[1] "\r\n\r\n\t\r\n\r\n\r\n \r\n \r\n \r\n Rhincodon typus\r\n — Whale Shark\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 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 EPBC Legal Status and Documents\r\n \r\n \r\n Top\r\n \r\n\r\n\r\nEPBC Act Listing Status\r\n \r\n\t \r\n\t\t\t\r\n\t\t\t Listed as Vulnerable\r\n\t\t\t \r\n\t\t\t \r\n\t\t\t\t(Date effective 16-Oct-2001)\r\n\t\t\t \r\n\t\t\t \r\n\t\t\t\r\n\t\t\t\r\n\t\t\t Listed migratory -\r\n\t\t\t \r\n\t\t\t\tEPBC Act, \r\n\t\t\t \r\n\t\t\t\tBonn\r\n\t\t\t \r\n\t\t\t\r\n\t\t\t\r\n\t\t\t\r\n\t\t\r\n \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\t \r\n\t\t\t \r\n\t\t\t\tThreatened Species Scientific Committee (2015). Conservation Advice Rhincodon typus whale shark. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/66680-conservation-advice-01102015.pdf. In effect under the EPBC Act from 01-Oct-2015.\r\n\t\t\t \r\n\t\t\t \r\n\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\t\r\n\t\t\t \r\n\t\t\t \r\n\t\t\t\tThreatened Species Scientific Committee (2001). Commonwealth Listing Advice on Rhincodon typus (Whale shark). Available from: http://www.environment.gov.au/biodiversity/threatened/species/r-typus.html. In effect under the EPBC Act from 16-Oct-2001.\r\n\t\t\t \r\n\t\t\t \r\n\t\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). The recovery plan (DEH 2005) that was made for this species on 28/04/2005 ceased to be in effect from 1/10/2015.\r\n\t\t\t \r\n\t\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\tThere is no adopted or made Recovery Plan for this species\r\n \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\tNo Threat Abatement Plan has been identified as being relevant for this species\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 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 \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 Survey guidelines for Australia's threatened fish. EPBC Act survey guidelines 6.4\n\n (Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC), 2011) [Admin Guideline].\r\n\t \r\n\t \r\n\t Sharks and rays - 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 Christmas Island National Park Management Plan 2014-2024 (Director of National Parks, 2014) [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\tMigratory:List of Migratory Species (13/07/2000) (Commonwealth of Australia, 2000b) [Legislative Instrument]Recovery Plan:Whale Shark (Rhincodon typus) Recovery Plan 2005-2010 (Commonwealth of Australia, 2005ab) [Legislative Instrument]Threatened:Inclusion of species in the list of threatened species under section 178 of the Environment Protection and Biodiversity Conservation Act 1999 (24/09/2001) (Commonwealth of Australia, 2001d) [Legislative Instrument]\r\n \r\n\t State Government Documents and Websites\r\n\t\r\n\t\r\n\t NT:Threatened Species of the Northern Territory - Whale Shark Rhincodon typus (Woinarski, J. & H. Larson, 2006) [Information Sheet].\r\n State Listing Status\r\n\t \r\n\t WA:\r\n\t\t\t\r\n\t\t\t\tListed as Other protected fauna\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\t \r\n\t\t \r\n\r\n Non-statutory Listing Status\r\n\t \r\n\t IUCN:\r\n\t\t\r\n\t\t\t\tListed as Endangered\r\n\t\t\t\t (Global Status: IUCN Red List of Threatened Species: 2020.2 list)\r\n\t\t\t\r\n\t\t\t \r\n\r\n \r\n\r\n Naming\r\n \r\n\r\n Top\r\n \r\n\r\n\r\nScientific name\r\n \r\n Rhincodon typus [66680]\r\n \r\n Family\r\n \r\n Rhincodontidae:Orectolobiformes:Chondrichthyes:Chordata:Animalia\r\n \r\n

\r\n Species author\r\n \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\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.amonline.net.au/fishes/fishfacts/fish/rtypus.htm\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 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 (2001d). Inclusion of species in the list of threatened species under section 178 of the Environment Protection and Biodiversity Conservation Act 1999 (24/09/2001). F2005B02667. Canberra: Federal Register of Legislative Instruments. Available from: http://www.comlaw.gov.au/Details/F2005B02667. In effect under the EPBC Act from 16-Oct-2001.\r\n \r\n Department of the Environment and Heritage (DEH) (2005o). Whale Shark (Rhincodon typus) Recovery Plan: Issues Paper. Page(s) 26. DEH, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/recovery/r-typus-issues/pubs/r-typus-issues-paper.pdf.\r\n \r\n Department of the Environment and Heritage (DEH) (2005s). NON-CURRENT Whale Shark (Rhincodon typus) Recovery Plan 2005\u00962010. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/recovery/r-typus/index.html. In effect under the EPBC Act from 28-Apr-2005. Ceased to be in effect under the EPBC Act from 01-Oct-2015.\r\n \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\nRhincodon typus in Species Profile and Threats Database,\r\nDepartment of the Environment,\r\nCanberra.\r\nAvailable from:\r\nhttps://www.environment.gov.au/sprat.\r\nAccessed Tue, 18 Jan 2022 21:43:39 +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 \r\n Australian and State/Territory Government Legal Status\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n The WA Department of Conservation and Land Management (WA CALM) is responsible for the day-to-day management of Whale Sharks within Commonwealth Waters under a memorandum of understanding between WA CALM and the Commonwealth Department of the Environment (DEH 2005o).\n\nInternational: Listed on Annex I (Highly Migratory Species) of the United Nations Convention on the Law of the Sea(UNCLOS).\nThe Whale Shark is covered by protective legislation in the Republic of the Maldives, the Philippines and off the United States Atlantic and Gulf coasts (Pogonoski et al. 2002).\n\r\n \r\n \r\n \r\n \r\n \r\n Taxonomy\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n Smith first described this species as Rhiniodon typus in 1828 from a specimen collected at Table Bay, South Africa. The current scientific name of this species is Rhincodon typus (Paxton et al. 1989).\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 Whale Shark is a large filter-feeding shark characterised by a streamlined body with a flattened, broad head. It has a very large and wide mouth, positioned at the front of the head, with approximately 300 minute teeth in each jaw (Last & Stevens 1994). The first dorsal fin is much larger than the second. These sharks are greyish, bluish or brownish above, with a distinctive checkered pattern of creamy white spots between pale vertical and horizontal stripes (Martins & Knickle 2004). The Whale Shark has three prominent ridges along its flanks and a spiracle (small round hole) behind each eye (Last & Stevens 1994; Taylor 1994). This species has five large gill-slits, which are modified to function as filtering screens as well as to extract oxygen from the water (Last & Stevens 1994; Taylor 1994).\nThe Whale Shark is the world's largest fish, with the largest accurately measured specimen being 12 m in length (Karbhari & Josekutty 1986, cited in Colman 1997). Animals over 3 m in length are encountered worldwide and most reported specimens are between 4 and 10 m (Colman 1997).\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 Whale Shark is known from NSW, Queensland, Northern Territory, Western Australia and occasionally Victoria and South Australia, but it is most commonly seen in waters off northern Western Australia, Northern Territory and Queensland (Compagno 1984; Last & Stevens 1994).\nNingaloo Reef, off the Western Australian coast, is the main known aggregation site of Whale Sharks in Australian waters. Taylor (1996) suggests that this aggregation is due to seasonal concentrations of krill and other zooplankton, which are a food source for the Whale Shark.\nDetailed and informal surveys carried out in both 1991 and 1992 demonstrated that Whale Sharks congregate off Ningaloo Reef (Western Australia) from March to July, when the coral undergoes mass spawning. The number of Whale Sharks reaches a peak about two weeks after this coral spawning (DEH 2005o; Taylor 1996). Whale Shark aggregations around Ningaloo Reef are generally the greatest during La Niña years and are associated with the intensification of the Leeuwin Current in March (DEWHA 2008b).\nThe Whale Shark also seasonally aggregates in coastal waters off Christmas Island between December and January and in the Coral Sea between November and December (DEH 2005o). These seasonal aggregations are thought to be linked to localised seasonal 'pulses' of food productivity.\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 Whale Shark occurs in approximately 124 countries worldwide (Fowler 2000 cited in Chen & Phipps 2002). They have a broad distribution usually between latitudes 30° N and 35° S in tropical and warm temperate seas, both oceanic and coastal (Compagno 1984). Although Compagno (1984) suggests that this species prefers waters with temperatures between 21\u009625 °C, the Whale Sharks sighted at Ningaloo Marine Park in Western Australia are predominantly found in waters with temperatures averaging 27 °C (Norman 1999).\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 Yearly numbers of Whale Sharks in Ningaloo Marine Park are estimated to vary between 300 and 500 individuals (Meekan et al. 2006). Data on the global population size are not available (DEH 2005o).\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 In Australian waters, Ningaloo Reef, Christmas Island and the area of the Coral Sea within the Coringa-Herald National Nature Reserve and the Lihou Reef National Nature Reserve are all afforded a high level of protection through their status as protected areas under the EPBC Act. Additional protection to Ningaloo Reef is afforded through its status as a Marine Park under Western Australia's Conservation and Land Management Act 1984 (DEH 2005s).\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 The Whale Shark is an oceanic and coastal, tropical to warm-temperate pelagic shark. It is often seen far offshore, but also comes close inshore and sometimes enters lagoons of coral atolls. The Whale Shark is generally encountered close to or at the surface, as single individuals or occasionally in schools or aggregations of up to hundreds of sharks (Compagno 1984). Whale Sharks are generally found in areas where the surface temperature is 21\u009625 °C, preferably with cold water of 17 °C or less upwelling into it, and salinity of 34 to 34.5 parts per thousand (ppt) (Pogonoski et al. 2002). In Ningaloo Marine Park waters (Western Australia), sightings are most common in water temperatures around 27 °C (DEH 2005o).Sharks can reach maximum depths that are close to or greater than depths reported for other large fish that are found in the open sea, such as Blue Sharks (Prionace glauca) and Bigeye Thresher Sharks (Alopias superciliosus) (Carey & Scharold 1990; Nakano et al. 2003).\nResearch conducted in 2003 on Whale Sharks aggregating at Ningaloo Reef found that this species routinely moved between the sea surface and depth. Sharks spent at least 40% of their time in the upper 15 m of the water column and at least 50% of their time at depths equal to or less than 30 m. In general, daytime depths were greater than those at night (Wilson et al. 2006).\nDeeper dives were recorded in the open ocean and overall sharks spent about 1% of their time at depths greater than 300 m. The deepest recorded dive was 980 m, which was the measurement limit of tags used in 2004. Most of these deep dives occurred during the day. One shark recorded a constant depth of 980 m in water temperature of 2.2 °C for

at least 12 hours (Wilson et al. 2006).\nTemperature records gathered during research in 2003 (Wilson et al. 2006) indicated that Whale Sharks spent at least 90% of their time in water temperatures of 23\u009628 °C, but experienced a water temperature range of 4.2\u009628.7 °C (Wilson et al. 2006).\nOff the outer North West Shelf, Whale Sharks spend much of their time swimming near the seafloor, and can make dives to around 1000 m. Wilson and colleagues (2006) suggest that Whale Sharks are able to tolerate the colder temperatures associated with the deep ocean due to insulation provided by their body mass. The dives into deeper water are thought to primarily be for prey, such as krill, lantern fish, squid and jellyfish (DEWHA 2008b).\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 on the lifespan of the Whale Shark is limited. Taylor (1994) indicates that based on the late age of sexual maturity, estimated at around 30 years of age, the Whale Shark may be one of the longest living animals in the world, with an estimated lifespan of over 100 years. The Whale Shark is a livebearer, with an ovoviviparous mode of development; that is, it produces eggs which develop and hatch within the mother's body (Joung et al. 1996). A commercial fishing vessel off the east coast of Taiwan harpooned a pregnant Whale Shark, measuring about 10.6 m total length and weighing 16 tonnes in July 1995. About 300 embryos were found in the uteri, far exceeding the largest number of embryos reported for any shark (Joung et al. 1996).\nInformation about size at sexual maturity and longevity is sparse. The evidence suggests that sexual maturity in both sexes may not occur until the sharks are at least 9 m in length (Joung et al. 1996). It is unknown when and where this species breeds and very few juvenile Whale Sharks have been observed or captured (AMCS 2001). Whale shark pups are born at a fraction of their adult size, ranging from approximately 55\u009663 cm in length at birth (AMCS 2001; Taylor 1994).\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 The Whale Shark is a suction filter feeder (Compagno 1984). It feeds on a variety of planktonic and nektonic prey, including small crustaceans, small schooling fishes such as sardines, anchovies and mackerel and, to a lesser extent, on small tuna and squid (Compagno 1984; Last & Stevens 1994). Whale Sharks at Ningaloo Reef have been observed feeding on swarms of the tropical krill (Pseudeuphausia latifrons) (Norman 1999; Taylor 1994). Two Whale Shark faecal samples from Ningaloo Reef contained eyes, legs, and fragments of exoskeleton from crustacean prey, namely Pseudeuphausia latifrons, suggesting that Whale Sharks aggregate seasonally off Ningaloo Reef to predominantly feed on this tropical krill (Norman 1999, Wilson & Newbound 2001 cited in DEH 2005o). At Christmas Island, the Whale Sharks have been observed feeding on localised concentrations of mysids (Anisomysis spinata) and Christmas Island Red Crabs (Gecarcoidea natalis) (Norman 1999). In 2008 DNA sampling of a Whale Shark faecal sample revealed the presence of Christmas Island Red Crab larvae (Meekan et al. 2009).\nThree faecal samples analysed by Norman (1999) revealed exoskeletal remains of zooplankton (specifically calanoid and harpacticoid copepods), crustaceans (specifically larval decapods) and the scales of small fishes.\nWhale Sharks have been observed feeding passively by swimming forward with mouth agape, and feeding actively by opening their mouths and sucking in prey. Whale Sharks have also been reported hanging vertically in the water while feeding (Colman 1997); often it assumes a vertical position in schools of baitfish and opens its mouth so the baitfish can be sucked in (Compagno 1984). The species feeds at or close to the surface (Compagno 1984).\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 There are CITES identification documents available for the Whale Shark.\nThe large size, free-swimming epipelagic nature, and sporadic appearance of Whale Sharks create numerous technical and methodological problems, making their study intrinsically difficult. Population studies require large sample sizes and this is a major problem when working with rarely encountered species, especially if individuals cannot be captured or restrained (Colman 1997).\nBetween April and May 2005, Stewart and colleagues (2005) conducted field research on the Whale Shark at Ningaloo Reef, Western Australia. This research documented the movements and behaviour of Whale Sharks that aggregated seasonally to feed at Ningaloo Reef. During the research, the research team attached pop-up archival tags, or PAT tags (Microwave Telemetry, Inc.) to nine Whale Sharks and SPLASH tags (Wildlife Computers) to six Whale Sharks, including three that had already been tagged with PAT tags (Stewart et al. 2005).\nPAT tags are designed to measure and store information on ambient light, depth and water temperature at one-hour intervals. PAT tags are programmed to detach from the Whale Shark in about five to eight months after attachment. Once detached, the tag will float to the sea surface and transmit stored data to earth-orbiting satellites for a certain number of days until the batteries expire (Stewart et al. 2005).\nSPLASH tags are programmed to sample and store (in electronic memory) information about hydrostatic pressure, water temperature and ambient light at 60 second intervals. When the transmitter float is at the sea-surface, SPLASH tags are also programmed to transmit summary histogram data on maximum dive depth (m), dive duration (min), time-at-depth and time-at-temperature to earth-orbitting ARGOS satellites approximately every 45 seconds (Stewart et al. 2005).\nBefore the tags were

actually attached to the sharks, the Whale Sharks were located using aircraft. Once a Whale Shark was spotted the aircraft directed a charter vessel to position snorkelers ahead of the approaching shark in preparation for tagging (Stewart et al. 2005).\nPAT tags are applied to the Whale Shark's dorsal fin using a hand spear and are attached with a small stainless steel dart (Stewart et al. 2005). The SPLASH tag is secured with a pin that is inserted through the fin (Stewart et al. 2005).\nWhale Sharks have a tendency to be site-faithful (philopatric), returning regularly to the same seasonal feeding locations (CITES Prop. 12.35 cited in DEH 2005o). For example, it has been possible to identify particular individuals (using photographic identification) returning to Ningaloo Marine Park and the Maldives in successive seasons (Norman 2004 cited in DEH 2005o). During their 2005 field research, Stewart and colleagues (2005) photographed individuals at Ningaloo Reef to facilitate long-term identification using spot patterns and scars.\nThere is a global program between both citizens and scientists admnistered by ECOCEAN to monitor and identify individual Whale Sharks. This program encourages volunteer divers to log photos of Whale Sharks via the ECOCEAN Whale Shark Photo-identification Library.\n\r\n \r\n \r\n \r\n \r\n Threats\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n Predation\nThere are no known predators of adult Whale Sharks, however, the Blue Shark (Prionace glauca), the Blue Marlin (Makaira nigricons) and the Killer Whale (Orcinus orca) are all predators of juvenile Whale Sharks (Kukuyev 1996 cited in DEH 2005o; O'Sullivan & Mitchell 2000 cited in Norman 2005; A. Goorah pers. comm. cited in Norman 2005). Although unconfirmed, an attack on a sub-adult Whale Shark photographed in north-western Australia in 2003 is believed to have been inflicted by a Great White Shark (Carcharodon carcharias) (R. Mau pers. comm. to B. Norman cited in DEH 2005o).\nHabitat Modification and Degradation\nIt is possible that increased levels of noise and pollution resulting from an increase in boat traffic may have a negative impact on the migration patterns normally followed by Whale Sharks, through disturbance to habitat or disturbance to sharks (DEH 2005o).\nShipping and Boating\nAlthough the Whale Shark's skin is thicker and tougher than any other species in the world, the species may be behaviourally vulnerable to boat strike. They spend a significant amount of their time close to the surface of the water (Gunn et al. 1999 in DEH 2005o; Norman 1999) and several sharks bear scars that have probably been caused by boat contact (Norman 2004 cited in DEH 2005o; Stevens 2007 cited in DEWHA 2008b). There have been several reports of Whale Sharks being impaled on the bows of larger ships in other regions (Norman 1999).\nCommercial Fishing\nIn Taiwan, the Whale Shark is caught commercially by harpoon. Occasionally small individuals are also caught on long-lines or by set nets in coastal waters, except in the shallow seas in the north and north-west of the country. Like most commercially hunted sharks, the Whale Shark population around Taiwan seems to be decreasing. In the 1970s and early 1980s, it was not unusual for fishermen to catch 30\u0096100 Whale Sharks in one season in the Peng Hu area, a group of over 60 islands off the south-west coast of Taiwan. By the late 1980s, some seasons produced less than 10. According to records from An-Ping Harbour (a major landing site for Whale Sharks about 130 km south-east of the Peng-Hu Island), more than 70 individuals were caught in 1992, but only two in 1993 and 14 in 1994. In 1996, Whale Shark meat sold for 400 New Taiwanese Dollars per kg, which is the highest price for the flesh of any commercial shark species. Considering the large quantity of meat obtained from even a small Whale Shark, commercial fishermen will continue targeting it (Joung et al. 1996).\nIn the past, harpoon fisheries have been reported from India, Pakistan, Indonesia and Iraq. A seasonal (April\u0096May) fishery existed in the Philippines, where 90 sharks were taken during the 1996 season (Colman 1997). It is now protected in Philippine waters. The Whale Shark may also be taken in China, and has been captured and utilised in Senegal. It is eaten either fresh or dried and salted, and the oil is used to treat boat hulls in Pakistan (Compagno 1984). Other uses of Whale Shark products are for the manufacture of shoe polish and as a treatment for some skin diseases. The processing of Whale Shark fins and fin rays has been reported in India, at least partly to supply the growing external demand for Whale Shark fins and meat (Hanfee 1998).\nIt is captured in significant numbers by directed (and bycatch) fisheries in South-East Asia, which, if they continue, could lead to significant declines of Whale Shark numbers. Increased protection and bans on fishing would help to alleviate the pressures on its populations. There is some evidence that they may move very long distances (e.g. across the Pacific), so heavy fishing in Asia (and other areas) may directly impact global populations (C. Simpfendorfer 1999, pers. comm. cited in Pogonoski et al. 2002).\nRecent evidence suggests that in one fishery alone in India as many as 1000 Whale Sharks might have been killed in 1999\u00962000. However, since mid-2001, the Whale Shark has been protected in Indian waters. Although many countries have protected it, illegal hunting still continues, as there are often inadequate resources to ensure the law is upheld (AMCS 2001).\nIllegal, unreported and unregulated fishing\nWhale Sharks may be caught by illegal, unreported and unregulated fishers in the north-west marine region of Australia, however there are no records of this occurring. In Indonesian waters, Whale Sharks are directly targeted for their fins and meat (White & Cavanagh 2007 cited in DEWHA

2008b).\nDisturbances of important habitat\nWhale sharks rely on coral reef habitats around Ningaloo, which attract krill and zooplankton, the sharks' main prey. Deterioration or destruction of important seasonal coral reef habitat and feeding areas through coral bleaching events, climate change and other anthropogenic distrurbances (for exapmle oil spills), may pose a threat to Whale Sharks (Stewart & Wilson 2005 cited in DEWHA 2008b)\nDuring the late 1980s, there was a decline in Whale Shark numbers on Ningaloo Reef which was thought to be associated with the destruction of corals by the coral-eating sea snail, Drupella cornus (Taylor 1996). These sea snails mainly targeted the fast growing Acropora coral species, which thrive in shallow water and make a major contribution to coral spawning. The reduction in coral spawning is thought to have resulted in less food for krill and zooplankton that Whale Sharks feed on. This resulted in fewer Whale Sharks migrating to Ningaloo to feed (Taylor 1996).\nTourism\nWhale Sharks at Ningaloo Reef have generated a significant number of tourism industries including boat and flight tours as well as snorkel and dive tours. These activities have the potential to negatively affect Whale Shark behaviour, habitat and ecology (DEWHA 2008b). Repeated interactions, such as touching by divers and snorkellers, may result in Whale Sharks avoiding some waters, which may include critical habitat (Martin 2007 cited in DEWHA 2008b). Whale Shark tourism around Ningaloo Reef is well managed and hence is not thought to have a significant impact (Davis et al. 1997 cited in DEWHA 2008b).\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 The objective of the Whale Shark (Rhincodon typus) Recovery Plan 2005\u00962010 (DEH 2005s) is to maintain existing levels of protection for the Whale Shark in Australia whilst working to increase the level of protection within the Indian Ocean and South-East Asian region. The goal of this objective is to enable population growth in order to remove the Whale Shark from the EPBC Act.\nAlthough there are several different threats to the Whale Shark, including both natural threats and those caused anthropogenically, the Whale Shark (Rhincodon typus) Recovery Plan 2005\u00962010 only addresses anthropogenic threats which can be managed effectively and realistically (DEH 2005s).\nThe Recovery Plan (DEH 2005s) identifies two actions to manage anthropogenic threats and achieve the recovery objective.\n\nThe first is to increase the level of cooperation with other range states (countries that have jurisdiction over any part of a species' distribution), particularly in the Indian Ocean and South-East Asian region, to protect the Whale Shark through engagement in multilateral forums such as the Convention on the Conservation of Migratory Species of Wild Animals (CMS). Ideally, increased cooperation will result in range state agreement to:reduce fishing pressures on the species in the waters of other regional range states\nhalt the decline of the species in regional range states.The second action is to monitor numbers of the Whale Shark visiting Australian waters to:determine the rate of population change and population size by undertaking scientifically robust, regular and repeatable population surveys\nidentify any emerging actual impacts that will have an immediate impact on the species and thus on its recovery, and to facilitate the development of appropriate responses.\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 Whale Shark has been identified as a conservation value in the North-west (DSEWPaC 2012y) and Temperate East (DSEWPaC 2012aa) marine regions. See Schedule 2 of the North-west Marine Bioregional Plan (DSEWPaC 2012y) for regional advice. Maps of Biologically Important Areas have been developed for Whale Shark in the North-west (DSEWPaC 2012y) Marine Region 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 - sharks\" for the Temperate East (DSEWPaC 2012aa) Marine Region and the \"species group report card - sharks and sawfishes\" for the North-west (DSEWPaC 2012y) Marine Region 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 There have been a number of studies conducted on the Whale Shark. Summaries or reviews of the species' biology, ecology and occurrence are addressed by Joung and colleagues (1996), Taylor (1996), Colman (1997), Norman (1999), Eckert and Stewart (2001) and Wilson and colleagues (2001, 2006). Sleeman and colleagues (2010) have undertaken study of the possible factors behind variable abundance at Ningaloo National Park.\n\r\n \r\n \r\n \r\n \r\n Management Documentation\r\n \r\n \r\n Top\r\n \r\n \r\n \r\n The Whale Shark (Rhincodon typus) Recovery Plan 2005\u00962010 (DEH

2005s), the Whale Shark (Rhincodon typus) Recovery Plan: Issues Paper (DEH 2005o) and the National Plan of Action for the Conservation and Management of Sharks (Shark-Plan) (DAFF 2004) provide brief biological overviews and management recommendations for the Whale Shark.\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 Australian Marine Conservation Society (AMCS) (2001). Whale Shark Public Awareness Project Information Pamphlet. Page(s) 4. AMCS & the National Heritage Trust.\r\n \r\n Carey, F.G. & J.V. Scharold (1990). Movements of blue sharks (Prionace glauca) in depth and course. Marine Biology. 106:329-342.\r\n \r\n Chen, V.Y. & M.J. Phipps (2002). Management and Trade of Whale Shark in Taiwan. Traffic East Asia - Taipei.\r\n \r\n Colman, J.G. (1997). A review of the biology and ecology of the whale shark. Journal of Fish Biology. 51:1219-1234.\r\n \r\n Compagno, L.J.V. (1984). Part 1 - Hexanchiformes to Lamniformes. 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