international tag returns (Limpus & Limpus 2003).\nInternational threats such as turtle hunting (Indonesia and South Pacific Islands), egg collection (New Caledonia) and high seas fishing are known to impact Australian Loggerhead Turtle populations (Limpus & Limpus 2003).\n\r\n \r\n \r\n \r\n \r\n Surveys Conducted\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n Eastern AustralianWith the exception of New Caledonia, the eastern Australian stock has been well surveyed for both nesting distribution and population size. However, because the New Caledonia component is assumed to be small, the estimated size for the eastern Australian stock is accurate (Limpus & Limpus 2003). Extensive foraging area surveys have occurred on Heron Reef (commenced 1974) and Moreton Bay (commenced 1990). The Heron Reef aggregation has been found to decline by ~3% per year (Chaloupka & Limpus 2001; Limpus et al. 1994b).\nWestern AustralianThe Western Australian stock has been reasonably well surveyed for its distribution (nesting) but not for estimates of population size or status. The most reliable data comes from six years of census work at Dirk Hartog Island, South Murion and North West Cape (Baldwin et al. 2003), however surveys have been irregular and monitoring protocols are hard to determine. Hence estimates of population size and status are problematic. Limited foraging area surveys have been conducted in Shark Bay (Heithaus et al. 2005). Aerial surveys in 2008/09 and 2009/10, and intensive on-ground monitoring has been undertaken on Gnaraloo Station (adjacent to Ningaloo Reef) from 2008/09 to 2013/14 and ongoing (Hattingh et al. 2009, 2010, 2011, 2012, 2012a, 2012b, 2012c, 2013, 2014). The Gnaraloo Bay Rookery is the largest confirmed mainland nesting rookery for loggerhead sea turtles in Western Australia, with consecutive full season surveys from 2008/09 to 2013/14 and ongoing (Prince, DPaW, 17/10/2013).\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 Loggerhead Turtle is considered to comprise of two distinct genetic stocks in Australia - the eastern Australian genetic stock and the western Australian genetic stock (Dutton et al. 2002). Interbreeding does not occur between Western Australian and Queensland breeding aggregations (Bowen et al. 1994).\nEastern AustraliaIn 2000 it was estimated that there were 500 nesting females per year (Limpus & Limpus 2003). Adult females comprise approximately 20% of the population and annual breeding rates have been found to vary between 0 and 73% (Limpus & Limpus 2003).\nWestern AustraliaData from the early to mid 1990s indicate that there were approximately 1000–2000 females breeding annually (Baldwin et al. 2003).\nEastern Australia genetic stockThe eastern Australia population is the most significant in the southern Pacific Ocean (Limpus 2008a). In Queensland, it has been established that nesting turtles from the Capricorn-Bunker group of Islands, the mainland coast (Mon Repos and Wreck Rock) and the Swain Reefs represent a single genetic stock (Limpus & Limpus 2003), and recent evidence suggests that females nesting in New Caledonia may also be part of the same genetic stock (Boyle 2006). Population figures include:\nMainland coast (Mon Repos north to Wreck Rock) - approximately 150–350 females per year (Limpus & Limpus 2003).\r\nCapricorn Bunker Islands (southern Great Barrier Reef) - approximately 10–150 females per year (Limpus & Limpus 2003).\r\nSwain Reefs - not routinely surveyed but in the order of 10–50 females per year.\r\nVery small numbers (1 per year) of females have been recorded shifting between these sites (e.g. Mon Repos to Wreck Island) between years (Limpus et al. 1984b).\nNew Caledonia - approximately 10 females per year (Limpus & Limpus 2003). No females have been recorded shifting between rookeries in New Caledonia and rookeries in Queensland.\r\nLow density to sporadic nesting also occurs along the Sunshine Coast beaches (e.g. Caloundra), Moreton, North Stradbroke and South Stradbroke Island southwards into northern NSW (Limpus & Limpus 2003).\nWestern Australia genetic stockThe Western Australian population is the largest population in Australia, one of only four populations in the Indian Ocean and, when all nesting activity in Western Australia is combined, represents the third (Limpus 2008a) or fourth (Wirsing et al. 2004) largest population in the world.\nPopulation estimates include:\nDirk Hartog Island - 800–1500 females breeding per year.\r\nGnaraloo Bay Rookery – estimated 61 – 84 (range 38 – 211) females breeding per year (Hattingh et al. 2011, 2012c, 2013, 2014).\r\nSouth Murion Island - 50–350 females breeding per year (Baldwin et al. 2003).\r\nNorth West Cape - 50–150 females breeding per year (Prince 1993, 1994b).\r\nThe eastern Australian population has declined by an estimated 86% between 1977 and 2000; 3500 females were breeding annually in 1997 while only 500 females were nesting annually in 2000 (Limpus & Limpus 2003).\nThe Heron Reef foraging aggregation has been found to decline by ~3% per year (Chaloupka & Limpus 2001).\nThere are no data on the trends for the western Australian genetic stock, nor have the threatening processes been quantified for the stock. Limpus (2008a) suggests, however, that it is highly probable that egg loss to foxes and vehicle traffic in recent years has exceeded the sustainable level of loss for the Western Australian Loggerhead Turtle population.\nBreeding rates for the eastern Australia genetic stock are linked to environmental parameters (Chaloupka et al. 2008), but no extreme fluctuations have been recorded in Australia or

overseas.\nApproximately 70% of the breeding in the eastern Australian stock occurs at five rookeries - Mon Repos, Wreck Rock, Wreck Island, Erskine Island and Tryon Island. Of these areas only Wreck Rock is not contained within a Conservation management area (although the offshore waters are within the Great Barrier Reef Marine Park (GBRMP)). Important foraging areas span the area of the GBR World Heritage Area (GBRWHA) and Moreton Bay. While these foraging sites are protected within marine parks, there are still threats occurring to foraging turtles such as boat strike and entanglement in fishing gear (Greenland et al. 2002).\nIn Western Australia, the principal nesting sites include: Muiron Islands, Ningaloo Coast south to about Carnarvon and islands near Shark Bay, including Dirk Hartog Island (Baldwin et al. 2003; Prince 1993, 1994b).\n \nHybridisation in marine turtles is difficult to quantify because it either involves identification of the hatchlings for each nest a female lays in a particular year or by using genetic analysis tools. However, occasional hybrid clutches have been found at Mon Repos (Green and Loggerhead Turtles) and hybridisation between Loggerhead Turtles and other marine turtle species has been found to occur at very low frequencies in other populations (Karl et al. 1995). Although hybridisation is thought to occur at very low levels the ultimate frequency and ramifications are unknown.\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 Approximately 70% of the eastern Australian stock breed within five rookeries - Mon Repos, Wreck Rock, Wreck Island, Erskine Island and Tryon Island. Of these rookeries only Wreck Rock is not contained within a conservation management area (although the offshore waters are within the GBRMP). In addition, each of the other rookeries in the Capricorn Bunker group and Swains Reef are protected within the GBRWHA. \nThe GBRWHA and Moreton Bay Marine Park are very important foraging areas for the species and protection is provided through enforced zoning regulations.\nWhile nesting habitat within Ningaloo Marine Park is provided with some protection, much of the mainland nesting habitat is within pastoral leases (WA DEC 2009).\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 In Australia, Loggerhead Turtles nest on open, sandy beaches (Spotila 2004). Hatchlings enter the open ocean and begin feeding on small animals. Small Loggerhead Turtles live at or near the surface of the ocean and move with the ocean currents. In eastern Australia, there is evidence that they spend around 15 years or more in the open ocean (M. Chaloupka pers. comm. cited in Bjorndal et al. 2000), with much of their feeding in the top 5 m of water (Spotila 2004), before recruiting to their chosen inshore or neritic feeding area. Loggerhead Turtles choose a wide variety of tidal and sub-tidal habitat as feeding areas (Limpus 2008a). Loggerhead Turtles show fidelity to both their foraging and breeding areas (Limpus 2008a). When ready for breeding, mature turtles migrate to their chosen breeding area. Nesting females stay within an \"internesting area\" during their nesting period. Once breeding and nesting is complete, turtles return to their favoured foraging areas.\nHatchling to subadult loggerheads occur in the open ocean foraging on planktonic organisms (Carr 1986, 1987b; Limpus et al. 1994b).\nLoggerhead Turtles enter the benthic foraging habitat at a larger size than other hard-shelled sea turtles. Adults and large juveniles with greater than 70 cm curved carapace length (Limpus et al. 1994b) occur in waters with both hard and soft substrates including rocky and coral reefs (Limpus et al. 1984b), muddy bays (Conway 1994), sandflats, estuaries and seagrass meadows (Limpus et al. 1994b; McCauley & Bjorndal 1999; Preen 1996).\nLoggerhead Turtles require sandy beaches to nest. Sand temperatures between 25\u009633 °C are needed for successful incubation. Beaches free from light pollution are required to prevent disorientation, disturbance and to allow nesting females to come ashore.\n\nLoggerhead Turtles do not use refuge habitat.\nLoggerhead Turtles do not rely on a listed threatened ecological community. They often share foraging areas with other species of marine turtle that are listed under the EPBC Act.\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 Data for the eastern Australian genetic stock indicate that sexual maturity is reached at between 22 to 27 years of age (Chaloupka 2003). Breeding life has been estimated from overseas stocks at 32 years (Frazer 1995). While it is not clear how long a juvenile Loggerhead Turtle will stay in the open ocean, once it moves to its chosen feeding area, it will be a further 13 years or so before it is ready to breed. Some movement between the chosen feeding area to the open ocean during the juvenile period has been demonstrated off the coast of North America (McClellan & Read 2007) but fidelity to the feeding area is strong. Once it has reached breeding age, it will move between its chosen feeding area and its chosen breeding area for the rest of its life (Limpus 2008a).\nSurvivorship varies with age class:Eggs - average emergence success is between 70\u009690% (Limpus 1985).\nHatchlings - average mortality was estimated at between 16\u009665% at Heron Reef (Gyuris 1994).\nImmature turtles - annual survivorship is calculated to be between 58% (males) and 84% (females) (Chaloupka & Limpus 2002).\nAdult turtles - annual survivorship is calculated to be 87% (Chaloupka & Limpus 2002).Loggerhead Turtles in Australia breed from November to March with a peak in late December/early January (Limpus 1985). Breeding rates for adult females vary annually from 0% up to 70%. Seasonal breeding in Loggerhead Turtles, as is the case for all species, is tied to incubation conditions

(in particular, sand temperatures need to be between 25\u009632°C), hatchling dispersal and courtship (Hamann et al. 2002).\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 Loggerhead Turtles are carnivorous, feeding primarily on benthic invertebrates in habitat ranging from nearshore to 55 m (Plotkin et al. 1993). In their juvenile stage, they feed on algae, pelagic crustaceans, molluscs, flotsam and anthropogenic debris (Plotkin 1996). Once they move to the benthic foraging habitat their diet changes. \nIn the Gulf of Mexico, dietary items include: sea pens, crabs, molluscs, tube worms, barnacles, fish, shrimp, algae and anthropogenic debris (Plotkin et al. 1993). At Heron Island, Queensland, their diet mostly consisted of gastropod molluscs and clams but smaller amounts of jellyfish, starfish, corals, crabs and fish (Limpus et al. 1984b; Moodie 1979). Gastropod molluscs were the main diet of three individuals in Fog Bay, Northern Territory (Conway 1994). \n\nThere have been no studies of feeding behaviour. However, Loggerhead Turtles are regularly, and often repeatedly, caught on baited shark program hooks (Greenland et al. 2002) and have been recorded trapped in baited crab pots (Greenland et al. 2002). They are able to use their flippers to burrow into the substrate to find prey under the substrate (Preen 1996). While Loggerhead Turtles are not known for their habit of eating live fish, in south-east Queensland during the late 1990s Loggerhead Turtles were repeatedly observed preying on fish released as bycatch (Limpus et al. 2008). In 2000, six cases of dead or moribund Loggerhead Turtles with Porcupine Fish (Family Diodontidae) stuck in their mouths or throats were recorded (Limpus et al. 2008). While this incidence, all recorded in 2000, is believed to be an anomoly, Loggerhead Turtles are known to ingest marine debris and be subject to the risks associated with that behaviour (Balazs 1985; Carr 1987a; Plotkin et al. 1993).\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 \r\n Boyle (2006) and Boyle and colleagues (2009) provide evidence that following the movement of Loggerhead Turtle hatchlings from eastern Australia rookeries to the open ocean, they may then make a trans-Pacific migration to the coasts off Peru and Chile. They move down the coast of eastern Australia with the East Australian Current, into the Tasman Front, past Lord Howe Island to the north of New Zealand and across the southern Pacific Ocean to the waters off the coast of Peru and Chile. The journey back to the east Australian coast has not been documented. Loggerhead Turtles show fidelity to both their feeding and breeding areas (Limpus et al. 1992, 1994b), and can make reproductive migrations between foraging and nesting areas of over 2600 km (Limpus et al. 1992). Migrations from southern Queensland rookeries to the Northern Territory, Torres Strait, Papua New Guinea, Solomon Islands, New Caledonia and Vanuatu have been recorded (Limpus et al. 1992). During the nesting months females generally remain within 10 km of the rookery (Tucker et al. 1995). \n\nThere have been no studies to estimate home ranges for Loggerhead Turtles.\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 \r\n The Loggerhead Turtle is characterised by five pairs of costal (between the centre and outer margin of shell) scales. For trained people Loggerhead Turtles are relatively easy to distinguish from other marine turtle species using both the identification of the turtle itself or by viewing tracks. On land, adult Loggerhead Turtles move their foreflippers alternately, with hind flippers moved together or alternately (Wyneken 1997).\nNesting beachesThere are essentially three methods which can be used singly or in combination to monitor nesting populations - aerial track counts, beach based track counts and individual marking. Each method has associated error, costs, advantages and disadvantages. The specific methods used for nesting beach surveys for Loggerhead Turtles will be site specific and depend on ease of access to the sites, cost of surveys, availability of staff/volunteers and time of year. There are some clear gaps in knowledge of Loggerhead Turtle populations that future research and monitoring could address:\nNesting beach-based population surveys at one or more index sites for the Western Australian population.\r\nSurveys of predation rates and hatchling production at main rookeries in the Western Australian population.\r\nExperimental and/or comparative studies that address the impacts of light pollution on the behaviour, survival, physiology and reproductive biology of hatchling and adult turtles.\r\nExperimental and/or comparative studies that address the impacts of climate change on the behaviour, survival, physiology and reproductive biology of hatchling and adult turtles.\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 Marine turtles face a number of threats associated with the following broad categories of human activity: commercial and recreational fishing; coastal infrastructure and development (including industrial, residential and tourism development); Indigenous harvest; feral animal predation; and climate change.\nFishing - commercial and recreationalWhile commercial harvest of turtles in Australia is no longer allowed, death or injury to turtles as a result of incidental capture (or bycatch) is a threat.\nTrawlingHundreds of marine turtles used to be killed annually in trawling activities in northern Australia (EA 2003ai; Limpus 2008a) prior to the introduction of Turtle Excluder Devices (TEDs): Limpus (2008a) documents many records of incidental capture and death of Loggerhead Turtles and concludes that the trawl fisheries off the coast of NSW, Queensland, Northern Territory and

Western Australia have had, prior to the introduction of TEDs, the potential to kill many hundreds, or possibly thousands, of Loggerhead Turtles annually since the late 1970s. In 1994, Limpus and Reimer (1994) implicated trawling as a significant contributing factor in the decline of the eastern Australian Loggerhead Turtle stock. The introduction of TEDs has, however, significantly reduced capture and mortality of Loggerhead Turtles in association with trawling. For instance, while Poiner and Harris (1994, 1996 cited in Limpus 2008a) estimated that the Northern Prawn Fishery killed 163 and 67 Loggerhead Turtles in 1989 and 1990 respectively, between 2002–2004, this same Fishery recorded only one death of a Loggerhead Turtle and two 'released alive' Loggerhead Turtles through incidental bycatch during this three year period (Perdrau & Garvey 2005). Between 2005–2007, this Fishery recorded one death of a Loggerhead Turtle and four 'released alive' Loggerhead Turtles (Ciccosilla 2008).\nLongline and Pot FishingTurtles can be hooked on the front and hind flippers, head, mouth, neck and carapace or get entangled in either the monofilament, mainline or balldrop/buoy line. In pot fisheries, turtles may become entangled in the float lines or enter pot traps and drown (DEWHA in prep.). Globally, longline fishing is likely to have had a significant impact on populations of Loggerhead Turtles, though estimates are difficult to arrive at due to differences in bycatch rates, fishing effort and compliance with reporting. Lewison and colleagues (2004) report that, despite infrequent encounters, more than 200 000 Loggerhead Turtles were likely to have been taken as pelagic longline bycatch in 2000 globally and that thousands of Loggerhead Turtles die each year from longline gear in the Pacific Ocean alone. Lewison and Crowder (2007) also identify longline fishing as a serious threat because of its tendency to affect older, reproductively valuable age classes of turtles. They also note that while bycatch rates from individual longline vessels are extremely low, the cumulative effect could be substantial.\nThe estimated sea turtle catch by Australian pelagic longliners is considerably less than some other longline fisheries around the world (Robins et al. 2002). The two pelagic longline fisheries in Australia have been required to keep logbooks on turtle bycatch since 1996 (Robins et al. 2002): the Eastern Tuna and Billfish Fishery recorded a total of 21 Loggerhead Turtles released alive, and no deaths, between 2000–2006(Evans 2007). In the Southern and Western Tuna and Billfish Fishery, around one and two Loggerhead Turtles per year were reported as being released alive between 1999–2000 (Perdrau 2002). Given that the eastern stock of Loggerhead Turtles are believed to move over the Pacific Ocean off the coast of Peru (Boyle 2006; Boyle et al. 2009), bycatch from longline fisheries in these waters is likely to affect the viability of the eastern Australian Loggerhead population.\nGill NetsLimpus (2008a) details one incident of 15 Loggerhead Turtles drowned by a shark net in Fog Bay, Northern Territory in 1996. This type of fishing was banned in the Northern Territory following this event.\nGhost NetsWhile ghost nets (lost and discarded fishing nets) pose a serious threat to marine turtles as they float in the ocean and coastal waters and indiscriminately capture marine animals (DEWHA in prep.), this threat is not well quantified for Loggerhead Turtles.\nMarine DebrisInjury and fatality as a result of ingestion or entangelement of marine debris has been listed as a key threatening process under the EPBC Act. High concentrations of debris accumulate on parts of the coastline all around Australia; areas where it occurs in relatively high concentrations include coasts adjacent to urban centres and remote areas of north-western Cape York, Groote Eylandt, north-east Arnhem Land, the far north Great Barrier Reef, parts of South Australia including Anxious Bay, parts of Western Australia, south-west Tasmania, and Australia's sub- Antarctic Islands (DEWHA 2009t). White (2006) details that up to 400 kg of debris can be found per kilometre of coastline along remote parts of the northern Australian. Carr (1987 cited in DEWHA in prep.) records that fishing line, rope and cord fragments, styrofoam beads, tar balls, plastic bags and balloons are all known to have killed marine turtles through ingestion or entanglement. Limpus (2008a) records an average annual reported mortality of five deaths per year of Loggerhead Turtles in Queensland from entanglement in rope, fishing-line or bags and 1.5 deaths per year from ingestion of synthetic material, usually fishing line.\nIndigenous HarvestWhile marine turtles are economically and culturally significant to Indigenous Australians (Aboriginal and Torres Strait Islanders) (DEWHA in prep.), in his review of data relevant to harvest of Loggerhead Turtles and/or eggs, Limpus (2008a) suggests that this is not a common practice.\nAnimal PredationFoxes and dogs destroy hundreds of nests in eastern Queensland (EA 2003ai). Limpus (2008a) suggests that the decline in recruitment of immature Loggerhead Turtles along the eastern Australian coast is consistent with the rise of European Red Fox (Vulpes vulpes) predation of eggs: up to 95% of all clutches laid at Mon Repos in the 1970s were destroyed by foxes. Limpus (2008a) also suggests that there will be between 15–20 years of reduced recruitment to the nesting adult population between 2000–2020 as a result of fox predation in the 1960s and 1970s. The positive effects of fox control in the 1980s, 1990s and more recently, will likely take some decades to be apparent (Limpus 2008a). Up to 70% of Loggerhead nests at surveyed beaches at Jane's Bay, Ningaloo Station, Western Australia were destroyed by foxes before fox control was implemented (Mau 2003). Gnaraloo Bay Rookery experienced 100% predation of Loggerhead turtle nests at certain parts of the

rookery prior to the commencement of the Gnaraloo Feral Animal Control Program in 2008/09 (Butcher & Hattingh 2013). Limpus (2008a) suggests that much of the egg predation is likely to occur on those Western Australian beaches most likely to produce female hatchlings, adding a further long-term complication to future population dynamics.\nCoastal Infrastructure and DevelopmentCoastal developments, including residential, industrial and tourism development, can directly destroy or degrade beach habitats used as nesting sites. The habit of Loggerhead Turtles to bask in shallow waters, has led to interference by humans (Limpus 2008a) while in Western Australia the threat of uncontrolled vehicle access on nesting beaches also poses a threat (WA DEC 2009).\nShark Control ProgramsThe setting of nets to limit shark movement off popular swimming beaches presents a threat to all marine turtle species. Limpus (2008a) details data collected on turtles caught in the Queensland Shark Control Program run by the state Department of Primary Industries and Fisheries: between 1998–2002 there were 232 Loggerhead turtles captured, with 195 taken on drum lines and 37 taken in nets. Of these 98% were released alive from drum lines and 92% released alive from nets.\nLight PollutionLight pollution on nesting beaches alters nocturnal behaviors in sea turtles, including; how sea turtles choose nesting sites; how they return to the sea after nesting; and how hatchlings find the sea after emerging from their nests (Witherington & Martin 1996). In Western Australia, the region between North West Cape and Port Hedland has the highest impact of artificial lighting on turtle nesting beaches and hatchling dispersal due to shipping (iron ore and natural gas carriers, tugs, jetties and load out facilities), onshore and offshore industrial activity and residential development. Limpus (2008a) suggests that significant sources of altered light horizons may occur with coastal real estate and tourist facilities within line of sight of the nesting beaches along the Ningaloo Coast, though there are no studies that quantify the magnitude of this problem.\nBoat StrikeFast moving boats have the potential to cause marine turtle injury or death (DEWHA in prep.). Limpus (2008a) details records of deaths of Loggerhead Turtles as a result of boat strike in Moreton Bay and Hervey Bay, Queensland. Limpus (2008a) suggests that deaths are likely to be higher than eight Loggerhead Turtles per year. Shallow seagrass habitat can support large numbers of foraging Loggerhead Turtles and when there is high recreational use of these areas by humans, the risk of boat strike increases.\nDredgingBetween 1999–2002, the average annual reported mortality was 1.7 Loggerhead Turtles per year (with a maximum of 3) from port dredging operations.\nSeismic SurveyWhile seismic surveys, which produce noise pollution in the water, are unlikely to cause the death of turtles, they may impact on the foraging, inter-nesting, courting or mating behaviour of turtles. McCauley and colleagues (2000 cited in Limpus 2008a) document the circumstances in which turtles will change behaviour as a result of seismic surveys and recommend the timing and location of seismic surveys take into account time and place of specific activities of turtles. No information on seismic impact on this species is available.\nClimate Change and Extreme Events\nChanging termparatures and weather patterns associated with climate change are likely to have both direct physiological impacts on marine turtles, as well as indirect effects through impacts on critical turtle habitats (DEWHA in prep.). The sex of marine turtle hatchlings is determined by the incubation termperature of the eggs, with warmer incubation temperatures leading to the production of female hatchlings and cooler incubation temperatures leading to production of male hatchlings. Climate change may alter the temperature of nesting beaches, thereby affecting the male/female ratio.\nRising sea levels and an increase in the frequency and/or intensity of cyclones and associated storm surges could lead to erosion of nesting beaches, changes in beach morphology, washing away or inundation of nests \n(Hamann et al. 2007). Changes in ocean circulation patterns and alteration to marine food webs may both have significant impacts on Loggerhead Turtles, particulary during their pelagic phase (DEWHA in prep.). The long life span and long maturation and reproductive times of Loggerhead Turtles reduces the ability of these animals to adapt to changes in environmental conditions likely to be associated with climate change (DEWHA in prep.).\nLongevity, slow growth and delayed sexual reproduction are all life history traits of Loggerhead Turtles that hinder efforts to identify population trends and also act to prevent fast population recovery. Marine turtles require sand temperatures to be between 25 and 33°C for successful embryo development. This makes hatchling production tightly linked to air and thus sand temperatures. Adult turtles use dark nesting sites and thus are sensitive to changes in light horizons. Hatchling turtles use a combination of light, waves, currents and magnetic navigation to emerge from nests and make their way out to offshore currents. Hence they are susceptible to any changes in light horizons, currents, wave patterns and dune formation.\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 National Recovery PlanThe Recovery Plan for Marine Turtles in Australia (EA 2003ai) outlines actions for the protection, conservation and management of the six marine turtles listed under the EPBC Act, including the Loggerhead Turtle. This Plan is currently under review (DEH 2005a).\nFishingBoth Commonwealth and State governments manage fisheries in Australia and both are subject to a mix of legislative, regulatory and policy instruments that contribute to reducing the threat that

bycatch poses to marine turtles (EA 2003ai). The Australian Fisheries Management Authority (AFMA) shares responsibility for managing some fisheries with the states and Northern Territory, though in general states and the Northern Territory manage inshore species, such as rock lobster and abalone, whereas AFMA generally manages deeper water finfish and tuna species. AFMA is the Commonwealth agency responsible for implementing the Fisheries Management Act 1991and managing Commonwealth fisheries. The EPBC Act broadly requires that actions taken when fishing do not have a significant impact on the Commonwealth marine environment and its biodiversity, including protected species such as marine turtles. All Commonwealth fisheries have to be assessed and accredited under Part 13 and 13A of the EPBC Act. Other more specific actions are controlled through recovery plans, wildlife conservation plans and threat abatement plans made under the EPBC Act as a result of a protected species listing or type of fishing activity being listed. For instance, Incidental catch (bycatch) of Sea Turtle during coastal otter-trawling operations within Australian waters north of 28º South (TSSC 2001x) was listed as a key threatening process under the EPBC Act in 2001; harmful marine debris was also listed as a key threatening process in 2003 (DEWHA 2009t).\nRelevant Commonwealth policies and programs include the Guidelines for the Ecologically Sustainable Management of Fisheries 2007 (DEWR 2007bd) and AFMA's Bycatch and Discarding Program. The Australian Government released the Commonwealth Policy on Fisheries Bycatch in 2000 to guide Commonwealth fisheries in the pursuit of legislative objectives relating to non-target species and the broader marine environment. The key tool used to pursue bycatch minimisation under the Commonwealth bycatch policy is the requirement for each fishery to implement a Bycatch Action Plan (BAP). AFMA (2008) established a Bycatch and Discarding Implementation Strategy(AFMA 2008) to provide additional resources and direction for pursuing policy and legislative objectives in relation to bycatch and discarding.\nTo assist in the management and mitigation of bycatch in longline fleets a DVD called \"Crossing the Line\" has been produced by \"Hatchling Productions\" and the Australian Government's Fisheries Research and Development Corporation (Belldi & Hatchlings Productions 2005) and provided to the Australian longline fleet. Research into mitigation of bycatch in the longline fisheries in Australia has been undertaken and includes design and testing of numerous modifications to longline practices, including deep setting of lines (Beverly 2004) and the use of circle hooks (Ward et al. 2008) as well as education of fishers. AFMA and Fisheries Research and Development Corporation are providing funding assistance for a research project to test the efficacy of the the smart hook system in tuna longline fisheries to reduce accidental injury to seabirds and marine turtles (AFMA 2008b). The mitigation measure has been developed by a modification to any tuna longline hook, allowing a shield to be attached after the hook has been baited. The shield disarms the hook, increases the sink rate and prevents ingestion of the baited hook. Technology used to hold the shield in place releases once it is below the feeding range of the seabirds and marine turtles, providing a normal baited hook. Preliminary results are promising (AFMA 2008b).\nBycatch Action Plans (BAP)The Australian Tuna and Billfish Longline Fisheries Bycatch and Discarding Workplan(AFMA 2008a) addresses the minimisation and management of interactions with marine turtles; six monthly reports detail progress of implementation of the workplan. For instance the Eastern Tuna and Billfish implementation plan reports that arrangements are being developed for turtle releasing devices to be placed on board all their vessels and research is under way to assess circle hooks to reduce turtle impacts.\nState governments are also responsible for managing a large number of commercial fisheries and each state has its own range of legislative, regulatory or policy instruments that serve to reduce bycatch of marine turtles.\nGhost netsThere is a substantial network of communities working together to remove ghost nets from beaches, quantify its impact and reduce turtle mortality (Ghost Nets).\nA comprehensive assessment of the nature and impact of marine debris was made in 2003 (Kiesling 2003). This study detailed 25 activities that could be implemented to help reduce the volume and impact of marine debris, including in matters of research and monitoring, communication, education and outreach, incentives, regulation and technical advances.\nA key advance in the monitoring of ghost nets was the release of the tool \"The Net Kit: A Fishing Net Identification Kit for Northern Australia\" by the World Wildlife Fund in 2002 (with support from the Natural Heritage Trust) (White 2006).\nWhile the majority of nets found in the Gulf of Carpentaria are of foreign origin, a pilot study to model drift and circulation patterns (Griffin 2008) found no evidence that nets stranding on the shores of Arnhem Land and Gulf of Carpentaria were likely to have been lost or discarded in south-east Asian waters further away than the Arafura Sea. Instead, modelling indicated that marine debris passing through Torres Strait was likely to come close to the Arnhem Land coastline, or enter the Gulf of Carpentaria, where it might strand in the Cape Arnhem-Groote Eylandt region in the Dry Season, or in the Weipa region during the Wet Season (Griffin 2008). Understanding where marine debris is coming from is an important prerequisite for management of the threat that marine debris poses to Loggerhead and other turtles.\nAnimal Predation\nFox baitingFox baiting by Queensland Parks and Wildlife Service (QPWS) is undertaken along the mainland coast adjacent to

major (Wreck Bay, Mon Repos) and minor Loggerhead Turtle rookeries. Limpus (2008a) reports a significant decrease in fox predation of nests in Queensland.\nGnaraloo StationThe Gnaraloo Feral Animal Control Program (GFACP) was implemented along the Gnaraloo coast (adjacent to the Ningaloo Marine Park and the Ningaloo World Heritage Area) at the commencement of the Gnaraloo Turtle Conservation Program (GTCP) in 2008/09 and continues to be ongoing in 2014. The GFACP targets European red foxes (Vulpes vulpes), feral cats and wild dogs, with strategic 1080 baiting using Dried Meat Baits and impregnated fowl eggs, in four main regions of the Gnaraloo property: immediately behind and adjacent to the coastal rookeries (up to 2 km inland); in surrounding hinterland (2-8 km inland); all beaches north and south of the confirmed two turtle nesting rookeries, from Gnaraloo's southern to northern boundary; and the remainder of Gnaraloo Station (Butcher & Hattingh, 2012, 2013). During the GTCP seasons 2010/11 – 2012/13, the GFACP achieved zero loggerhead turtle nest mortalities from feral animal predation (Butcher & Hattingh 2012, 2013). This work is ongoing. Gnaraloo Bay Rookery has an average of 346 loggerhead nests per season with an approximate of 45 000 eggs (Butcher & Hattingh, 2013). Hence, during GFACP 2010/11 – 2012/13, approximately 135 000 endangered loggerhead turtle eggs have been protected from feral animal predation (Butcher & Hattingh 2013). 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, 2013).\nClimate Change\nClimate change impacts are being monitored through a Department of the Environment, Water, Heritage and the Arts initiative to record sand temperatures for major rookeries for each genetic stock.\nClimate change impacts are being monitored by the QPWS turtle research project by conducting detailed sand temperature studies at Mon Repos. Sand temperatures at Mon Repos beach have been routinely collected by QPWS since the mid 1970s.\nMore effort should be placed on understanding patterns of nest site selection and how nesting sites may change under different climate regimes (Hamann et al. 2007); and understanding the ecological roles of Loggerhead Turtles and possible impacts of climate change to important diet species (Hamann et al. 2007).\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 Loggerhead Turtle has been identified as a conservation value in the South-west (DSEWPaC 2012z), North-west (DSEWPaC 2012y), North (DSEWPaC 2012x) and Temperate East (DSEWPaC 2012aa) marine regions. See Schedule 2 of the North-west Marine Bioregional Plan (DSEWPaC 2012y) and the Temperate East Marine Bioregional Plan (DSEWPaC 2012aa) for regional advice. Maps of Biologically Important Areas have been developed for loggerhead turtle in the North-west (DSEWPaC 2012y) and Temperate East (DSEWPaC 2012aa) 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 South-west (DSEWPaC 2012z), 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 Major Studies\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n Queensland Parks & Wildlife Service (QPWS) - operate annual nesting beach surveys at Mon Repos, Heron Island, Wreck Rock and Wreck Island and annual foraging area surveys in Moreton Bay (see Limpus & Limpus 2003a,b cited in Limpus 2008a for summaries of studies and locations). Other studies include nesting biology (Limpus 1985), migration (Limpus et al. 1992), embryology (Miller 1985), population dynamics (Chaloupka et al. 2008; Heppell et al. 1996) and physiology (Whittier et al. 1997). QPWS record stranding events and support rehabilitation centres (Greenland et al. 2002).\nIn Western Australia, studies continue at Ningaloo through the Ningaloo Marine Turtle Program, a community-based monitoring program designed to provide marine turtle nesting information of the three main species nesting in the Ningaloo Region, including the Loggerhead Turtle (WA DEC 2009). Also on the west coast, adjacent to the Ningaloo Marine Park and the Ningaloo World Heritage Area, lies Gnaraloo Station. The Gnaraloo Turtle Conservation Program (GTCP) and the Gnaraloo Feral Animal Control Program (GFACP) are privately funded and managed by the Gnaraloo Station Trust. The GTCP and the GFACP are also supported by other partners and entities including Animal Pest Management Services, Esri Australia, the Australian Government, Rangelands NRM Western Australia and the Department of Parks and Wildlife (WA). The GTCP aims to collect reliable high quality data on sea

turtle nesting activities for protection of significant rookeries and informed management activity to promote the long-term survival of sea turtle populations. The field research is completed by annually appointed scientific interns, who strive to increase awareness of sea turtle protection and basic conservation issues including the involvement of community groups and school students. The surveys are undertaken at two significant rookeries, namely, daily surveying at the Gnaraloo Bay Rookery and periodic surveying at the Gnaraloo Cape Farquhar Rookery. Each year of the GTCP produces a season end report with results and recommendations.\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 Management documents include:\nMarine turtle recovery plan (EA 2003ai) (under review as of June 2008)Australian Tuna and Billfish Longline Fisheries Bycatch and Discarding Workplan November 1 2008 to October 31 2010 (AFMA 2008a) Threat Abatement Plan for the impacts of marine debris on vertebrate marine life (DEWHA 2009t)Threat Abatement Plan for Predation by the European Red Fox (EA 1999a)North West Marine Bioregional Plan Bioregional Profile (DEWHA 2008b)North Marine Bioregional Plan Bioregional Profile (DEWHA 2008).\nAn issues paper on protection of sea turtles is in preparation (DEWHA in prep.). In addition, fisheries, both Commonwealth and state managed, are guided by bycatch action plans and ecological assessment processes.\nKiesling (2003) has addressed the issue of derelict fishing material while White (2006) reports on marine debris in the Northern Territory.\n\r\n \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 Australian Fisheries Management Authority (AFMA) (2008). AFMA's Program for Addressing Bycatch and Discarding on Commonwealth Fisheries:an Implementation Strategy. Australian Government. Available from: http://www.afma.gov.au/environment/bycatch/is_env_bycatch-prog_feb08_20080417.pdf.\r\n \r\n Australian Fisheries Management Authority (AFMA) (2008a). Australian Tuna and Billfish Longline Fisheries Bycatch and discarding workplan November 1, 2008 To October 31, 2010. Available from: http://www.afma.gov.au/information/publications/fishery/baps/docs/afma_tuna_bap.pdf.\r\n \r\n Australian Fisheries Management Authority (AFMA) (2008b). AFMA Update - A newsletter from the Australian Fisheries Management Authority. Available from: http://www.afma.gov.au/information/publications/newsletters/afma_update/docs/update_0517/update_0517.htm#item_7.\r\n \r\n Balazs, G.H. (1985). Impact of ocean debris on marine turtles: entanglement and ingestion. In: NOAA-TM-NMFS-SWFC. 54:387-429.\r\n \r\n Baldwin, R., G. Hughes & R. Prince (2003). Loggerhead turtles in the Indian Ocean. In: Bolten, A. & B. Witherington, eds. Loggerhead sea turtles. Washington: Smithsonian Books.\r\n \r\n Belldi and Hatchling Productions (2005). Crossing the Line (DVD).\r\n \r\n Beverly, S. (2004). New deep setting longline technique for bycatch mitigation. AFMA Final Research Report No. R03/1398.\r\n \r\n Bjorndal, K.A, A.B Bolten & H.R. Martins (2000). Somatic growth model of juvenile loggerhead sea turtles Caretta caretta: duration of pelagic stage. Marine Ecology Progress Series. 202:265-272. Available from: http://www.seaturtle.org/PDF/Bjorndal_2000_MarEcolProgSer.pdf.\r\n \r\n Bolten, A. & B. Witherington (2003). Loggerhead sea turtles. Washington: Smithsonian Books.\r\n \r\n Bowen, B.W., N. Kamezaki, C.J. Limpus, G.R. Hughes, A.B. Meylan & J.C. Avise (1994). Global phylogeography of the loggerhead turtle (Caretta caretta) as indicated by mitochondrical DNA halotypes. Evolution. 46 (6):1820-1828.\r\n \r\n Boyle, M.C, N.N. FitzSimmons, C.J. Limpus, S. Kelez, X. Velez-Zuazo & M. Waycott (2009). Evidence for transoceanic migrations by loggerhead sea turtles in the southern Pacific Ocean. Proceedings fo the Royal Society B.\r\n \r\n Boyle, M.C. (2006). Post hatchling sea turtles. Ph.D. Thesis. James Cook University.\r\n \r\n Butcher, M. (2008). Fox Control Program for Gnaraloo Station. Turtle Predation Minimisation Project (For turtle breeding season 2008/09). December 2008. Animal Pest Management Services. Available from: http://www.gnaraloo.com.au.\r\n \r\n Butcher, M. (2009). Fox Management Project. Technical Report for Gnaraloo (For turtle breeding season 2009/10). November 2009. Animal Pest Management Services. Available from: http://www.gnaraloo.com.au.\r\n \r\n Butcher, M. (2009a). Fox Control Program for Gnaraloo Station. Turtle Predation Minimisation Project (For turtle breeding season 2008/09). January 2009. Animal Pest Management Services. Available from: http://www.gnaraloo.com.au.\r\n \r\n Butcher, M. (2010). Fox Control Program for Gnaraloo Station. Turtle Predation Minimisation Project (For turtle breeding season 2009/10). February 2010. Animal Pest Management Services. Available from: http://www.gnaraloo.com.au.\r\n \r\n Butcher, M. (2011). Gnaraloo Fox Control Program. Report 2010/11, Protection of sea turtle rookeries on the Gnaraloo coast. June 2011. Animal Pest Management Services. Available from: http://www.gnaraloo.com.au.\r\n \r\n Butcher, M. & K. Hattingh (2012). Gnaraloo Feral Animal Control Program. Final Report 2011/12. 30 June 2012. Animal Pest Management Services and Gnaraloo Station Trust, Western Australia. Available from: http://www.gnaraloo.com.au.\r\n \r\n Butcher, M. & K. Hattingh (2013). Gnaraloo Feral Animal Control Program. Report for sea turtle nesting season 2012/13. 30 June 2013. Animal Pest Management

Services and Gnaraloo Station Trust, Western Australia. Available from: http://www.gnaraloo.com.au.\r\n \r\n Butcher, M., & K. Hattingh (2015). Gnaraloo Feral Animal Control Program. Report for sea turtle nesting season 2013/14. 30 June 2014. Animal Pest Management Services and Gnaraloo Station Trust, Western Australia.\r\n \r\n Carr, A. (1986). Rips, FADS, and little loggerheads. BioScience. 36(2):92-100.\r\n \r\n Carr, A. (1987a). Impact of nondegradable marine debris on the ecology and survival outlook of sea turtles. Marine Pollution Bulletin. 18(6b):352-356.\r\n \r\n Carr, A. (1987b). New perspectives on the pelagic stage of sea turtle development. Conservation Biology. 1(2):103-121.\r\n \r\n Chaloupka, M. (2003). Stochastic simulation modeling of loggerhead population dynamics given exposure to competing risks in the western south Pacific. In: Bolten, A. & B. Witherington, eds. Loggerhead sea turtles. Page(s) 274-294. Washington: Smithsonian Books.\r\n \r\n Chaloupka, M. & C. Limpus (2001). Trends in the abundance of sea turtles resident in southern Great Barrier Reef waters. Biological Conservation. 102:235-249.\r\n \r\n Chaloupka, M. & C.J. Limpus (2002). Survival probability estimates for the endangered loggerhead sea turtle resident in souther Great Barrier Reef waters. Marine Biology. 140:267-277.\r\n \r\n Chaloupka, M., N. Kamezaki & C. Limpus (2008). Is climate change affecting the population dynamics of the endangered Pacific loggerhead sea turtle?. Journal of Experimental Marine Biology and Ecology. 356:136-143.\r\n \r\n Ciccosillo, R (2008). Northern Prawn Fishery Data Summary 2007. Australian Fisheries Management Authority. Available from: http://www.afma.gov.au/information/publications/fishery/data_summ/docs/npf_2007.pdf.\r\n \r\n Cogger, H.G. (1996). Reptiles and Amphibians of Australia. Chatswood, NSW: Reed Books.\r\n \r\n Cogger, H.G., E.E. Cameron, R.A. Sadlier & P. Eggler (1993). The Action Plan for Australian Reptiles. Canberra, ACT: Australian Nature Conservation Agency. Available from: http://www.environment.gov.au/biodiversity/threatened/action/reptiles/index.html.\r\n \r\n Conway, S. (1994). Diets and feeding biology of adult olive ridley (Lepidochelys olivacea) and loggerhead (Caretta caretta) sea turtles in Fog Bay, Northern Territory. Hons. Thesis. Darwin: Northern Territory University.\r\n \r\n Department of the Environment and Heritage (2005b). Draft Recovery Plan for marine turtles found in Australia: Olive Ridley Turtle Lepidochelys olivacea, Loggerhead Turtle Caretta caretta, Flatback Turtle Natator depressus, Green Turtle Chelonia mydas, Hawksbill Turtle Eretmochelys imbricata & Leatherback. Canberra: Commonwealth Department of Environment and Heritage. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/recovery/marine-turtles/pubs/marine-turtle.pdf.\r\n \r\n Department of the Environment and Water Resources (DEWR) (2007bd). Guidelines for the Ecologically Sustainable Management of Fisheries. Canberra: Australian Government. Available from: http://www.environment.gov.au/coasts/fisheries/publications/pubs/guidelines.pdf.\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 Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008). The North Marine Bioregional Plan: Bioregional Profile: A Description of the Ecosystems, Conservation Values and Uses of the North Marine Region. Canberra: DEWHA. Available from: http://www.environment.gov.au/resource/north-marine-bioregional-plan-bioregional-profile-description-ecosystems-conservation.\r\n \r\n Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008b). North-West Marine Bioregional Plan: Bioregional Profile: A Description of the Ecosystems, Conservation Values and Uses of the North-West Marine Region. Canberra: DEWHA. Available from: http://www.environment.gov.au/coasts/mbp/publications/north-west/bioregional-profile.html.\r\n \r\n Department of the Environment, Water, Heritage and the Arts (DEWHA) (in prep.). Issues paper for six species of marine turtles found in Australian waters that are listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/recovery/marine-turtles/pubs/issues-paper.pdf.\r\n \r\n Dobbs, K.A. (2007). Marine turtle and dugong habitats in the Great Barrier Reef Marine Park used to implement biophysical operational principles for the Representative Areas Program. Unpublished Report of the Great Barrier Reef Marine Park Authority, Townsville.\r\n \r\n Dutton, P., D. Broderick & N. Fitzsimmons (2002). Defining Management Units: Molecular Genetics. Kinan, I., ed. Proceedings of the Western Pacific Sea Turtle Cooperative Research and Management Workshop. Page(s) 93-101. Honolulu: Western Pacific Regional Fishery Management Council.\r\n \r\n Ehrhart, L., D. Bagley & W. Redfoot (2003). Loggerhead turtles in the Atlantic Ocean: geographic distribution, abundance and population status. In: Bolten, A. & B. Witherington, eds. Loggerhead sea turtles. Page(s) 157-176. Washington: Smithsonian Books.\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 Environment Australia (EA) (1999a). NON-CURRENT Threat Abatement Plan for Predation by the European Red Fox. Biodiversity Group, Environment Australia. Available from: http://www.environment.gov.au/archive/biodiversity/threatened/publications/tap/foxes/index.html. In effect under the EPBC Act from 16-Jul-2000.\r\n \r\n Evans, S. (2007). Eastern Tuna and Billfish Fishery Data Summary 2005-06. Australian Fisheries Management Authority. Available from: http://www.afma.gov.au/information/publications/fishery/data_summ/docs/ds_etbf_2005-06v7_20080407.pdf.\r\n \r\n Frazer, N. (1995). Loggerhead Sea Turtle, Caretta caretta. In: Plotkin, P., ed. National Marine Fisheries Service and US Fish and Wildlife Service Status Reviews for Sea Turtles Listed under the Endangered Species Act of 1973. Page(s) 2. Silver Spring, Maryland: National Marine Fisheries Service.\r\n \r\n Greenland, J., C.J. Limpus & K. Currie (2002). Marine wildlife stranding and mortality database annual report 2001-2002 III. Marine Turtles Queensland EPA report.\r\n \r\n Griffin, D (2008). Pilot investigation of the origins and pathways of marine debris found in the northern Australian marine environment. Report for the Department of the Environment, Water, Heritage and the Arts. Centre for Australian Weather and Climate Research. Available from: http://www.environment.gov.au/coasts/publications/pubs/origins-marine-debris.pdf.\r\n \r\n Guinea, M.L. (1995). The sea turtles and sea snakes of Ashmore Reef Nature Reserve. Page(s) 67. Darwin: Northern Territory University.\r\n \r\n Gyuris, E. (1994). The rate of predation by fishes on hatchlings of the green turtle (Chelonia mydas). Coral Reefs. 13:137-144.\r\n \r\n Hamann, M., C. Limpus & M. Read (2007). Vulnerability of marine reptiles to climate change in the Great Barrier Reef. In: Johnson, J. & P. Marshal, eds. Great Barrier Reef Marine Park Authority and The Australian Greenhouse Office: Climate change and the Great Barrier Reef.\r\n \r\n Hamann, M., D. Owens & C.J. Limpus (2002). Reproductive cycles in male and female sea turtles. In: Lutz, P.L., J. A. Musick & J. Wyneken, eds. Biology of sea turtles. 2. Boca Raton, Florida: CRC Press.\r\n \r\n Hattingh, K., C. Palmer, N. Hajnoczky & B. Slade (2014). DRAFT Gnaraloo Turtle Conservation Program. Gnaraloo Bay Rookery and Gnaraloo Cape Farquhar Rookery, Report for Season 2013/14. Day monitoring program with Night verification, Sampled nest survey and Community engagement. In peer review. Gnaraloo Station Trust, Western Australia. Available from: http://www.gnaraloo.com.au.\r\n \r\n Hattingh, K., J. Arnold, C. Crossman, D. Ilich & A. Greenley (2013). DRAFT Gnaraloo Turtle Conservation Program. Gnaraloo Bay Rookery and Gnaraloo Cape Farquhar Rookery, Report for Season 2012/13. Day monitoring program with Night verification, Sampled nest survey and Community engagement. In peer review. Gnaraloo Station Trust, Western Australia. Available from: http://www.gnaraloo.com.au.\r\n \r\n Hattingh, K., J. Thomson, N. Goldsmith, K. Nielsen, A. Green & M. Do (2016). Gnaraloo Turtle Conservation Program (GTCP). Gnaraloo Bay Rookery and Gnaraloo Cape Farquhar Rookery, Report 2015/16. Gnaraloo Wilderness Foundation, Western Australia.\r\n \r\n Hattingh, K., M. Boureau, M. Duffy & M. Wall (2011). Gnaraloo Bay Rookery, Final Report, Program 2010/11. Day monitoring program with Night checks and Crab burrow surveys. 20 July 2011. Gnaraloo Turtle Conservation Program. Gnaraloo Station Trust, Western Australia. Available from: http://www.gnaraloo.com.au.\r\n \r\n Hattingh, K., P. Becker & G. Paterson (2009). Beach Monitoring, Nesting Season 2008/09, Final Report. 28 June 2009. Gnaraloo marine turtle research program. Gnaraloo Station Trust, Western Australia. Available from: http://www.gnaraloo.com.au.\r\n \r\n Hattingh, K., P. Boelling, S. Jacomy, A. James, J. Leonard, J-M. Stuart & M. Williamson (2010). Gnaraloo Day and Night Monitoring, Final Report 2009/2010. 30 July 2010. Gnaraloo Turtle Conservation Program. Gnaraloo Station Trust, Western Australia. Available from: http://www.gnaraloo.com.au.\r\n \r\n Hattingh, K., R. Edman, F. Morgan & K. Riskas (2012). Gnaraloo Cape Farquhar Rookery, Report on first reconnaissance survey (21-23 December 2011), Season 2011/12. Day monitoring program. 1 August 2012. Gnaraloo Turtle Conservation Program. Gnaraloo Station Trust, Western Australia. Available from: http://www.gnaraloo.com.au.\r\n \r\n Hattingh, K., R. Edman, F. Morgan & K. Riskas (2012a). Gnaraloo Cape Farquhar Rookery, Report on second reconnaissance survey (21-23 January 2012), Season 2011/12. Day monitoring program. 1 August 2012. Gnaraloo Turtle Conservation Program. Gnaraloo Station Trust, Western Australia. Available from: http://www.gnaraloo.com.au.\r\n \r\n Hattingh, K., R. Edman, F. Morgan & K. Riskas (2012b). Gnaraloo Cape Farquhar Rookery, Report on final reconnaissance survey (21-23 February 2012), Season 2011/12. Day monitoring program. 1 August 2012. Gnaraloo Turtle Conservation Program. Gnaraloo Station Trust, Western Australia.\r\n \r\n Hattingh, K., R. Edman, F. Morgan & K. Riskas (2012c). DRAFT Gnaraloo Turtle Conservation Program. Gnaraloo Bay Rookery and Gnaraloo Cape Farquhar Rookery, Final Report for Season 2011/12. Day monitoring program with Night

verification, Sampled nest survey, Crab burrow study and Community engagement. In peer review. Gnaraloo Station Trust, Western Australia. Available from: http://www.gnaraloo.com.au.\r\n \r\n Hattingh, K., R. Edman, F. Morgan & K. Riskas (2013). Gnaraloo Bay Rookery and Gnaraloo Cape Farquhar Rookery, Final Report, Season 2011/12. Day monitoring program with Night verification, Sampled nest survey, Crab burrow study and Community engagement. Gnaraloo Turtle Conservation Program. Gnaraloo Station Trust, Western Australia. Available from: http://www.gnaraloo.com.au.\r\n \r\n Heithaus, M.R., A. Frid, A.J. Wirsing, L. Bejder & L.M. Dill (2005). Biology of sea turtles under risk from tiger sharks at a foraging ground. Marine Ecology-Progress Series. 288:285-294.\r\n \r\n Heppell, S.S., C.J. Limpus, D.T. Crouse, N.B. Frazer & L.B. Crowder (1996). Population model analysis for the loggerhead sea turtles, Caretta caretta, in Queensland. Wildlife Research. 23:143-159.\r\n \r\n Hughes, G. (1974b). The sea turtles of south east Africa II. The biology of the Tongerland loggerhead turtle Caretta caretta L. (see notes for full title). Invest. Rep. Oceanogr. Res. Inst. S. Afr. 36:1-91.\r\n \r\n Hughes, G.R. (1999). The Tongaland sea turtle project - 1998/1999. Pietermaritzburg, South Africa: KZM Nature Conservation Service.\r\n \r\n Kamezaki, N., R. Argano, I. Baran, F. Bentivegna, M. Bradai, J. Caminas, P. Casale, G. Metrio, A. Demetropoulos, G. Gerosa, D. Haddoud, J. Houghton, L. Laurent & B. Lazar (2003). Loggerhead turtles nesting in Japan. In: Bolten, A. & B. Witherington, eds. Loggerhead sea turtles. Page(s) 210-217. Washington: Smithsonian Books.\r\n \r\n Karl, S.A., B.W. Bowen & J.C. Avise (1995). Hybridization among the Ancient Mariners - Characterization of Marine Turtle Hybrids with Molecular Genetic Assays. Journal of Heredity. 86:262-268.\r\n \r\n Kiessling, I (2003). Finding solutions: derelict fishing gear and other marine debris in northern Australia. National Oceans Office, Hobart. Available from: http://www.environment.gov.au/resource/finding-solutions-derelict-fishing-gear-and-other-marine-debris-northern-australia.\r\n \r\n Lewison, R.L. & L.B. Crowder (2007). Putting Longline Bycatch of Sea Turtles into Perspective. Conservation Biology. 21:79-86. Available from: http://www3.interscience.wiley.com/cgi-bin/fulltext/118487661/PDFSTART?CRETRY=1&SRETRY=0.\r\n \r\n Lewison, R.L., Freeman, S.A.& L.B. Crowder (2004). Quantifying the effects of fisheries on threatened species: the impact of pelagic longlines on loggerhead and leatherback sea turtles. Ecology Letters. 7:221&#15231.\r\n \r\n Limpus, C.J, D.J. Limpus, M. Horton & L. Ferris (2008). Loggerhead Turtle Mortality form Attempted Ingestion of Porcupine Fish. Marine Turtle Newsletter. 120:1-3.\r\n \r\n Limpus, C.J. (1985). A study of the Loggerhead Turtle, Caretta caretta, in eastern Australia. Ph.D. Thesis. Brisbane, Department of Zoology, University of Queensland.\r\n \r\n Limpus, C.J. (1995a). Conservation of marine turtles in the Indo-Pacific region. Brisbane: Queensland Department of Environment and Heritage.\r\n \r\n Limpus, C.J. (2008a). A biological review of Australian Marine Turtles. 1. Loggerhead Turtle Caretta caretta (Linneaus). Queensland Environment Protection Agency. Available from: http://www.epa.qld.gov.au/publications/p02785aa.pdf/A_Biological_Review_Of_Australian_Marine_Turtles_1_Loggerhead_Turtle_emCaretta_Caretta/em_Linnaeus.pdf.\r\n \r\n Limpus, C.J. & D. Reimer (1994). The Loggerhead Turtle, Caretta caretta, in Queensland: a population in decline. In: James, R., ed. Proceedings of the Australian Marine Turtle Conservation Workshop, Gold Coast 14-17 November 1990. Page(s) 39-59. Qld Dept Env. & Heritage. Canberra, ANCA.\r\n \r\n Limpus, C.J. & D.J. Limpus (2003). Loggerhead turtles in the equatorial and southern Pacific Ocean: A species in decline. In: Bolten, A. and B. Witherington, eds. Loggerhead Sea Turtles. Page(s) 199-210. Washington, D. C: Smithsonian Institution Press.\r\n \r\n Limpus, C.J., A. Fleay & M. Guinea (1984b). Sea turtles of the Capricornia section, Great Barrier Reef. Royal Society Queensland Symposium. Page(s) 61-78.\r\n \r\n Limpus, C.J., J.D. Miller, C.J. Parmenter, D. Reimer, N. McLachlan & R. Webb (1992). Migration of green (Chelonia mydas) and loggerhead (Caretta caretta) turtles to and from eastern Australian rookeries. Wildlife Research. 19(3):347-358.\r\n \r\n Limpus, C.J., P.J. Couper & M.A. Read (1994b). The loggerhead turtle, Caretta caretta, in Queensland: population structure in a warm temperate feeding area. Memoirs of the Queensland Museum. 37(1):195-204.\r\n \r\n Margaritoulis, D., R. Argano, I. Baran, F. Bentivegna, M. Bradai, J. Caminas, P. Casale, G. Metrio, A. Demetropoulos, G. Gerosa, D. Haddoud, J. Houghton, L. Laurent & B. Lazar (2003). Loggerhead sea turtles in the Mediterranean Sea: present knowledge and conservation practices. In: Bolten, A. & B. Witherington, eds. Loggerhead sea turtles. Page(s) 175-198. Washington: Smithsonian Books.\r\n \r\n Marquez, R. (1990). FAO Species Catalogue; Sea Turtles of the World. An annotated and illustrated catalogue of the sea turtle species known to date. FAO Fisheries Synopsis. 125 (11):pp 81. Rome: Food and Agriculture Organisation of United Nations.\r\n \r\n Mau, R (2003). Conservation and Management: The Nesting Turtles of Ningaloo. In: Carter, R., ed. Ningaloo Marine Turtle Conference. Exmouth: World Wildlife Fund.\r\n \r\n McCauley, S.J. & K.A. Bjorndal (1999). Conservation implications of dietary dilution from debris ingestion: sublethal effects in post-hatchling loggerhead sea turtles. Conservation Biology. 13(4):925-929.\r\n \r\n McClellan, C.M & A.J Read (2007). Complexity

and variation in loggerhead sea turtle life history. Biology Letters. 3:592-594. Royal Society. Available from: http://rsbl.royalsocietypublishing.org/content/3/6/592.abstract?sid=eedf0e2d-4ca4-4c46-beaa-0f252eba054b.\r\n \r\n Miller, J.D. (1985). Embryology of marine turtles. In: Gans C., F. Billet & P. F. A. Maderson, eds. Biology of Reptilia. 14A:269. New York, Wiley-Interscience.\r\n \r\n Moodie, E.G. (1979). Aspects of the feeding biology of the Loggerhead Turtle (Caretta caretta). Page(s) 105. Hons. Thesis. Townsville: James Cook University.\r\n \r\n Perdrau, M. (2002). Southern and Western Tuna and Billfish Fishery Data Summary 2001. Australian Fisheries Management Authority. Available from: http://www.afma.gov.au/information/publications/fishery/data_summ/docs/swtbf_2001.pdf.\r\n \r\n Perdrau, M. & J. Garvey (2005). Northern Prawn Fishery Summary Data 2004 Logbook Program. Canberra: Australian Fisheries Management Authority. Available from: http://www.afma.gov.au/information/publications/fishery/data_summ/docs/npf_2004.pdf.\r\n \r\n Plotkin, P.T. (1996). The occurrence and diet of juvenile loggerhead sea turtles, Caretta caretta, in the northwestern Gulf of Mexico. Chelonian Conservation and Biology. 2(1):78-80.\r\n \r\n Plotkin, P.T., M.K. Wicksten & A.F. Amos (1993). Feeding ecology of the loggerhead sea turtle Caretta caretta in the northwestern Gulf of Mexico. Marine Biology (Berlin). 115(1):1-May.\r\n \r\n Poiner, I.R. & A.N.M. Harris (1994). The incidental capture and mortality of sea turtles in Australia's northern prawn fishery. In: James, R., ed. Proceedings of the Australian Marine Turtle Conservation Workshop, Gold Coast 14-17 November 1990. Page(s) 127-135. Qld Dept Env. & Heritage. Canberra, ANCA.\r\n \r\n Poiner, I.R. & A.N.M. Harris (1996). Incidental capture, direct mortality and delayed mortality of sea turtles in Australia's northern prawn fishery. Marine Biology. 125:813-825.\r\n \r\n Preen, A.R. (1996). Infaunal mining: a novel foraging method of loggerhead turtles. Journal of Herpetology. 30(1):94-96.\r\n \r\n Prince, R.I. (1994b). Status of the Western Australian marine turtle populations: the Western Australian Marine Turtle Project 1986-1990. In: Russell, J., ed. Proceedings of the Australian Marine Turtle Conservation Workshop, Gold Coast 14-17 November 1990. Page(s) 1-14. Queensland Department of Environment and Heritage. Canberra, ANCA.\r\n \r\n Prince, R.I.T. (1993). Western Australian marine turtle conservation project: an outline of scope and an invitation to participate. Marine Turtle Newsletter. 60:Aug-14.\r\n \r\n Robins, C.M, J.B Sali & S.R Kalish (2002). Bycatch of sea Turtles in Pelagic Longline Fisheries - Australia. Fisheries Resources Research Fund. Canberra: Bureau of Rural Sciences.\r\n \r\n Salm, R.V., A.C. Jenson & V.A. Papastavrou (1993). Marine Fauna of Oman: Cetaceans, Turtles, Seabirds and Shallow Water Corals. Page(s) 66. Gland, IUCN.\r\n \r\n Spotila, J.R (2004). Sea turtles: a complete guide to their biology, behavior, and conservation. Baltimore, Maryland: The Johns Hopkins University Press and Oakwood Arts.\r\n \r\n Threatened Species Scientific Committee (TSSC) (2001x). Commonwealth Listing Advice on Incidental catch (bycatch) of Sea Turtle during coastal otter-trawling operations within Australian waters north of 28 degrees South. Available from: http://www.environment.gov.au/biodiversity/threatened/ktp/ottertrawl.html. In effect under the EPBC Act from 04-Apr-2001.\r\n \r\n Tucker, A.D., N.N. Fitzsimmons & C.J. Limpus (1995). Conservation implications of internesting habitat use by loggerhead turtles Caretta caretta in Woongarra Marine Park, Queensland, Australia. Pacific Conservation Biology. 2:157-166.\r\n \r\n Ward, P., Epe, S., Kreutz, D., Lawrence, E., Robins, C. & A. Sands (2008). Implementation of bycatch mitigations measures in Australia's pelagic longline fisheries: the effects of circle hooks on target and non-target catches. Final Report to the Natural Heritage Trust. Canberra: Bureau of Rural Sciences.\r\n \r\n Western Australian Department of Environment and Conservation (WA DEC) (2009). Marine turtles in Western Australia: Loggerhead Turtle. Available from: http://www.naturebase.net/content/view/2462/1401.\r\n \r\n White, D (2006). Marine Debris in Northern Territory Waters 2004 WWF Report. Sydney, WWF-Australia. Available from: http://awsassets.wwf.org.au/downloads/mo017_marine_debris_in_nt_waters_2004_1mar06.pdf.\r\n \r\n Whittier, J.M., F. Corrie & C. Limpus (1997). Plasma steroid profiles in nesting loggerhead turtles (Caretta caretta) in Queensland, Australia: Relationship to nesting episode and season. General and Comparative Endocrinology. 106:39-47.\r\n \r\n Wirsing, A.J., K. Crane, M.R. Heithaus, D. Charles & L.M Dill (2004). Pilot study of loggerhead turtles in the Shark Bay World Heritage Area: movements and community based conservation. Canberra: Department of the Environment and Heritage.\r\n \r\n Witherington, B.E. & R.E. Martin (1996). Understanding, assessing, and resolving light-pollution problems on sea turtle nesting beaches. Technical Report TR-2. Page(s) 73. Florida Marine Research Institute. Available from: http://research.myfwc.com/engine/download_redirection_process.asp?file=tr-2_3101.pdf&objid=2156&dltype=article.\r\n \r\n Wyneken, J. (1997). Sea Turtle Locomotion: Mechanisms, Behaviour and Energetics. In: Lutz, P. & J.A. Musick, eds. The Biology of Sea Turtles. Page(s) 165-194. Boca Raton: CRC Press.\r\n \r\n \r\n\r\n"