

**SHARK BAY**

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SAVE OUR SHARKS

## **The grey nurse**

By Brad Norman



The grey nurse shark (*Carcharias taurus*) (© Ken Hoppen, oceannotions@primus.com.au)

## THE GREY NURSE

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### Introduction

The grey nurse shark (*Carcharias taurus*) is one of Australia's most endangered marine species (figure 1). It is also known as the sand tiger shark in the United States of America or the spotted ragged-tooth shark in South Africa. With the introduction of the powerhead spear gun, grey nurse sharks were hunted almost to extinction during the 1950s and 60s—it is likely that large numbers were taken along the New South Wales coastline. Today, activities such as commercial and recreational fishing, and protective shark-meshing of beaches, continue to impact on these sharks. It is estimated that there are less than 500 left along Australia's east coast. Research has indicated that without extra protection, the species could be extinct within 40 years.



Figure 1. The grey nurse shark, *Carcharias taurus* (© Ken Hoppen, oceannotions@primus.com.au).

### History

These sharks have a fierce appearance, but are not considered to be dangerous to divers or swimmers unless provoked. In fact many shark attacks in Australia have been attributed incorrectly to the grey nurse shark. They are a passive species with teeth designed for capturing prey such as fish, squid and crustaceans. Two separate populations are listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The east coast population is listed as critically endangered; the west coast population is listed as vulnerable.

This species became the first protected shark in the world when the New South Wales Government declared it a protected species in 1984. The grey nurse is now protected under fisheries legislation in New South Wales, Western Australia, Victoria, Tasmania and Queensland, and is listed as vulnerable globally on the *IUCN Red List of Threatened species 2000*. However the east coast population of grey nurse shark is listed as critically endangered under the IUCN.

### Distribution

The grey nurse was originally described from the sharks taken in the Mediterranean Sea. It once had a broad distribution in warm-temperate (from sub-tropical to cool-temperate) inshore waters around the main continental landmasses. It is now found primarily along the east coasts of South Africa, North and South America, and on the east and west coasts Australia.

In Australia, the grey nurse shark has been recorded from Mackay in Southern Queensland, southwards to the Victorian border in eastern Australia, and from south-western Australia northwards to the North West Shelf. They have also been recorded as far north as the Arafura Sea off the Northern Territory.

Today, however the grey nurse is restricted to two populations, one on the east coast from southern Queensland to southern New South Wales and the other around the south west coast of Western Australia. It is believed that in general, the east and west coast populations do not interact; and research has indicated that the populations are genetically different. The grey nurse shark is now considered to be extinct in Victorian waters.

### Biology

The grey nurse shark generally occurs as a solitary individual or in small schools, with larger aggregations occurring during courtship and mating. The species can be easily distinguished from other sharks as it has a first and second dorsal fin of almost equal size (figure 2). The body is generally bronze in colour, with a pale under-surface, and brown spots present on the upper body and tail (caudal) fin. The maximum total length recorded for a grey nurse was 318 cm.

The grey nurse feeds on a wide variety of teleost fishes, small sharks, rays, squid, and very occasionally crabs and lobsters. In addition, groups of these sharks can feed cooperatively, surrounding and bunching schooling prey fish prior to feeding on them.

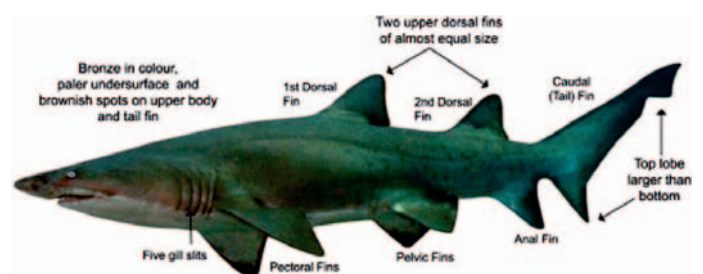


Figure 2. The grey nurse shark indicating various morphological features (© David Harasti).

## Reproduction

The grey nurse shark has a relatively slow growth rate and was previously thought to mature at about 4–6 years, with males and females maturing at about 220 cm and 240 cm total length, respectively. However, recent work in the United States of America and Australia (New South Wales Department of Primary Industries) indicates that the age at maturity is likely to be 9–10 years. The average life-span of a wild grey nurse is unknown, although it is greater than 16 years.

The reproductive strategy used by the grey nurse shark is intra-uterine cannibalism and oophagy which results in a maximum of two young per litter (one in each uterus). The females reproduce every second year equating to, on average, one pup birth per annum. Embryos hatch into the uterus at about 5.5 cm long and at lengths of around 10 cm they develop teeth and consume other embryos in the uterus (intra-uterine cannibalism). The single remaining embryo in each uterus then feeds on any unfertilised eggs (oophagy) as the female continues to ovulate. Gestation is between 9 and 12 months. The shark pups are about 1 metre long at birth.

The precise timing of mating and pupping in Australian waters is unknown, although it appears that grey nurse sharks give birth at select pupping grounds. Many sharks have been observed at Pimpernel Rock, New South Wales during the months of March and April with mating scars, i.e., bite marks around the pectoral fins, flanks and head. In South Africa mating occurs between late October and the end of November, with pregnant females moving southwards each year during July and August to give birth in early spring.

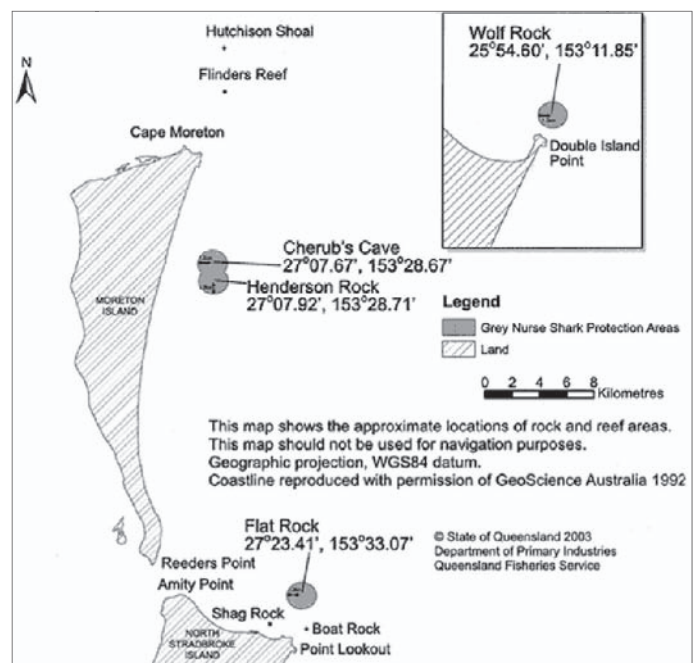
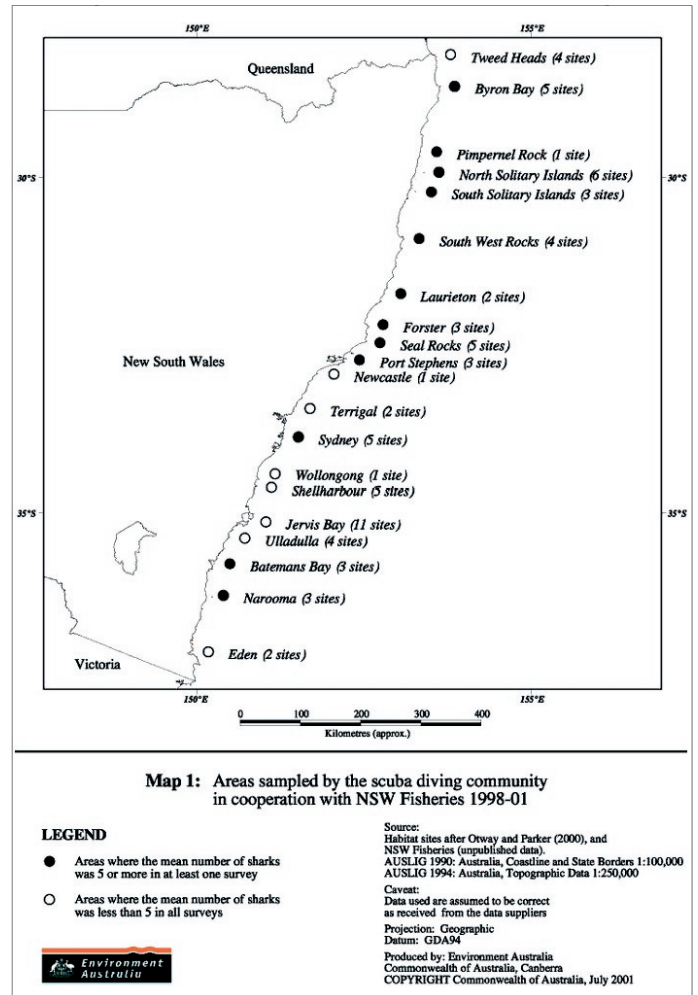
## Habitat and ecology

The grey nurse is found in areas ranging from rocky inshore reefs, occasionally in the surf zone and in shallow bays, and to maximum depths of around 200 metres on the continental shelf. It is often found near or on the bottom, but can also occur in midwater and occasionally at the surface.

The grey nurse roams over very large distances along the east coast of southern Queensland and New South Wales. They are known to gather to feed, mate and pup at a small number of locations (figure 3). In New South Wales, a number of sites have been identified as grey nurse critical-habitats, which are vital to the survival of this species:

*Opposite:*

Figure 3 (top) Locations of grey nurse habitats in New South Wales (© The Department of the Environment and Heritage); (bottom) Locations of grey nurse sightings in Queensland (© Queensland DPI).





- Julian Rocks near Byron Bay
- Green Island near South West Rocks
- Fish Rock near South West Rocks
- The Pinnacle near Forster
- Big Seal and Little Seal at Seal Rocks
- Little Broughton Island near Port Stephens
- Bass Point near Shellharbour
- Magic Point, Maroubra
- The Tollgate Islands at Batemans Bay
- Montague Island near Narooma

Additionally, North and South Solitary Islands are important grey nurse habitats.

Details of the critical-habitat can be found at the New South Wales Department of Primary Industries web site. These were established to reduce the impact of fishing on grey nurse sharks, and regulations have been implemented to control fishing activities.

Rules for divers and snorkellers in each grey nurse shark critical-habitat area are:

- No scuba diving between sunset and sunrise
- No blocking entrances to caves or gutters when the sharks are there
- No feeding or touching the sharks
- No chasing or harassing the sharks
- No electronic shark repelling devices
- No underwater scooters

The Queensland Department of Primary Industries (DPI) has introduced new fishing and diving regulations for three grey nurse shark protected areas (Flat Rock, Henderson Rock and Cherub's Cave) in the Moreton Bay Marine Park, and for Wolf Rock located off Double Island Point near Rainbow Beach. The changes became effective on 19 December 2003 and were developed to reduce risk of harm or disturbance to grey nurse sharks.

Penalties for breaches of fisheries legislation, and infringement notices, can be issued on the spot for some offences. The grey nurse shark is listed under Queensland's *Nature Conservation Act 1992* as an endangered species. The maximum fine for unlawfully taking, possessing, or selling a grey nurse shark or its parts is A\$225 000. The maximum fine for unlawfully fishing in a Grey Nurse Shark Protection Area is A\$75 000.

In Western Australian waters, very little is known about the grey nurse shark population. They are rarely seen by divers but are caught as bycatch in the Western Australian shark fisheries.

## Migration

A tagging program was implemented in 2002 to gain an understanding of grey nurse shark movements along the east coast of Australia. This work was conducted by the New South Wales Department of Primary Industries, Queensland Parks and Wildlife Service and the CSIRO. Sharks were tagged with small plastic cattle tags that had a unique number that could be observed underwater by scuba divers. Scuba divers then reported tag sharks to New South Wales Grey Nurse Shark Hotline and the locations and dates of re-sighted, tagged grey nurse sharks were used to construct large-scale movements among the sites in the coastal waters of South East Australia. Twenty-four sharks were tagged ranging in size from 1.00 metres to 2.61 metres. Of these, 20 individuals (83.3 percent) had been resighted on at least one occasion within one year of tagging. Conventional tagging is used to help assess the numbers of grey nurse sharks in the wild.

The tagging research has found that the same grey nurse sharks occupied particular sites along the coast at various times throughout the year. The sharks spent differing amounts of time at particular sites, and the uni-directional distances travelled ranged from 25 to 880 km and included journeys from sites in Queensland to sites in central and southern New South Wales and vice-versa. One small female grey nurse shark (known as Lucy) went from the Tollgates Islands at Batemans Bay (southern New South Wales) in summer to Fish Rock at South West Rocks (northern New South Wales) during winter, and was then seen again at Tollgate Islands during the following summer. Lucy then returned to Fish Rock in winter and continued her journey north into the waters of southern Queensland (Flat Rock)—all within a two year period.

The New South Wales Department of Primary Industries and the CSIRO are currently examining localised grey nurse shark movements within the critical-habitat sites. Results from this ongoing work have shown that grey nurse sharks move out to at least 1.2 km from their aggregation site.

## Threats

Grey nurse shark numbers in New South Wales inshore waters declined dramatically from 1950 to 1970 due to the combined effects of spearfishing, commercial and recreational fishing, and protective shark-meshing of beaches.

Hook wounds to grey nurse sharks can puncture the oesophagus, stomach, pericardial cavity, and liver causing infections and death. A hooked shark, upon release, may swim away seemingly unharmed, only to die several days later from internal bleeding or peritonitis. The stress of capture may cause changes in the physiology of a shark including bradycardia, blood acidosis, hyperglycaemia and muscle rigidity.

### Recreational fishing (sportfishing, spearfishing, gamefishers)

- As a consequence of listing under the EPBC Act 1999, if a recreational fisher carries out activities that result in the taking of a listed species in Commonwealth waters, the taking must be reported to the Secretary for the Australian Department of Environment and Heritage.
- Grey nurse sharks can take baited hooks that are often set for demersal species such as snapper, kingfish and mulloway. This can cause infection and death when these get caught in the jaws of the grey nurse and/or puncture the stomach, pericardial cavity and oesophagus.
- Recreational gamefishers have voluntarily banned grey nurse captures in 1979.
- Spearing of grey nurse sharks is prohibited in Commonwealth and state waters.

### Commercial fishing

- Several commercial fisheries that impact or potentially impact on grey nurse sharks include:
  - New South Wales Ocean Trap and Line
  - New South Wales Ocean Fish Trawl
  - New South Wales Ocean Prawn Trawl
  - Queensland East Coast Trawl
  - Queensland Line Fisheries
  - Western Australia Northern Shark Fishery
  - Western Australia West Coast Demersal Gillnet and Demersal Longline Fishery
  - Southern Demersal Gillnet and Demersal Longline Fishery
- Set lines are often left overnight and unattended by commercial fishers. It is believed that this method catches more grey nurse sharks than any other fishing method. Trawling can also capture this species as bycatch.
- The high demand for shark fins can impact upon sharks as this leads to targeting (Figure 4).

### Beach netting

- Shark control programs are a major threat to the grey nurse shark in New South Wales and Queensland. These sharks are caught as bycatch and not targeted in these programs as they are not considered to be a threat to humans.

### Ecotourism

- When grey nurse numbers were high, interactions with snorkellers and scuba divers were relatively common. There are dive sites along the New South Wales and Queensland coast that divers regularly visit to see grey nurse sharks in

the wild. If divers continue to keep an acceptable distance from these sharks and adhere to the diving regulations, it is unlikely that scuba diving will have any detrimental effects on grey nurse survival. The regulations that have been introduced for diving with grey nurse sharks will help minimise any potential diving pressures in the future. Additionally, the New South Wales Department of Primary Industry will be using acoustic tracking techniques to monitor the impacts of scuba diving on grey nurse sharks, in the near future.

### Protection

- Listed as an Endangered Species in New South Wales waters under the *Fisheries Management Act 1994*
- Listed as an Endangered species in Queensland under the *Nature Conservation Act 1992*
- Listed as a Vulnerable Species in Victorian waters under the *Fisheries Act 1995*
- Protected Species in Tasmanian waters under *Fisheries Regulations 1996*
- Protected Species in Western Australian waters under the *Wildlife Conservation Act 1950*
- The east coast population is listed as critically endangered and the west coast population as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999*

### What can you do?

It is important for the public to be aware of threats faced by the grey nurse sharks and what actions can be taken to minimise any impacts on this species.

The following information is important to collect and can be sent to fisheries agencies in New South Wales, Western Australia and Queensland:

- Total number of sharks sighted
- The sex of each shark (if not identified use 'unknown' category)
- Length of each shark (measure up against another diver)
- Temperature of the water at the bottom (digital gauge only)
- Special markings (scars, damaged fins - note where it is on the shark)
- Fishing tackle attachments (type of tackle, e.g., rope, hooks etc., - note where it is on the shark)
- Visibility of water
- Number of divers
- Identification tags (colour and number)
- Location (name of site and/or latitude and longitude)
- Your name and contact details

## For further information

New South Wales Fisheries Grey Nurse Shark web site:  
<http://www.fisheries.nsw.gov.au/thr/species/gns/home-gns.htm>

Queensland Department of Primary Industries web site:  
<http://www.dpi.qld.gov.au/fishweb/13789.html>

Recovery Plan for the Grey Nurse Shark in Australia:  
<http://www.deh.gov.au/coasts/species/sharks/greynurse/plan/index.html>

National Plan of Action for the Conservation and Management of Sharks (Shark-plan):  
<http://www.daff.gov.au/sharkplan>

Otway, N.M., Burke, A.L., Morrison, N.S. and Parker, P.C. (2003). Monitoring and identification of NSW Critical Habitat Sites for conservation of grey nurse sharks. NSW EA Project No. 22499. *NSW Fisheries Final Report Series No 47*. NSW Fisheries, Sydney, NSW, Australia. 62 pp.

Otway, N.M. and Burke, A.L. (2004). Mark-recapture population estimate and movements of grey nurse sharks. NSW EA Project No. 30786. *NSW Fisheries Final Report Series No 63*. NSW Fisheries, Sydney, NSW, Australia. 53 pp.

Otway, N.M., Bradshaw C.J.A. and Harcourt, R.G. (2004). Estimating the rate of quasi-extinction of the Australian grey nurse shark (*Carcharias taurus*) population using deterministic age- and stage-classified models. *Biological Conservation* 119: 341–350.

Otway, N.M. (2004). A grey future for grey nurse. *Proceedings of the 2004 Conference of the Australian Association of Veterinary Conservation Biologists*. R. Woods Ed., Canberra, ACT, Australia. pp. 8–27.

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