



Australian Government  
Department of the Environment

# Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*)



2014

The issues paper linked to this recovery plan is obtainable from:  
[www.environment.gov.au/resource/recovery-plan-grey-nurse-shark-carcharias-taurus](http://www.environment.gov.au/resource/recovery-plan-grey-nurse-shark-carcharias-taurus)

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# Abbreviations

AFMA	Australian Fisheries Management Authority, Commonwealth
BIA	Biologically Important Area
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DoA	Department of Agriculture, Commonwealth
DoE	Department of the Environment, Commonwealth
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
HSI	Humane Society International
IUCN	International Union for Conservation of Nature
MNES	Matters of national environmental significance
NSRG	National Shark Recovery Group
NSW DPI	New South Wales Department of Primary Industries
SPRAT	Species Profile and Threats Database
TRAFFIC	Trade Records Analysis of Flora and Fauna in Commerce
TSSC	Threatened Species Scientific Committee

# 1 Summary

This document constitutes the Australian National Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*).

The plan considers the conservation requirements of the species across its range, identifies the actions to be taken to ensure the species' long-term viability in nature and indicates the parties that will undertake those actions. This plan replaces the 2002 Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) in Australia and should be read in conjunction with the Issues Paper for the Grey Nurse Shark.

A review of the 2002 Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) in Australia was finalised in January 2009. The review noted that since 2002, all but one of the 19 key aggregation sites listed as 'habitat critical to the survival of the species' in the recovery plan had been given some level of protection. The review found it was not possible to determine if the east coast population had shown any sign of recovery since the implementation of the plan and identified an ongoing need to maintain a recovery plan for the species. The review also found no reason to alter the status of the east coast population from critically endangered, or the west coast population from vulnerable, under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The review concluded that a new recovery plan should be developed to remove the completed actions and include new conservation priorities.

In addition to the grey nurse shark listing under Commonwealth legislation, the species is protected in the coastal waters of Tasmania, South Australia, Victoria and Western Australia, and protected in the coastal waters of New South Wales and Queensland with exemptions or a defence to prosecution for shark control programs for bather protection (e.g. beach meshing and/or drumlining).

The principal threats and likely contributors to the lack of grey nurse shark recovery in Australia are mortality resulting from incidental (accidental and/or illegal) capture by commercial and recreational fishers and from shark control activities. Other potential threats to the species include impacts from ecotourism, collection for public aquaria, pollution and disease and ecosystem effects as a result of habitat modification and climate change.

This recovery plan sets out the research and management actions necessary to stop the decline of, and support the recovery of, the grey nurse shark in Australian waters.

The overarching objective of this recovery plan is to assist the recovery of the grey nurse shark in the wild, throughout its range in Australian waters, with a view to:

- improving the population status, leading to future removal of the grey nurse shark from the threatened species list of the EPBC Act
- ensuring that anthropogenic activities do not hinder the recovery of the grey nurse shark in the near future, or impact on the long term conservation status of the species.

An accompanying issues paper has also been developed to provide background information on the biology, population status and threats to the grey nurse shark. Both the issues paper and the recovery plan can be found at: [www.environment.gov.au/resource/recovery-plan-grey-nurse-shark-carcharias-taurus](http://www.environment.gov.au/resource/recovery-plan-grey-nurse-shark-carcharias-taurus)

## 2 Background

### 2.1 Species description and distribution in Australian waters

The grey nurse shark (*Carcharias taurus*) is one of three species belonging to the family Odontaspidae. It is known as the sand tiger shark in the United States of America, and the spotted ragged-tooth shark in South Africa. The grey nurse shark is reported to have separate and distinct populations and is found mostly in inshore regions in cool temperate to sub-tropical waters (Compagno, 1984; Last & Stevens, 2009). Significant declines have occurred throughout its range, resulting in grey nurse shark populations now being restricted to the east coasts of North and South America, South Africa and the east and west coasts of Australia (Musick et al., 1993; Lucifora et al., 2002; Otway et al., 2004).

The grey nurse shark is considered to have slow growth, be long-lived, present late onset sexual maturity and have low fecundity. While the average

life span of the grey nurse shark in the wild is unknown, studies in captivity in South Africa indicate they may live up to 35 years (Smith et al., 1998).

In Australia, the grey nurse shark has an inshore coastal distribution primarily in sub-tropical to cool temperate waters on the continental shelf. There are two separate, genetically distinct grey nurse shark populations in Australian waters—one on the east coast and one on the west coast (Stow et al., 2006). Grey nurse sharks have been caught only rarely in the Arafura Sea and have not been identified in Tasmanian waters (Read & Ward, 1986; Last & Stevens, 2009). The east coast population covers a range of approximately 2700 km and extends from the Capricornia coast (central Queensland) to Narooma in southern New South Wales (Otway et al., 2003; Bansemer, 2009; Otway et al., 2009). Sightings data from the New South Wales Department of Primary Industries (NSW DPI) includes sightings as far south as the NSW/Victoria border (NSW DPI, 2002). The range of the west coast population is less well known, however records indicate that the species is



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widely distributed from the North West Shelf (including coastal waters in Exmouth Gulf), south to coastal waters near Cocklebidy in the Great Australian Bight (McAuley et al., 2002; Cavanagh et al., 2003), covering a range of approximately 2900 km.

## 2.2 Population trends

Prior to 1998, limited data describing the spatial and temporal patterns of abundance of the grey nurse shark along the east coast of Australia were available (Pepperell, 1992; Reid & Krogh, 1992; Krogh, 1994; Dudley, 1997). In the 1960s, the grey nurse shark was anecdotally known to aggregate at approximately 60 sites along the east coast of Australia, with at least 30 individuals observed at each site (Cropp, 1964). However, later surveys (1999, 2000 and 2003) conducted by NSW DPI highlighted that the grey nurse shark was absent from many of the sites occupied during the 1960s and, at the time of these surveys, there were only a few sites where the species could be reliably observed (Otway et al., 2003; Bennett & Bansemer, 2004). Similar declines were identified in both the bather protection programs and game fishing records (Pepperell, 1992), suggesting the grey nurse shark on the east coast had experienced a dramatic decline in population numbers over the latter half of the 20th century.

Recent research has obtained relatively robust estimates for the east coast grey nurse shark population. All estimates put the total east coast population above 1131 individuals, with the highest estimate being 2142 individuals (Bansemer, 2009; Bansemer & Bennett, 2010; Cardno Ecology Lab, 2010). An estimate of approximately 1365 individual grey nurse sharks is considered the most robust estimate currently available for the east coast population (Cardno Ecology Lab, 2010).

Population trends in the west coast population are less well known and estimates of population size have not been made. The primary source of anthropogenic mortality has been from incidental capture by the demersal gillnet fishery that operates between Steep Point, Western Australia and the South Australian border (Chidlow et al., 2006). Analysis of data from

this fishery (up to 1997) indicates that the grey nurse shark was relatively abundant in temperate Western Australian waters in the mid to late 1990s (Cavanagh et al., 2003). However, after listing of the species in 1997, catch-rate reporting on this species effectively stopped, making more recent assessments of population size and trends difficult (Chidlow et al., 2006).

## 2.3 Aggregation sites – habitat critical to the survival of the grey nurse shark

Grey nurse sharks tend to be found in groups at specific locations (Otway et al., 2003). These locations are known as aggregation sites. Grey nurse sharks are often observed aggregating around inshore rocky reefs or islands. At these locations they are typically found near the sea bed (at depths of 10–40 m) in deep sandy or gravel filled gutters, or in rocky caves (Otway & Burke, 2004; Dicken, 2006; Last & Stevens, 2009). Otway et al., (2003) defined ‘key aggregation sites’ as being locations where five or more grey nurse sharks were consistently found throughout the year and recommended that these sites be considered habitat critical to the survival of the species. For the purposes of this recovery plan, the Otway et al., (2003) definition of key aggregation sites has been used and, as in the 2002 Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) in Australia (EA, 2002), these sites have been considered to be the areas of habitat critical to the survival of the species.

Confirmed key aggregation sites in Australian waters are summarised in Table 1. There are currently four sites identified in Queensland waters, 13 sites located in New South Wales waters and two in Commonwealth waters.

There are also a number of potential key aggregation sites identified in Western Australian waters and potentially further sites in New South Wales waters. These sites require further investigation to confirm if they meet the requirements of five or more grey nurse sharks being consistently found there throughout the year.

Table 1. Known key aggregation sites critical to the survival of the grey nurse shark in Australian waters

Queensland Waters
Wolf Rock off Rainbow Beach
Cherubs Cave off Moreton Island
Henderson's Rock off Moreton Island
Flat Rock off North Stradbroke Island
New South Wales Waters
Julian Rocks near Byron Bay
North Solitary Island (Anemone Bay)
South Solitary Island (Manta Arch)
Green Island near South West Rocks
Fish Rock near South West Rocks
Mermaid Reef near Laurieton
The Pinnacle near Forster
Big Seal, Seal Rocks
Little Seal, Seal Rocks
Little Broughton Island near Port Stephens
Magic Point at Maroubra, Sydney
Tollgate Islands near Batemans Bay
Montague Island near Narooma
Commonwealth Waters (off New South Wales Coast)
Pimpernel Rock off Brooms Head (northern section of Solitary Islands Marine Park)
Cod Grounds off Laurieton



### 3 Conservation status

The grey nurse shark has been protected in New South Wales waters since 1984 and nationally since 1996. Since October 2001, grey nurse sharks

have been listed as two separate populations under the EPBC Act.

The grey nurse shark is currently listed as:

Commonwealth:	The east coast population is listed as critically endangered and the west coast population is listed as vulnerable under the EPBC Act.
New South Wales:	Critically Endangered ( <i>Fisheries Management Act 1994</i> )
Queensland:	Endangered ( <i>Nature Conservation Act 1992</i> ) Protected ( <i>Fisheries Act 1994</i> )
Victoria:	Protected ( <i>Fisheries Act 1995</i> ) Threatened ( <i>Flora and Fauna Guarantee Act 1988</i> )
Tasmania:	Protected ( <i>Fisheries Regulations 1996</i> )
Western Australia:	Threatened ( <i>Wildlife Conservation Act 1950</i> ) with a ranking of vulnerable
IUCN:	International Union for Conservation of Nature (IUCN) Red List, Worldwide: listed as vulnerable (2009); East coast of Australia subpopulation: listed as critically endangered (2003); and Western Australia subpopulation: listed as near threatened (2003).

## 4 Reasons for listing under the EPBC Act

The grey nurse shark was listed as vulnerable under the EPBC Act in August 2000. This listing was based on declining population trends, the life history characteristics of the species, limited knowledge of their ecology and abundance, and the fact that the species was still under pressure from some sectors of the Australian commercial and recreational fishing industries.

In October 2001, the grey nurse shark was listed as two separate populations under the EPBC Act. Given the serious decline in numbers in the east coast population of the grey nurse shark, this population is now listed as critically endangered. The size of the west coast population is unknown but considering the species life history characteristics and continuing incidental impacts from fishing, this population remains listed as vulnerable under the Western Australian *Wildlife Conservation Act 1950* and the EPBC Act.

## 5 Evaluation of performance of the previous Recovery Plan for the Grey Nurse Shark

A recovery plan for the grey nurse shark was made in June 2002 (EA, 2002). Under the EPBC Act (section 279(2)), recovery plans must be reviewed every five years.

The purpose of the review is to summarise the actions undertaken against those specified in the recovery plan, and to assess whether:

- there is an ongoing need for a recovery plan under the EPBC Act
- the recovery plan needs to be varied to ensure further protection for the species.

A review of the 2002 Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) in Australia (EA, 2002) was completed in January 2009 (DEWHA, 2009). This review found that progress had been made on most of the 40 actions listed in the recovery plan. Of the 40 actions, 12 had been completed, 25 had been partially completed and were considered to be ongoing, and three had little or no action recorded against them. A summary of the status of the actions identified in the 2002 recovery plan is provided at Appendix 1.

Importantly, the review noted that since 2002, all but one of the 19 key aggregation sites listed as ‘habitat critical to the survival of the species’ in the 2002 recovery plan had been given some level of protection (DEWHA, 2009). This included: the declaration of critical habitats, marine parks and fishing closures in New South Wales; grey nurse shark protection areas and marine national park zones in Queensland; and marine reserves in Commonwealth waters.

These key aggregation sites have not been placed on the EPBC Act Register of Critical Habitat. Seventeen of these sites are in state jurisdiction and are therefore outside the scope of the critical habitat provisions of the EPBC Act. The remaining two sites,

Pimpernel Rock and the Cod Grounds, are within Commonwealth areas and are protected as Commonwealth marine reserves, therefore further protection would not be gained by placing them on the Critical Habitat Register.

Despite progress against the listed actions, the 2009 review:

- concluded it was not possible to determine if the east coast population of the grey nurse shark had shown any sign of recovery
- highlighted that since the introduction of the original recovery plan there had only been a small number of official reports of incidental capture of grey nurse sharks from the commercial and recreational fishing sectors and that this was likely to be an underestimate of the actual take
- highlighted that the New South Wales and Queensland shark control programs were a significant and ongoing source of mortality for the east coast grey nurse shark population
- found no reason to alter the status of the east coast population from critically endangered or the west coast population from vulnerable
- identified an ongoing need to maintain a recovery plan for the species and recommended that a new recovery plan be developed to remove the completed actions and include new conservation priorities.

This new recovery plan builds on the 2002 Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) in Australia (EA, 2002) and was developed by the Department of the Environment (DoE) in consultation with representatives from Australian and state government agencies, commercial and recreational fishers, environmental non-government organisations and research agencies.

An accompanying issues paper was also developed to provide detailed background information on the biology, population status and threats to the grey nurse shark, as well as to identify research and management priorities. The Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) 2014 should

therefore be read in conjunction with the Issues Paper for the Grey Nurse Shark (*Carcharias taurus*) 2014 (DoE, 2014). The Issues Paper can be downloaded from the department's website at: [www.environment.gov.au/resource/recovery-plan-grey-nurse-shark-carcharias-taurus](http://www.environment.gov.au/resource/recovery-plan-grey-nurse-shark-carcharias-taurus)



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## 6 Threats

Historically (1950s through to the 1970s), the grey nurse shark was fished in eastern Australia for its oil, flesh, skin and fins. Due to its fierce appearance and being mistaken for other sharks that posed a danger to humans, large numbers were also killed by recreational spear fishers and line fishers who targeted the sharks at their aggregation sites (EA, 2002). The protection of grey nurse sharks under state and Commonwealth legislation means that this species can no longer be targeted by fishers.

The principal current threats to the grey nurse shark in Australia are similar to those identified in the 2002 recovery plan. They can be summarised as:

- mortality related to incidental (accidental and/or illegal) capture by commercial and recreational fisheries
- mortality related to shark control activities such as beach meshing or drumlining.

Other potential threats to the species include impacts from ecotourism, collection for public aquaria, pollution and disease and ecosystem effects as a result of habitat modification and climate change—including changes in sea temperature and ocean acidification.

## 7 Populations that require protective measures

Both the Australian east coast population (currently listed as critically endangered under the EPBC Act) and the west coast population (currently listed as vulnerable under the EPBC Act) are covered under this recovery plan.

Differences in genetic structure have been shown to exist between eastern and western populations, inferring limited or zero dispersal between these populations (Stow et al., 2006). The isolation of the

Australian grey nurse shark populations has important implications for the conservation management of this species, as natural migration—and therefore replenishment of diminished populations—between the two Australian populations and/or those of other locations is not expected to occur.



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## 8 Objectives

The overarching objective of this recovery plan is to assist the recovery of the grey nurse shark in the wild, throughout its range in Australian waters, with a view to:

- improving the population status, leading to future removal of the grey nurse shark from the threatened species list of the EPBC Act
- ensuring that anthropogenic activities do not hinder the recovery of the grey nurse shark in the near future, or impact on the conservation status of the species in the future.

As the east coast population is considered to be critically endangered, this population will be the primary focus of the actions outlined in this plan, with an emphasis placed on monitoring and compliance. Although the proposed actions are still relevant to the west coast population, further information is required to better understand the status of the population and the importance of critical habitat sites to that population.

The specific objectives of this recovery plan are to:

Objective 1: Develop and apply quantitative monitoring of the population status (distribution and abundance) and potential recovery of the grey nurse shark in Australian waters.

Objective 2: Quantify and reduce the impact of commercial fishing on the grey nurse shark through incidental (accidental and/or illegal) take, throughout its range.

Objective 3: Quantify and reduce the impact of recreational fishing on the grey nurse shark through incidental (accidental and/or illegal) take, throughout its range.

Objective 4: Where practicable, minimise the impact of shark control activities on the grey nurse shark.

Objective 5: Investigate and manage the impact of ecotourism on the grey nurse shark.

Objective 6: Manage the impact of aquarium collection on the grey nurse shark.

Objective 7: Improve understanding of the threat of pollution and disease to the grey nurse shark.

Objective 8: Continue to identify and protect habitat critical to the survival of the grey nurse shark and reduce the impact of threatening processes within these areas.

Objective 9: Continue to develop and implement research programs to support the conservation of the grey nurse shark.

Objective 10: Promote community education and awareness in relation to grey nurse shark conservation and management.



## 9 Actions to achieve the specific objectives



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Actions identified for the recovery of the species covered by this plan are described below. Some of the objectives are long term and may not be achieved prior to the scheduled five year review of the recovery plan.

Priorities assigned to actions should be interpreted as follows:

- |             |  |
|-------------|--|
| Priority 1: | Taking prompt action is necessary in order to mitigate the key threats to the grey nurse shark and also provide valuable information to help identify long-term population trends. |
| Priority 2: | Action would provide a more informed basis for the long-term management and recovery of the grey nurse shark.  |
| Priority 3: | Action is desirable, but not critical to the recovery of the grey nurse shark or assessment of trends in that recovery.  |

Objective 1: Develop and apply quantitative monitoring of the population status (distribution and abundance) and potential recovery of the grey nurse shark in Australian waters.

Action	Description	Priority	Performance Criteria	Responsible agencies and potential partners	Indicative costing Only priority 1 actions are costing
1.1	Monitor and re-survey grey nurse shark populations to assess population trends and dynamics, including estimates of population growth and mortality.	1	<ul style="list-style-type: none"> <li>A monitoring program to assess population trends and dynamics has been developed (including identifying appropriate techniques) and appropriate timeframe between surveys established (link to Action 1.2, Objective 9).</li> <li>Annual monitoring and reporting of available mortality data.</li> <li>Links to adaptive management response established as required.</li> </ul>	DoE, state governments and research agencies	Core government business
1.2	Develop monitoring protocols and establish a national database to record data collected on grey nurse sharks, to assist with population monitoring.	1	<ul style="list-style-type: none"> <li>Monitoring protocols developed (including testing different monitoring techniques) and database established.</li> <li>Annual reporting/consolidation of monitoring data undertaken and ongoing.</li> <li>Database maintained and updated annually.</li> </ul>	DoE, state governments and research agencies	Core government business
1.3	Evaluate the use of and develop new population models, using reliable data sets as they are collected, to reassess changes in extinction risks.	2	<ul style="list-style-type: none"> <li>Population Viability Analysis (PVA) evaluated and if appropriate, utilised following the acquisition of essential population data.</li> <li>Other population models also considered and utilised where considered more appropriate than PVA.</li> <li>Population modelling available to assist management decision making.</li> </ul>	State governments and research agencies, DoE	

Objective 2: Quantify and reduce the impact of commercial fishing on the grey nurse shark through incidental (accidental and/or illegal) take, throughout its range.

Action	Description	Priority	Performance Criteria	Responsible agencies and potential partners	Indicative costing Only priority 1 actions are costing
2.1	Monitor the bycatch and mortality of grey nurse sharks in relevant fisheries (all interactions are recorded) and report annually to DoE.	1	<ul style="list-style-type: none"> <li>Bycatch and mortality numbers (including post-release mortality where possible) are monitored by Commonwealth and state government agencies and reported annually to DoE.</li> <li>Non-lethal interactions recorded and reported annually to DoE.</li> <li>Observer programs collect data on grey nurse shark interactions.</li> </ul>	DoE, DoA, AFMA and state governments, research agencies	Core government business
2.2	Ensure that fisheries management plans/ strategies or other documentation reviewed for accreditation under the EPBC Act contain actions consistent with the recovery of the grey nurse shark (where relevant), including reduction of bycatch and recording of all interactions.	1	<ul style="list-style-type: none"> <li>Fisheries management plans/ strategies include measures to reduce bycatch (including developing best handling practices and gear modifications) and appropriate mechanisms to record all interactions with grey nurse sharks, where relevant.</li> <li>Bycatch management arrangements assessed and approved by DoE.</li> </ul>	DoE and state governments	Core government business
2.3	Conduct research to quantify post-release mortality rates of grey nurse sharks caught incidentally in commercial fisheries.	1	<ul style="list-style-type: none"> <li>Research into hook related injuries and post-release mortality undertaken.</li> </ul>	State governments, industry, research agencies, DoE	Approximately \$25,000-200,000
2.4	Ensure appropriate controls are implemented in important habitat sites to reduce the risk of grey nurse shark interaction with commercial fishing gear.	1	<ul style="list-style-type: none"> <li>Changes introduced which modify or remove fishing gear that pose a high risk of incidental capture of grey nurse sharks from key aggregation sites and/or adjacent areas.</li> </ul>	DoE and state governments	Core government business
2.5	Identify and classify commercial fishing gear that has, or could potentially, interact with grey nurse sharks to inform the development of management arrangements to mitigate interactions.	2	<ul style="list-style-type: none"> <li>Commercial fishing gear reviewed in consultation with industry and modified or removed where necessary.</li> </ul>	DoE, state governments and research agencies	

**Objective 3: Quantify and reduce the impact of recreational fishing on the grey nurse shark through incidental (accidental and/or illegal) take, throughout its range.**

Action	Description	Priority	Performance Criteria	Responsible agencies and potential partners	Indicative costing Only priority 1 actions are costing
3.1	Develop mechanisms and protocols that facilitate reporting by recreational fishers of interactions with grey nurse sharks. Mechanisms chosen should foster the understanding that any reported interaction will be received without prejudice.	1	<ul style="list-style-type: none"> <li>Grey nurse shark sighting program for recreational fishers developed within one year, including identification guides and reporting protocols.</li> </ul>	DoE, state governments, research agencies, recreational fishing groups and conservation groups	Approximately \$10,000 – 50,000 for 3.1 and 3.2
3.2	Encourage recreational fishers (and spear fishers) to utilise the sighting program (link to action 3.1) to report and provide, where possible, photographic evidence of sightings and interactions with grey nurse sharks. Requested information from fishers should include estimated number, size and weight of sharks, as well as site location and depth.	1	<ul style="list-style-type: none"> <li>Grey nurse shark sighting program developed and utilised by recreational fishers within one year.</li> <li>Practical identification materials distributed.</li> <li>Report detailing catch levels is prepared on annual basis.</li> </ul>	DoE and state governments, recreational fishing groups and conservation groups	Approximately \$10,000 – 50,000 for 3.1 and 3.2
3.3	Undertake research into grey nurse shark interactions with recreational fishing gear/ methods to inform the development of risk mitigation strategies such as spatial, temporal or methods based restrictions.	1	<ul style="list-style-type: none"> <li>Research into hook related injury undertaken within two years.</li> <li>Fishing gear/methods reviewed within one year, in consultation with recreational fishers, and gear modified or removed where necessary.</li> <li>Changes introduced which modify or remove fishing gear/methods that pose a high risk of incidental capture of grey nurse sharks from key aggregation sites.</li> <li>Evaluation of spatial closures undertaken.</li> </ul>	DoE, state governments, recreational fishing groups and conservation groups	Core government business
3.4	Quantify (through monitoring, reports and, where necessary, estimations of grey nurse shark bycatch) mortality and non-lethal interactions in recreational fishing sectors and report annually to DoE.	2	<ul style="list-style-type: none"> <li>Bycatch and mortality of grey nurse sharks from recreational fishing are monitored and reported annually.</li> </ul>	DoE and state governments	

Objective 4: Where practicable, minimise the impact of shark control activities on the grey nurse shark.

Action	Description	Priority	Performance Criteria	Responsible agencies and potential partners	Indicative costing Only priority 1 actions are costing
4.1	Shark control programs to continue to report catches annually to the state governments.	1	<ul style="list-style-type: none"> <li>Ongoing collection and assessment of meshing and drumlining data (link to Action 4.3).</li> </ul>	DoE and state governments	Core government business
4.2	Maintain review processes by state governments of the effect of shark control programs on the grey nurse shark.	1	<ul style="list-style-type: none"> <li>Levels of grey nurse shark mortality/interaction during shark control activities are quantified.</li> <li>In areas where there is regular mortality/interaction with grey nurse sharks during shark control activities, seasonal trends in interactions are monitored.</li> <li>Options that may facilitate a reduction in grey nurse shark captures at locations where there is regular interaction/ mortality of grey nurse sharks during shark control activities are identified.</li> </ul>	State governments	Core government business
4.3	Continue to evaluate alternatives to shark meshing/drumlining, where bycatch levels are high, including the use of non-lethal methods or alternate strategies.	1	<ul style="list-style-type: none"> <li>Alternatives are evaluated and implemented if effective.</li> <li>The use of beach meshing nets and drumlines to decline as alternatives become available.</li> </ul>	State governments and relevant research agencies	Core government business
4.4	Establish and implement uniform minimum standards for the continued biological, pathological, genetic, toxicological and other post-mortem data recording and sampling of grey nurse sharks caught in shark control programs, using well established protocols. Develop a national database to collect this information (link to action 4.1).	2	<ul style="list-style-type: none"> <li>Minimum standards for data collection developed and agreed.</li> <li>Contracts with shark meshing and drum line contractors modified to require retention and delivery to governments and research agencies of all grey nurse sharks killed in beach safety mesh nets and on drum lines.</li> </ul>	State governments and relevant research agencies	
4.5	Develop a photo-tagging program for grey nurse sharks caught and released in shark control programs, in conjunction with existing programs.	2	<ul style="list-style-type: none"> <li>Photo-tagging program developed.</li> <li>Released sharks photo-tagged.</li> <li>Post-release survival of released sharks monitored.</li> </ul>	State governments and relevant research agencies	

Objective 5: Investigate and manage the impact of ecotourism on the grey nurse shark.

Action	Description	Priority	Performance Criteria	Responsible agencies and potential partners	Indicative costing Only priority 1 actions are costing
5.1	Review and assess the effectiveness of voluntary and regulated diving arrangements, in relation to viewing grey nurse sharks in their natural habitat, to ensure associated impacts continue to be minimised. Promote a consistent approach, where possible, among sites and across jurisdictions.	3	<ul style="list-style-type: none"> <li>Code of conduct fully implemented and adopted by industry.</li> <li>An assessment undertaken of the use and effectiveness of the code of conduct by dive operators.</li> </ul>	DoE, state governments, and stakeholders	
5.2	Ensure that any new, non-scuba diving related tourist operations aimed at viewing grey nurse sharks have effective management arrangements to minimise impacts.	3	<ul style="list-style-type: none"> <li>Majority of grey nurse shark sightings by tour groups reported.</li> <li>Standard operating procedures for non-scuba tour operators developed and in place.</li> </ul>	DoE, state governments, research agencies and tourism industry	

Objective 6: Manage the impact of aquarium collection on the grey nurse shark.

Action	Description	Priority	Performance Criteria	Responsible agencies and potential partners	Indicative costing Only priority 1 actions are costing
6.1	Moratorium on the removal of grey nurse sharks from the wild.	1	<ul style="list-style-type: none"> <li>Moratorium maintained.</li> <li>Review of the moratorium completed.</li> </ul>	DoE and state governments, aquaria operators and conservation groups	Core government business
6.2	Ensure consistent management protocols are developed and put in place for all existing captive grey nurse shark programs to ensure individuals are appropriately managed. Determine whether it is feasible and appropriate for management protocols to enable captive breeding and investigate survivorship in captivity, to maintain a sustainable captive population without further collection from the wild.	2	<ul style="list-style-type: none"> <li>Captive management protocols developed within two years, agreed and adopted nationally.</li> </ul>	DoE, state governments, aquaria	
6.3	Develop and contribute to conservation oriented education programs in those commercial aquaria with captive grey nurse sharks on display.	3	<ul style="list-style-type: none"> <li>Appropriate education programs and displays implemented in commercial aquaria currently displaying grey nurse sharks.</li> </ul>	DoE, state governments and aquaria	

Objective 7: Improve understanding of the threat of pollution and disease to the grey nurse shark.

Action	Description	Priority	Performance Criteria	Responsible agencies and potential partners	Indicative costing Only priority 1 actions are costing
7.1	Review and assess the potential threat of introduced species, pathogens and pollutants. Work undertaken under this action should be linked to action 4.4 on grey nurse shark post-mortem data recording and sampling.	3	<ul style="list-style-type: none"> <li>The potential threat of introduced species, pathogens and pollutants identified.</li> <li>Review and analysis of identified threats undertaken.</li> </ul>	DoE, state governments and research agencies	



Objective 8: Continue to identify and protect habitat critical to the survival of the grey nurse shark and reduce the impact of threatening processes in these areas.

Action	Description	Priority	Performance Criteria	Responsible agencies and potential partners	Indicative costing Only priority 1 actions are costing
8.1	Continue research to locate habitat critical to the survival of the grey nurse shark, including pupping, nursery and foraging areas.	1	<ul style="list-style-type: none"> <li>Important habitats (e.g. pupping, nursery, foraging and migration areas) for the grey nurse shark are identified and mapped (e.g. Biologically Important Areas; Link to Action 8.4) and criteria are developed and applied to characterise such habitats as habitats critical to the survival of the species.</li> </ul>	DoE, state governments and research agencies	Core government business
8.2	Review the level and spatial extent of protection measures at key aggregation sites to ensure appropriate levels of protection, and a consistent approach to the designation and implementation of protective measures, are applied.	1	<ul style="list-style-type: none"> <li>Appropriate measures remain in place to ameliorate impacts on grey nurse sharks at identified key aggregation sites.</li> <li>A consistent approach to designation and implementation of protective measures, where possible.</li> </ul>	DoE and state governments	Core government business
8.3	Use Biologically Important Areas (BIA) to help inform the development of appropriate conservation measures, including through the application of advice in the marine bioregional plans on the types of actions which are likely to have a significant impact on the species and updating such conservation measures as new information becomes available.	1	<ul style="list-style-type: none"> <li>BIAs for grey nurse sharks are adequately taken into account when assessing the impact of proposed activities in the marine environment and adequately protected.</li> </ul>	DoE	Core government business
8.4	Update and refine information on existing biologically important areas (BIAs) <sup>1</sup> identified as part of the marine bioregional plans, and seek to identify new BIAs as information from research and other processes becomes available (Link to Action 8.1).	2	<ul style="list-style-type: none"> <li>Scientific information on grey nurse shark behaviour and distribution is improved to allow new biologically important areas to be defined, particularly habitat critical to the survival of the grey nurse shark (Link to Action 8.1).</li> <li>Currency of BIA maps in the Conservation Values Atlas is maintained.</li> </ul>	DoE	
8.5	Monitor grey nurse shark occupancy and utilisation of key aggregation sites.	2	<ul style="list-style-type: none"> <li>Monitoring program developed to determine grey nurse shark occupancy and utilisation of key aggregation sites.</li> </ul>	DoE, state governments and research agencies	

<sup>1</sup> Further information regarding BIAs is provided in Section 10.1: Marine Bioregional Plans.

Objective 9: Continue to develop and implement research programs to support the conservation of the grey nurse shark.

Action	Description	Priority	Performance Criteria	Responsible agencies and potential partners	Indicative costing Only priority 1 actions are costing
9.1	Collect, analyse and disseminate age, growth, reproduction, survival, mortality and diet information to further improve understanding of the population dynamics and habitat requirements of the grey nurse shark.	2	<ul style="list-style-type: none"> <li>Knowledge of reproductive biology of grey nurse sharks improved.</li> <li>Standardised methodology for field measurement of grey nurse sharks identified and shark measurements undertaken at selected sites.</li> <li>Ages estimated for the majority of incidentally caught and killed grey nurse sharks.</li> <li>Dietary preferences established.</li> </ul>	DoE, state governments and research agencies	
9.2	Continue to collect and analyse biological material for toxicology research and genetic analysis (for example to determine the stock structure, inbreeding depression, population boundaries and abundance), improve coordination of reporting and sampling programs and coordinate the collation of results and the storage of collected genetic, biological and toxicological material (Link to Action 7.1).	2	<ul style="list-style-type: none"> <li>Genetic and biological material collected and processed.</li> <li>Population genetics clarified by analysis of data.</li> <li>The use of close-kin genetics is explored to determine survival and abundance (Link to Objective 1).</li> </ul>	DoE, state governments and research agencies	
9.3	Examine habitat use, ontogeny and regional connectivity across life history stages through the use of tagging technologies, including acoustic listening station networks, satellite tagging and photo identification.	2	<ul style="list-style-type: none"> <li>Tagging program developed and implemented.</li> <li>Monitoring program established to assess abundance of adult grey nurse sharks and pups at key aggregation sites (Link to Action 1.1).</li> </ul>	DoE, state governments and research agencies	

Objective 10: Promote community education and awareness in relation to grey nurse shark conservation and management.

Action	Description	Priority	Performance Criteria	Responsible agencies and potential partners	Indicative costing Only priority 1 actions are costing
10.1	Update DoE's grey nurse shark recovery plan web page to reflect the most current information on the grey nurse shark. Ensure the web page is presented in a form that is easily understood by the public and is linked to the relevant website(s) of other jurisdictions with an interest in conservation of grey nurse sharks.	1	<ul style="list-style-type: none"> <li>DoE's grey nurse shark web page is up-to-date and linked to available information on relevant websites.</li> </ul>	DoE	Core government business
10.2	Strengthen awareness of, and encourage compliance with, the requirement to report grey nurse shark bycatch and mortality in commercial fisheries and recreational and charter fishing operations.	1	<ul style="list-style-type: none"> <li>Grey nurse shark educational material provided to commercial fishers and recreational fishers and published in recreational fishing media.</li> <li>Targeted grey nurse shark law enforcement actions carried out by relevant agencies.</li> </ul>	DoE, state governments, commercial and recreational fishing groups	Approximately \$10,000-50,000
10.3	Assess and evaluate effectiveness of prior or current education and awareness programs to identify alternative methods or improve efficacy.	2	<ul style="list-style-type: none"> <li>Advisory materials on successful methods prepared and distributed.</li> <li>Research into community awareness undertaken and showing evidence of increased community awareness.</li> </ul>	DoE, state governments, commercial and recreational fishing groups and aquaria	
10.4	Encourage community involvement in collaborative research, monitoring and education.	2	<ul style="list-style-type: none"> <li>Community education strategy and initiatives developed and implemented.</li> <li>Continuation of volunteer dive surveys.</li> </ul>	DoE, state governments, aquaria, community science groups and non-government organisations	

## 10 Current management practices

Management practices and measures other than those contained in this plan have been developed and are being implemented through a number of agencies and programs. These include Australian Fisheries Management Authority (AFMA) procedures and protocols, Department of Agriculture (DoA) policies and programs and state government programs.

These measures include the compulsory use of logbooks by commercial fishers to record incidental capture of grey nurse sharks and mechanisms to encourage recreational fishers to report interactions. There are also a number of observer programs in operation designed to provide fisheries-independent measures of grey nurse shark mortality in state and Commonwealth waters.

In July 2012, Senator the Hon. Joe Ludwig, then Minister for Agriculture, Fisheries and Forestry released Australia's second National Plan of Action for the Conservation and Management of Sharks (Shark-plan 2). Shark-plan 2 outlines how Australia will manage and conserve sharks, and ensure that Australia meets international conservation and management obligations. The plan identifies research and management actions across Australia for the long-term sustainability of shark populations, including actions to help minimise the impacts of fishing on sharks. Shark-plan 2 can be downloaded from the Department of Agriculture website at: [www.daff.gov.au/fisheries/environment/sharks/sharkplan2](http://www.daff.gov.au/fisheries/environment/sharks/sharkplan2). Shark-plan 2 was developed in conjunction with state, Northern Territory and Australian government agencies, and has been endorsed by the Shark-plan Implementation and Review Committee and the Australian Fisheries Management Forum.

The grey nurse shark is protected under the EPBC Act, and as such, it is an offence to kill, injure, take, trade, keep, or move any individual in Commonwealth waters without a permit. In addition, all listed threatened species are considered matters of national environmental significance (MNES), and any actions that are likely to have a significant impact on a MNES must be referred to the Australian government

minister responsible for the environment for assessment and approval.

The environmental performance of Commonwealth, state and Northern Territory managed wild harvest fisheries is assessed under the EPBC Act. The EPBC Act requires that:

- all Commonwealth managed and state wild capture marine fisheries with an export component be assessed to ensure they are being managed in an ecologically sustainable way
- all Commonwealth managed fisheries are assessed to determine the impact of actions taken under a fishery management plan on matters of national environmental significance
- all Commonwealth managed fisheries and any state-managed fisheries that operate in Commonwealth waters must be assessed to determine the impacts of fishing operations on cetaceans, listed threatened species and ecological communities, migratory species, and listed marine species under the EPBC Act.

The assessments consider the impacts of the relevant fishery on target and non-target species and the impacts of fishing activities on the broader marine environment. As a listed threatened species, grey nurse sharks cannot be taken in fisheries in Commonwealth, New South Wales, Queensland or Western Australian waters and interactions must be reported. Interactions with grey nurse sharks, as well as the life status of the animal when it was captured (e.g. whether it is released alive), are considered in the assessment of fisheries operating in Commonwealth waters.

Other relevant management practices include management planning processes for areas which contain breeding and/or aggregation sites for grey nurse sharks and the incorporation of important sites into marine reserves, both at the Commonwealth (e.g. through the marine bioregional planning process) and state levels. Importantly, since 2002, the majority of known key aggregation sites for the grey nurse shark, in both Commonwealth and state waters, have been

given some form of protection. Details of protection measures afforded to the grey nurse shark in each jurisdiction are outlined in the issues paper (DoE, 2014). The ongoing management and protection of grey nurse sharks at these sites is critical for the survival of the species.

Shark control activities are undertaken by the Queensland and New South Wales governments to protect bathers from shark attack. These states have mechanisms in place to monitor the impacts of these activities on protected species and, where possible without compromising bather safety, reduce those impacts. Data from the New South Wales program show that 22 grey nurse sharks were caught and killed through the program between July 2002 and July 2013, and eight were released alive following entanglement. In Queensland, 23 grey nurse sharks were caught between 2001 and October 2013. Further details of shark control programs are outlined in the issues paper (DoE, 2014). The actions set out in this recovery plan in regards to shark control activities focus on maximising the useful data the programs can provide on grey nurse shark biology and ecology and minimising the impact of these activities on non-target species without reducing the effectiveness of the programs in maintaining bather safety.

## 10.1 Marine bioregional plans

Marine bioregional plans have been prepared under section 176 of the EPBC Act for the South-west, North-west, North and Temperate East marine regions of Commonwealth waters around Australia. Each marine bioregional plan describes the conservation values of the region and identifies and characterises the pressures affecting these conservation values. The plans also identify regional priorities and outline strategies to address them. As part of the marine bioregional planning process, the grey nurse shark has been identified as a conservation value of regional priority in both the South-west and Temperate East marine regions. In addition, Schedule 2 of both the

South-west Marine Bioregional Plan and the Temperate East Marine Bioregional Plan include guidance for people planning to undertake actions which have the potential to impact on grey nurse sharks within these regions. Further information on marine bioregional planning is available on the department's website at: [www.environment.gov.au/coasts/marineplans/index.html](http://www.environment.gov.au/coasts/marineplans/index.html)

DoE, as the Australian Government department responsible for administering the EPBC Act, maintains a suite of interactive tools that allow users to search, find and generate reports on matters of national environmental significance, including the grey nurse shark. The conservation values atlas of each marine bioregional plan shows the location and spatial extent of conservation values (where sufficient information exists) and is available at: [www.environment.gov.au/coasts/marineplans/cva/index.html](http://www.environment.gov.au/coasts/marineplans/cva/index.html). Further information about the grey nurse shark is available on the Species Profile and Threats Database (SPRAT) at: [www.environment.gov.au/cgi-bin/sprat/public/sprat.pl](http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl). This database includes links to conservation value report cards which were developed to support the information provided in each marine bioregional plan.

As part of the marine bioregional planning process, biologically important areas (BIAs) have been identified for a number of species, including the grey nurse shark. BIAs are areas that are particularly important for the conservation of protected species and where aggregations of individuals display biologically important behaviour such as breeding, foraging, resting or migration. The presence of the observed behaviour is assumed to indicate that the habitat required for the behaviour is also present. BIAs have been identified using expert scientific knowledge about species' distribution, abundance and behaviour in the region, and BIA maps and descriptions for the grey nurse shark are available in the conservation values atlas: [www.environment.gov.au/coasts/marineplans/cva/index.html](http://www.environment.gov.au/coasts/marineplans/cva/index.html)

## 10.2 Commonwealth marine reserves

Marine reserves are parts of the ocean that are managed primarily for the conservation of their ecosystems, habitats and the marine life they support. They form the Commonwealth component of Australia's National Representative System of Marine Protected Areas. This system is comprised of five regional networks of Commonwealth Marine Reserves (South-east; South-west; North-west; North and Temperate east) and the Coral Sea Commonwealth Marine Reserve. Considered together, the Commonwealth marine reserve networks and the Coral Sea reserve protect examples of all of Australia's different marine ecosystems and habitats. Further information about the Commonwealth Marine Reserve Network is available at: [www.environment.gov.au/marinereserves/index.html](http://www.environment.gov.au/marinereserves/index.html).

The Commonwealth marine reserves network protects habitat important for protected species, including the grey nurse shark. Many of the Commonwealth marine reserves intersect with BIAs for the grey nurse shark, as identified in the marine bioregional plans. More information is available in the conservation values atlas at: [www.environment.gov.au/coasts/marineplans/cva/index.html](http://www.environment.gov.au/coasts/marineplans/cva/index.html). In particular, key aggregation sites for the critically endangered east coast population of grey nurse sharks intersect with a number of Commonwealth marine reserves in the Temperate East Commonwealth Marine Reserves Network. Pimpernel Rock is a significant feature of the Solitary Islands Commonwealth Marine Reserve and provides important habitat for the east coast population of the grey nurse shark. Similarly, the Cod Grounds Commonwealth Marine Reserve includes a key



Photo by Justin Gilligan

aggregation site for the grey nurse shark. In addition, a number of key aggregation sites for grey nurse sharks (e.g. Big Seal Rocks, Little Seal Rocks and Little Broughton Island) occur in state waters adjacent to the Hunter Commonwealth Marine Reserve and therefore, important habitat for this species is likely to extend into this reserve.

## 11 Effects on other native species or ecological communities

Reducing anthropogenic impacts from fisheries activities or encounters with shark protection devices may benefit other threatened marine species, such as other shark species, seabirds and marine mammals.

The creation of protected areas (which may include no take zones) around grey nurse shark key aggregation sites is likely to result in conservation benefits for other threatened or protected species of fish, such as black cod (*Epinephelus daemeli*), that share similar habitat. The conservation of heavily

targeted populations of species such as mullocky (*Argyrosomus hololepidotus*) and yellowtail kingfish (*Seriola lalandi*) should improve as a result of greater protection at grey nurse shark key aggregation sites (Silberschneider & Gray, 2005). The consequences for other native species, should grey nurse shark numbers increase substantially as a result of this plan, are unknown.



## 12 Biodiversity benefits

Given that this recovery plan focuses on removing threats from grey nurse shark habitats, it is also likely to have positive implications for a range of

non-target native species that occur within the same habitats.



Photo by Justin Gilligan

# 13 Social and economic considerations

## 13.1 Commercial and recreational fishing

Grey nurse sharks have been fished throughout their range in the past and, although there is no current legal directed catch of grey nurse sharks, incidental catch remains a major threat to the species.

In particular, trap and line fishers are most likely to come in direct contact with grey nurse sharks.

The species is also taken in bottom-set gillnets and trawls. The actions outlined in this recovery plan in relation to commercial fishing focus on improving reporting mechanisms for incidental take and other interactions with grey nurse sharks, including potentially an increase in observer coverage.

Implementation of these actions is expected to have a minimal to moderate degree of economic impact on commercial fisheries.

Although recreational fishers have generally been supportive of measures designed to ensure their sport is sustainable, recreational line fishing is still considered to be a major threat to the grey nurse shark. The actions outlined in this recovery plan focus on ensuring compliance with reporting requirements and ensuring reporting mechanisms are in place to adequately assess the impact of recreational fishing on this species. Implementation of these actions will have minimal economic impact on recreational fishers; however, changes in gear types may become necessary. Regular contact and consultation with fishers will be a key strategy in encouraging awareness, support and involvement in the recovery effort.

## 13.2 Ecotourism

Grey nurse sharks are of economic value for ecotourism such as scuba diving, snorkelling and viewing through glass bottom boats. Grey nurse shark ecotourism is a relatively recent but rapidly expanding industry that is likely to continue to spread to new

centres of grey nurse shark abundance and has the potential to increase coastal community income significantly.

Efforts to minimise degradation of grey nurse shark key aggregation areas will have important socio-economic benefits by protecting the aesthetic values of these areas and enhancing recreation and tourism opportunities. However, in some cases, public access to some key areas may need to be controlled, for example through limits on diver numbers or number of boats. Any such restrictions would need to be developed in consultation with the dive industry.

The involvement of dive groups and aquaria in recovery actions, such as education programs and survey work, requires an in-kind contribution of time and potentially some costs.

## 13.3 Habitat modification/degradation

Habitat degradation (e.g. through coastal development, pollution) also threatens this species and may largely exclude it from areas, perhaps traditionally utilised for feeding or as nurseries, where it was historically much more abundant. As near-coast areas are often a preferred habitat, grey nurse shark populations could be adversely affected by coastal habitat degradation and anthropogenic activities in these regions. As more key aggregation sites are identified there is potential for developments to be restricted under the EPBC Act development assessment and approval processes.

## 14 Duration and cost of the recovery process

It is anticipated that the recovery process will not be achieved prior to the scheduled five year review of the recovery plan. Therefore, a recovery plan for the grey nurse shark will remain in place until such time that the Australian population of the grey nurse shark has improved to the point that the population no longer meets threatened species status under the EPBC Act.

The cost of implementation of this plan should be incorporated into the core business expenditure of the

affected organisations and through additional funds obtained for the explicit purpose of implementing this recovery plan. It is expected that state and Commonwealth agencies will use this plan to prioritise actions to protect the species and enhance its recovery, and that projects will be undertaken according to agency priorities and available resources. Actions which cross jurisdictional boundaries may be funded jointly on agreement by relevant parties.

## 15 Affected interests

Organisations likely to be affected by the actions proposed in this plan include government agencies (Commonwealth and state), particularly those involved with environmental and fisheries concerns; commercial and recreational fishers; local Indigenous communities; researchers; tourism operators and scuba diving operators/clubs; conservation groups; wildlife interest groups; aquarium managers and proponents of

coastal development in the vicinity of important habitat areas. This list, however, should not be considered exhaustive, as there may be other interest groups that would like to be included in the future or need to be considered when specialised tasks are required in the recovery of the grey nurse shark.

## 16 Efficient and effective use of resources

In order to maximise the conservation outcomes and cost effectiveness of this plan, the actions proposed complement those of other threatened species recovery plans, such as the white shark recovery plan, and the

threat abatement plan for the impacts of marine debris on vertebrate life—which identifies actions to minimise the impacts to marine fauna from marine debris.



Photo by Justin Gilligan

## 17 Consultation

The Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) 2014 has been developed through extensive consultation with a broad range of stakeholders.

The review of the 2002 Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) in Australia (EA, 2002) was completed in January 2009, with the assistance of the then National Shark Recovery Group (NSRG). In February 2009, the review was completed by the department and tabled at the 38th meeting of the Threatened Species Scientific Committee (TSSC)—established under the EPBC Act—prior to being forwarded to the then Minister for Environment Protection, Heritage and the Arts in November 2009.

The NSRG comprised representatives from relevant Australian Government agencies, all states and the Northern Territory, key stakeholder groups including the Humane Society International and TRAFFIC, commercial and recreational fishing sectors, the CSIRO and the Australian Institute of Marine Science (refer to Appendix 2 for a full list of NSRG representatives).

The review concluded that while a number of the actions in the original recovery plan had been completed, there still remains an ongoing need to maintain a recovery plan for grey nurse sharks to

promote recovery of the species. The review recommended that the 2002 Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) in Australia be varied to remove completed actions and include new conservation priorities. Following endorsement by the TSSC to prepare a revised grey nurse shark recovery plan, a stakeholder workshop was held in November 2009 with members of the NSRG and selected shark experts, to develop a new recovery plan for the grey nurse shark. The revised draft recovery plan was presented at the 44th meeting of the TSSC in August 2010. Following detailed consultation with stakeholders and the TSSC, the plan was re-drafted in liaison with Commonwealth and state government agencies primarily responsible for implementing the actions.

The 2013 Draft Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) was endorsed at the 54th TSSC meeting in August 2013 and released for public comment by the then Minister for Sustainability, Environment, Water, Population and Communities, for a period of three months. Comments received were considered and minor changes incorporated into the recovery plan. The TSSC endorsed the recovery plan as final and recommended it to the Minister at the 55<sup>th</sup> TSSC meeting in March 2014.

# 18 Organisations/persons involved in evaluating the performance of the plan

This plan should be reviewed no later than five years from when it was endorsed and made publicly available.

The review will determine the performance of the plan and assess:

- whether the plan continues unchanged; is varied to remove completed actions; or varied to include new conservation priorities
- whether a recovery plan is no longer necessary for the species as either conservation advice will suffice; or the species is removed from the threatened species list.

As part of this review, the listing status of the species will be assessed against the EPBC Act species listing criteria.

The review will be coordinated by the Department of the Environment in association with relevant Australian Government and state agencies and key stakeholder groups, such as the commercial and recreational fishing sectors, non-government organisations, tourism operators, aquarium operators and scientific research organisations.

Key stakeholders who may be involved in the review of the performance of the Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) 2014, including organisations likely to be affected by the actions proposed in this plan are:

## Australian Government

Australian Fisheries Management Authority  
Australian Institute of Marine Science  
CSIRO  
Department of Agriculture  
Department of Industry  
Department of the Environment  
Great Barrier Reef Marine Park Authority  
Indigenous Land Corporation

## Industry and non-government organisations

Australasian Regional Association of Zoological Parks and Aquaria  
Aquarium industry  
Commercial fishers and associations  
Conservation groups  
Indigenous Land Councils and communities  
Local communities  
Nature-based tourism industry  
Marine/Ocean energy industry  
Recreational fishers and associations  
Universities and other research organisations  
Scuba diving associations, clubs and commercial operators  
Recreational boating

## State / territory governments

Department of Parks and Wildlife, WA  
Department of Environment and Heritage Protection, QLD  
Department of National Parks, Recreation, Sport and Racing, QLD  
Department of Primary Industries, NSW  
Fisheries agencies  
Museums  
NSW National Parks and Wildlife Service  
Natural Resource Management Bodies/ Catchment Management Authorities in coastal regions  
Local Government in coastal regions



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## 20 Appendices

### 20.1 Appendix 1

Table 2: Summary of the status of the actions identified in the 2002 Recovery Plan for the Grey Nurse Shark (*Carcharias taurus*) in Australia (EA, 2002)

#### A. Reduce the impact of commercial fishing on grey nurse sharks

Prescribed Action	Criteria for Success	2009 Review of Actions
<b>A.1.</b> NSW Fisheries to modify logbooks to record incidental capture, length and sex of grey nurse sharks in the following fisheries: <ul style="list-style-type: none"> <li>• NSW Ocean Trap and Line</li> <li>• NSW Fish Trawl</li> <li>• NSW Prawn Trawl</li> <li>• Charter Boat Fishery</li> </ul>	<ul style="list-style-type: none"> <li>• Logbooks used within all relevant fisheries are modified.</li> </ul>	Action completed
<b>A.2.</b> Assess data available from NSW fisheries records and logbooks to determine current levels of grey nurse shark bycatch and mortality.	<ul style="list-style-type: none"> <li>• Report detailing bycatch levels is prepared.</li> </ul>	Action mostly completed and ongoing, but actual levels of mortality remain difficult to quantify due to potential under reporting.
<b>A.3.</b> Assess data available from WA fisheries records and logbooks to determine current level of grey nurse bycatch and mortality in the following fisheries: <ul style="list-style-type: none"> <li>• West coast demersal gillnet and demersal longline</li> <li>• Southern demersal gillnet and demersal longline</li> <li>• Northern Shark Fishery.</li> </ul>	<ul style="list-style-type: none"> <li>• Report detailing bycatch levels is prepared.</li> </ul>	<p>Action partially completed.</p> <p>Grey nurse shark captures in the WA commercial gillnet (and longline) and tropical shark fisheries have been recorded in daily logbook records since their introduction in June 2006. These records are summarised in the Western Australian State of the Fisheries and Aquatic Resources reports.</p> <p>Formalisation of processes for the reporting of protected species interactions in WA Wildlife Trade Operations accredited fisheries is subject to the finalisation of a Memorandum of Understanding between state and Australian governments.</p>
<b>A.4.</b> Assess data available from Queensland fisheries records and logbooks to determine current level of grey nurse bycatch and mortality in the following fisheries: <ul style="list-style-type: none"> <li>• East Coast Trawl</li> <li>• Queensland Line Fisheries.</li> </ul>	<ul style="list-style-type: none"> <li>• Report detailing bycatch levels is prepared.</li> </ul>	Action mostly completed and ongoing, but uncertainty over the numbers provided considering the potentially high rate of under reporting evident in New South Wales.

Prescribed Action	Criteria for Success	2009 Review of Actions
<b>A.5.</b> All fishers to report take of grey nurse sharks in Commonwealth waters to Environment Australia.	<ul style="list-style-type: none"> <li>All grey nurse sharks taken in Commonwealth waters reported to Environment Australia.</li> </ul>	<p>Action mostly completed and ongoing. It is compulsory for any fisher in Commonwealth waters to report any interaction with a protected species. In states with an MOU in place, such as Queensland, the report can be made directly to the state based agency responsible or directly to AFMA, who then provide this information to the Commonwealth on a regular basis.</p> <p>However, if the state does not have an MOU in place with the Commonwealth for protected species reporting then it remains the responsibility of the fisher to report directly to the Commonwealth.</p>
<b>A.6.</b> Ensure that existing observer programs operating in relevant fisheries record interactions with grey nurse shark.	<ul style="list-style-type: none"> <li>Observer programs collect data on grey nurse shark interactions.</li> </ul>	<p>Action is mostly complete and ongoing. Most jurisdictions now have fishery observers in a number of fisheries that record information on target catch, bycatch and protected species interactions. The level of coverage varies between jurisdictions and fisheries, but gives some indication of the interactions with grey nurse sharks. However, given the limited coverage of observers in most state fisheries and the low incidence of grey nurse shark interactions, caution needs to be taken when using the observer data to support conclusions on the level of incidental capture of grey nurse sharks due to interactions with the commercial fishing sector.</p>
<b>A.7.</b> Improve education of commercial fishers about protected grey nurse sharks.	<ul style="list-style-type: none"> <li>Information sheets/posters provided to commercial fishers.</li> <li>Education programs promoted by commercial fishers and fishing agencies on grey nurse shark.</li> </ul>	<p>Action is mostly complete and ongoing. A range of communication activities focused on the grey nurse shark have been delivered to commercial fishers. However, to date there has been no comprehensive assessment of the effectiveness of these activities.</p>
<b>A.8.</b> All fishers where there is a risk of capture of grey nurse sharks in Commonwealth waters are to prepare bycatch management arrangements that minimise take and for these to be assessed under the EPBC Act.	<ul style="list-style-type: none"> <li>Bycatch management arrangements assessed and approved.</li> </ul>	<p>Action is complete. When Commonwealth Fisheries Management plans are made or reviewed they must consider provisions to avoid mortality of, or injuries to, protected marine species.</p>

## B. Reduce the impact of recreational fishing on grey nurse sharks.

Prescribed Action	Criteria for Success	2009 Review of Actions
<b>B.1.</b> Encourage recreational fishers to record and report grey nurse shark catches and sightings including: <ul style="list-style-type: none"><li>• location</li><li>• biological data.</li></ul> <p>These data should be assessed to determine historic and current level of catches and sightings.</p>	<ul style="list-style-type: none"><li>• Report detailing catch levels is prepared.</li></ul>	Action partially completed. Under the EPBC Act, it is compulsory for all interactions with protected species in Commonwealth waters to be reported to the Commonwealth. However, although the legislation differs between states, reporting of incidents with protected species is not legally required in Queensland, Western Australia or New South Wales.
<b>B.2.</b> Improve education of recreational fishers about protected grey nurse sharks. See action J.1.	<ul style="list-style-type: none"><li>• Information sheets/posters published in shops, boat ramps and magazines.</li><li>• Education programs promoted by recreational fishing groups and fishing agencies on grey nurse shark.</li></ul>	Action completed but no indication of the effectiveness of the campaigns.

## C. Reduce the impact of shark finning on grey nurse sharks.

Prescribed Action	Criteria for Success	2009 Review of Actions
<b>C.1.</b> Prevent unregulated shark finning.	<ul style="list-style-type: none"><li>• Regulations requiring that trunks with fins attached for all sharks caught are landed in port, for all Commonwealth and state/NT jurisdictions.</li></ul>	Action mostly completed.

#### D. Reduce the impact of shark control activities on grey nurse sharks.

Prescribed Action	Criteria for Success	2009 Review of Actions
<b>D.1.</b> Continue to quantify levels of grey nurse take during shark control activities in NSW and Queensland.	<ul style="list-style-type: none"> <li>Data on annual level of grey nurse bycatch in shark control activities is supplied to EA and Recovery Team.</li> </ul>	Action mostly completed and ongoing.
<b>D.2.</b> Develop and trial non lethal shark control alternatives to beach meshing and drumlines with a view to phasing out shark meshing programs in areas where grey nurse sharks are at risk.	<ul style="list-style-type: none"> <li>Alternatives are developed and implemented.</li> <li>As alternatives are developed, length of beach meshing nets declines annually.</li> </ul>	Action not completed. Alternate shark control methods have been trialled and changes have been made to the beach protection programs to reduce bycatch of non-target species. However, the programs still rely on lethal shark control methods as alternate technologies, such as bubble curtains and electrical fields, are not yet proven to be as effective as mesh nets and drumlines at reducing the risk of shark attack.
<b>D.3.</b> Ensure that grey nurse sharks caught in shark control activities are tagged before release.	<ul style="list-style-type: none"> <li>Released sharks tagged.</li> </ul>	Action partially completed. New South Wales have participated in small scale, largely ad hoc tagging of grey nurse sharks as part of their shark control activities. However, concerns over the risk to the sharks and the safety of contractors have led to these programs being stopped. Tagging of grey nurse sharks does not occur in the shark control program in Queensland, researchers indicating the risk of tagging mortality is extremely high, particularly when shark contractors are not professionally trained in tagging procedures
<b>D.4.</b> Review appropriateness of current shark control activities (beach meshing and drumlines) with a view to reducing impacts on grey nurse sharks.	<ul style="list-style-type: none"> <li>Shark control activities are revised to reduce their potential impact on grey nurse sharks.</li> </ul>	Action partially completed. A number of reviews have been undertaken however no major changes to the programs have been recommended.

## E. Manage the impact of ecotourism on grey nurse sharks.

Prescribed Action	Criteria for Success	2009 Review of Actions
<b>E.1.</b> Implement a code of conduct to minimise disturbance to grey nurse sharks by ecotourism activities and monitor and review code of conduct in two years.	<ul style="list-style-type: none"> <li>A Code of Conduct developed and adopted by relevant tour operators in NSW, Queensland and Western Australia.</li> <li>Signatories by commercial operations and dive clubs.</li> </ul>	Action partially completed. Codes of conduct for diving with grey nurse sharks have been developed and implemented in New South Wales and Queensland. However, there has been no detailed review on whether the guidelines are effective in minimising the impacts to grey nurse sharks from diving activities and nor has there been an assessment of compliance with these codes.
<b>E.2.</b> Sites that are declared as habitat protected areas adopt the scuba diving code of conduct as part of the management plans.	<ul style="list-style-type: none"> <li>Management plans include scuba diving code of conduct for declared sites.</li> </ul>	Action completed.
<b>E.3.</b> Tour operators encouraged to report all grey nurse shark sightings to NSW Fisheries and QPWS.	<ul style="list-style-type: none"> <li>Sightings recorded and data provided to Recovery Team.</li> </ul>	Action completed.
<b>E.4.</b> Research is conducted to determine the impacts of scuba diving.	<ul style="list-style-type: none"> <li>Data recorded and report on scuba diving impacts presented.</li> </ul>	Action partially completed.
<b>E.5.</b> Ban on night diving at sites identified as habitat critical to the survival of grey nurse sharks.	<ul style="list-style-type: none"> <li>No reports of diving on sites identified as habitat critical to the survival of grey nurse sharks.</li> </ul>	Action completed.
<b>E.6.</b> Ban on the use of shark deterrent devices at sites identified as habitat critical to the survival of grey nurse sharks.	<ul style="list-style-type: none"> <li>No reports of shark deterrent devices being used at sites identified as habitat critical to the survival of grey nurse sharks.</li> </ul>	Action completed.

## F. Reduce the impact of aquaria on grey nurse sharks.

Prescribed Action	Criteria for Success	2009 Review of Actions
<b>F.1.</b> Moratorium on the taking of grey nurse from the wild for aquaria in all jurisdictions.	<ul style="list-style-type: none"> <li>The taking of grey nurse sharks from the wild for aquaria banned in all relevant jurisdictions.</li> <li>Moratorium reviewed after two years.</li> </ul>	Action completed.
<b>F.2.</b> Aquariums to develop management plans for the keeping of grey nurse sharks.	<ul style="list-style-type: none"> <li>Management plans for grey nurse sharks in aquariums developed and reviewed</li> <li>Identification of grey nurse sharks currently in aquaria.</li> </ul>	Action partially completed.
<b>F.3.</b> Develop and contribute to a conservation orientated education programs in those commercial aquaria with captive grey nurse sharks on display.	<ul style="list-style-type: none"> <li>Appropriate education programs and displays implemented in commercial aquaria currently displaying grey nurse sharks.</li> </ul>	Action mostly completed and ongoing.



## G. Identify and establish protected areas to protect grey nurse sharks at key locations.

Prescribed Action	Criteria for Success	2009 Review of Actions
<p><b>G.1.</b> NSW and Qld to develop appropriate mechanisms to conserve sites identified as habitat critical to the survival of grey nurse sharks and associated foraging areas in their respective jurisdictions.</p> <p>Mechanisms to conserve grey nurse shark aggregation sites and associated foraging areas should include:</p> <ul style="list-style-type: none"> <li>• Establishment of effective marine protected areas (such as 'no take' sanctuary zones)</li> <li>• Seasonal or permanent closures of sites to commercial and recreational fishing.</li> </ul>	<ul style="list-style-type: none"> <li>• Appropriate protection mechanisms implemented.</li> </ul>	<p>Action partially completed. All but one of the 17 critical habitat sites in state waters that were listed in the 2002 Recovery Plan had been given some level of protection at the time of the 2009 review of the recovery plan. At a minimum, this includes restrictions on some commercial and recreational fishing methods and fishing gear. The level of protection provided to grey nurse sharks and the size of the protective protection zones varies and additional information on each of the sites is available from the relevant government agency.</p>
<p><b>G.2.</b> Commonwealth to develop and/or continue appropriate mechanisms to protect key sites in the following areas:</p> <ul style="list-style-type: none"> <li>• Solitary Islands Marine Reserve (Pimpernel Rock)</li> <li>• Laurieton (Cod Grounds)</li> </ul>	<ul style="list-style-type: none"> <li>• Appropriate protection mechanisms continued at Pimpernel Rock; part of the Commonwealth Solitary Islands Marine Reserve.</li> <li>• Appropriate protection mechanisms implemented at Cod Grounds, Laurieton.</li> </ul>	<p>Action completed. Both of the sites identified as habitat critical to the survival of the grey nurse shark in the 2002 recovery plan that lie in Commonwealth waters have some level of protection, which includes no fishing zones.</p>
<p><b>G.3.</b> Queensland will establish a community based program to identify future sites important for the conservation of grey nurse sharks.</p>	<ul style="list-style-type: none"> <li>• Community monitoring program established.</li> <li>• Important sites identified.</li> </ul>	<p>Action completed.</p>
<p><b>G.4.</b> Sites identified as habitat critical to the survival of grey nurse sharks are nominated to the register of critical habitats under the EPBC Act. Those sites listed in this recovery plan to be gazetted in the first year of the plan on the EPBC Act Register for Critical Habitat</p>	<ul style="list-style-type: none"> <li>• Critical habitat for grey nurse shark is listed on the register throughout the life of the plan.</li> </ul>	<p>Action not completed. No sites have been listed as critical habitat under the EPBC Act. This action was considered but it was decided not to pursue it as alternate forms of protection were available and considered more effective.</p> <p>Under the EPBC Act Register of Critical Habitat (Section 207b (2)) strict liability only applies to "habitat in or on a Commonwealth area". Of the 19 areas listed in the Grey Nurse Shark Recovery Plan, 17 sites are in State jurisdiction and are therefore outside the scope of the critical habitat provisions of the Act. Only two sites, Pimpernel Rock and the Cod Grounds, are within Commonwealth areas. These two sites are protected and therefore there would be no additional conservation benefit in listing them as critical habitat sites.</p>

Prescribed Action	Criteria for Success	2009 Review of Actions
<b>G.5.</b> Lead agencies in each state should protect sites identified as habitat critical to the survival of grey nurse sharks using appropriate planning or zoning policies, regulations and laws.	<ul style="list-style-type: none"> <li>Sites identified as habitat critical to the survival of grey nurse sharks are protected.</li> </ul>	Action partially completed. At the time of the 2009 review all but one of the 19 sites listed as habitat critical to the survival of the grey nurse shark in the 2002 recovery plan have been given some level of protection. At a minimum, this includes restrictions on fishing methods and fishing gear. The conditions and size of the sanctuary zones varies and additional information on each of the sites is available from the relevant government agency. (Also refer to G1 above).

#### **H. Develop research programs towards the conservation of grey nurse sharks.**

Prescribed Action	Criteria for Success	2009 Review of Actions
<b>H.1.</b> Continue existing NSW monitoring program and extend to document age and growth, migratory movements, recruitment rates and estimates of mortality.	<ul style="list-style-type: none"> <li>Population monitoring data at important sites in NSW continues to be collected and analysed.</li> </ul>	Action is ongoing.
<b>H.2.</b> Survey key sites identified as habitat critical to the survival of grey nurse sharks in NSW & Qld during winter to establish maternity sites and annual levels of pup production.	<ul style="list-style-type: none"> <li>Knowledge of annual pup productivity in NSW and Qld improved.</li> </ul>	Action is ongoing.
<b>H.3.</b> Establish a tag/resighting program to improve knowledge of: <ul style="list-style-type: none"> <li>Demography and migratory movements</li> <li>Localised site movements</li> <li>Estimation of bycatch levels.</li> </ul>	<ul style="list-style-type: none"> <li>Tag/resighting program established.</li> <li>Data analysed and report provided to Recovery Team.</li> </ul>	Action is ongoing.
<b>H.4.</b> NSW Fisheries to expand the autopsy program for all dead grey nurse sharks encountered to increase biological knowledge of the species.	<ul style="list-style-type: none"> <li>The majority of grey nurse sharks encountered dead in NSW autopsied.</li> </ul>	Action is ongoing.
<b>H.5.</b> Other jurisdictions to be encouraged to establish autopsy programs for grey nurse sharks that are encountered dead.	<ul style="list-style-type: none"> <li>Autopsy programs established in Queensland and WA.</li> </ul>	Action is ongoing.
<b>H.6.</b> Assess population size, distribution and status in Western Australia.	<ul style="list-style-type: none"> <li>Population status, distribution and size documented.</li> </ul>	Action is ongoing.
<b>H.7.</b> Collect and analyse genetic material to determine the genetic distinctiveness of western and eastern grey nurse shark populations.	<ul style="list-style-type: none"> <li>Material collected.</li> <li>Population genetics clarified by analysis of data.</li> </ul>	Action is complete.
<b>H.8.</b> Establish a wobbegong monitoring program at known aggregation sites to determine relationship with grey nurse sharks.	<ul style="list-style-type: none"> <li>Wobbegong monitoring data at grey nurse sites in NSW collected and analysed.</li> </ul>	Action is ongoing.

### **I. Develop population models to assess populations and monitor recovery.**

Prescribed Action	Criteria for Success	2009 Review of Actions
<b>I.1.</b> Develop appropriate models for the grey nurse shark to assist in understanding its: <ul style="list-style-type: none"><li>• population status</li><li>• rates of recovery</li><li>• population structure and distribution.</li></ul>	<ul style="list-style-type: none"><li>• Appropriate model developed.</li></ul>	Action is ongoing.

### **J. Promote community education.**

Prescribed Action	Criteria for Success	2009 Review of Actions
<b>J.1.</b> Develop and implement a community education initiatives strategy for grey nurse sharks aimed at the general public, divers and commercial and recreational fishers including: <ul style="list-style-type: none"><li>• identification</li><li>• current threats and status</li><li>• biology.</li></ul>	<ul style="list-style-type: none"><li>• Community education strategy and initiatives developed and implemented throughout the community.</li><li>• Increased community awareness of grey nurse sharks.</li></ul>	Action is ongoing.

### **K. Reassess the conservation status of the grey nurse shark.**

Prescribed Action	Criteria for Success	2009 Review of Actions
<b>K.1.</b> Develop a quantitative framework that includes development of criteria and identification of indicators to assess the recovery of the species within the first two years of the recovery plan to manage the recovery of grey nurse sharks in Australia.	<ul style="list-style-type: none"><li>• Quantitative framework established to measure recovery of the species within first two years of recovery plan being adopted.</li></ul>	Action not initiated and refocussed – government is currently funding a project aimed at developing a repeatable sampling methodology that can be used to establish a baseline population estimate of the east coast grey nurse shark population. This baseline estimate can be used as part of a quantitative framework to measure the success of any future Recovery Plan for this species.
<b>K.2.</b> Establish a monitoring program to measure recovery of the species and evaluate the effectiveness of prescribed actions in promoting recovery.	<ul style="list-style-type: none"><li>• Monitoring program established and actions evaluated.</li></ul>	Action not completed – refer Action K1.

## 20.2 Appendix 2

Table 3: Organisations represented on the then National Shark Recovery Group (NSRG)

Organisation	Acronym
Humane Society International	HSI
Queensland Environment Protection Agency	QLD EPA
Commonwealth Fisheries Association	ComFish
Department of Agriculture, Fisheries and Forestry	DAFF
Tasmanian Department of Primary Industries, Parks, Water and Environment	DPIPWE
Trade Records Analysis of Flora and Fauna in Commerce	TRAFFIC
Commonwealth Scientific and Industrial Research Organisation	CSIRO
Primary Industries and Regions, South Australia	PIRSA – Fisheries
Australasian Regional Association of Zoological Parks and Aquaria	ARAZPA
RecFish Australia	RecFish
New South Wales Department of Primary Industries	NSW DPI
Australian Institute of Marine Science	AIMS
Great Barrier Reef Marine Park Authority	GBRMPA
Victorian Department of Primary Industries	Vic DPI
Australian Fisheries Management Authority	AFMA
Department of Fisheries Western Australia	WA Fisheries
Northern Territory Department of Resources (Fisheries)	NT DOR
Queensland Department of Agriculture, Fisheries and Forestry	QLD DAFF
Indigenous Advisory Committee	IAC

