

Appendix 3

Popular shark myths, misconceptions and factoids

A3.1 During this inquiry, various beliefs about how shark behaviour and the causes of shark bite incidents were discussed. Some of these have gained a degree of acceptance in the community; however, they are not supported by expert evidence. One of the major challenges in ensuring accurate information about sharks is the acceptance of correlation implying causation. That is, increases or decreases in human–shark encounters in particular areas are attributed to changes in some other variable, such as whale migration or the presence of shark nets, without scientific evidence demonstrating a link between the two changes.

A3.2 It can be difficult to disprove and dispel some of the myths and misconceptions that exist. There are significant challenges in conducting shark research about human–shark interactions. It is also generally accepted that there is a need for further research to improve understanding about shark populations, behaviour, movement and breeding patterns. The difficulties associated with obtaining and disseminating reliable scientific evidence are in stark contrast to the ease in which incorrect information can spread, gain credence and become accepted as fact. For example, it has been argued that incorrect information about shark behaviour shown in the blockbuster film *Jaws*, in which a terrifying monster targets humans at a particular location, has shaped people's attitudes towards sharks.

A3.3 This appendix provides a selection of myths and misconceptions about sharks and shark bites, followed by evidence received during this inquiry that responds to them.¹ Questioning and challenging widely held beliefs about sharks is important for evidence-based policy, particularly as it is evident that many of these myths and misconceptions influence how interested individuals (and governments) approach the debate on shark mitigation and deterrent measures.

All sharks are dangerous

A3.4 Although around 180 species of sharks can be found in Australian waters,² the available data indicate that the overwhelming majority of shark bites in Australia, including 99 per cent of fatalities, can be attributed to the following three species:

- white sharks (*Carcharodon carcharias*);
- tiger sharks (*Galeocerdo cuvier*); and
- bull sharks (*Carcharhinus leucas*).³

1 In compiling a selection of myths in one place, this appendix repeats some of the evidence referred to elsewhere in the report.

2 Department of the Environment and Energy (DoEE), 'Sharks in Australian waters', www.environment.gov.au/marine/marine-species/sharks (accessed 2 December 2016).

The shark population has 'exploded'

A3.5 That the number of sharks in Australian waters has increased significantly was put forward by many individuals who contributed to this inquiry.

A3.6 Unfortunately, reliable data on shark populations is not available, although there is work underway by CSIRO to develop an estimate of white shark abundance. Nevertheless, due to what is known about sharks, shark experts consider it highly unlikely that the population could have dramatically increased. For example, Professor Jessica Meeuwig explained that white sharks only start reproducing between 17–20 years of age and 'have one or two offspring every couple years'. The professor emphasised that white sharks 'are just not capable of rapid rebound like a herring or a pilchard'.⁴

A3.7 Professor Nic Bax, a senior principal research scientist at CSIRO told the committee that, with respect to the white shark population, 'it would be hard to imagine that their growth rate could be more than about four per cent a year'.⁵

A3.8 Experts suggested that the perception of an increasing shark population could be explained by a greater number of people being in the water resulting in a higher number of observations.⁶ Potentially, a larger number of sharks could be approaching the coast due to changes in the distribution of their prey.⁷

Sharks target humans as prey

A3.9 As the Department of the Environment and Energy explains on its website, the current understanding of shark species known to be dangerous to humans is that these sharks do not target humans as prey. The majority of human–shark encounters that occur are instead because the shark confuses the person with its normal prey.⁸

3 Taronga Conservation Society Australia (TCSA), 'Australian shark attack file: FAQs', <https://taronga.org.au/conservation/conservation-science-research/australian-shark-attack-file/faqs> (accessed 5 December 2016). See also New South Wales Department of Primary Industries (DPI), 'Identifying sharks', www.dpi.nsw.gov.au/fishing/sharks/identifying-sharks (accessed 5 December 2016).

4 Professor Jessica Meeuwig, *Committee Hansard*, 20 April 2017, p. 44.

5 Professor Nic Bax, Senior Principal Research Scientist, CSIRO, *Committee Hansard*, 20 October 2017, p. 4.

6 Professor Jessica Meeuwig, *Committee Hansard*, 20 April 2017, p. 44.

7 Professor Jessica Meeuwig, *Committee Hansard*, 20 April 2017, p. 44.

8 DoEE, 'Sharks in Australian waters', www.environment.gov.au/marine/marine-species/sharks (accessed 2 December 2016).

A3.10 It was noted that 'sharks are inquisitive (and opportunistic) animals, and will investigate almost anything in the water column or on the surface'. Furthermore, it is considered that most sharks take a 'cautious investigative approach' to large objects in the water.⁹ Professor Daniel Bucher added:

Basically, sharks being a top predator, the only enemies they have are bigger sharks. Anything that is sitting on the surface is worth investigating as a potential food item. I do not think they are mistaking us for other prey; I think they have got this electrical sense. They have got a really good sense of sound and movement. They know this is not their normal food, but it is big enough and it is sitting there, and it is not doing much, and it does not seem to be able to swim as fast as all the other food it might be eating. That is why a lot of attacks are from behind; they are a cautious approach.¹⁰

Killing 'rogue' sharks will solve the problem

A3.11 Related to the suggestion that sharks hunt humans is the theory of 'rogue sharks'. The existence of rogue sharks was theorised by Victor Coppelson in the 1950s. Essentially, the theory centres on a 'rogue' shark or sharks that have developed a taste for human flesh, and that a series of shark encounters in the same area can be attributed to 'the work of a single shark—a rogue shark—which maintains even for years a beat along a limited stretch of shore'.¹¹

A3.12 As Dr Christopher Neff has observed, the film *Jaws* captured the public imagination about the risk of sharks and provided a vehicle through which rogue shark theory became accepted as a true explanation for human–shark encounters. The committee was also referred to other examples where individuals have called for rogue sharks to be killed to solve the problem of human-shark encounters.¹² Governments have also hunted 'rogue' sharks following shark bite incidents.

A3.13 Shark experts who the committee questioned during this inquiry do not accept the rogue shark theory. In particular, it is emphasised that sharks are migratory. CSIRO explained that bull, tiger and white sharks have similar movement patterns in that they 'roam over considerable distances (1000s of km)...and utilise both nearshore and offshore waters as part of their normal habitat'. Regarding white sharks, CSIRO noted that they 'are not permanent residents at any one site' with movements that 'indicate temporary residency at various sites, mixed with periods of long-distance travel that may include common corridors'.¹³

9 Dr Daniel Bucher and Professor Peter Harrison, *Submission 23*, p. 3 (citation omitted).

10 Professor Daniel Bucher, *Committee Hansard*, 2 May 2017, p. 48.

11 V Coppelson, *Shark attack*, Angus & Robertson, Sydney, 1958, p. 45; cited in C Neff, 'The Jaws Effect: How movie narratives are used to influence policy responses to shark bites in Western Australia', *Australian Journal of Political Science*, vol. 50, no. 1, 2015, p. 118.

12 Dr Christopher Neff, *Committee Hansard*, 17 March 2017, p. 3.

13 CSIRO, *Submission 33*, p. 7.

A3.14 Essentially, experts were clear that they 'have no evidence for anything called a rogue shark'.¹⁴

Sharks are dumb

A3.15 Professor Jessica Meeuwig argued that sharks 'are actually quite smart'. To illustrate, the professor referred to learned behaviour where sharks start to follow boats that are chumming.¹⁵ Professor Bax from CSIRO stated that sharks are 'highly evolved creatures in a very specialist area'.¹⁶

The presence of sharks in an area means an attack is likely

A3.16 Essentially, there is a belief in some quarters that if a shark is in the area, then an attack is likely. In response to this suggestion, Professor Bax from CSIRO told the committee:

Clearly we've seen areas where there are large numbers of white sharks with no attacks. Similarly, large numbers of tiger sharks were caught in the WA drum line program when there weren't attacks by white sharks. So just because there are sharks there doesn't mean there's going to be an attack.¹⁷

A3.17 Similarly, it was noted that the waters off Port Stephens in New South Wales are a known residency location for juvenile white sharks and, although encounters often occur between humans and sharks 'it is not implicated as a particularly high-risk area'.¹⁸ It was also noted that bull sharks regularly travel through the waters off Sydney and in Sydney harbour, and that this activity occurs without incident when people are in the water.¹⁹

14 Professor Jessica Meeuwig, *Committee Hansard*, 20 April 2017, p. 36.

15 Professor Jessica Meeuwig, *Committee Hansard*, 20 April 2017, p. 44.

16 Professor Nic Bax, CSIRO, *Committee Hansard*, 20 October 2017, p. 12.

17 Professor Nic Bax, CSIRO, *Committee Hansard*, 20 October 2017, p. 10.

18 Dr Daniel Bucher and Professor Peter Harrison, *Submission 23*, p. 3 (citation omitted).

19 Mr Brendan Donohoe, Northern Beaches Branch President, Surfrider Foundation Australia, stated: 'In Sydney there has not been a serious ocean beach attack for a number of years, so people feel safe—and they should. We know that bull sharks track straight in through Bondi pretty much daily, and there are thousands of people there all the time and no-one is attacked'. *Committee Hansard*, 17 March 2017, p. 27. The committee was also referred to a study of bull shark movements in Sydney Harbour on Australia Day 2016 where over 20 bull sharks were tracked and travelled through areas where people were swimming at popular beaches. See Mr Chad Buxton, Marine Scientist and Volunteer, Sunshine Coast Environment Council, *Committee Hansard*, 2 May 2017, p. 74.

Lethal measures stop human–shark encounters

A3.18 Although lethal measures reduce the risk of a human–shark encounter by reducing the number of sharks in the water, the degree to which this risk is reduced is impossible to quantify. Nevertheless, the available evidence suggests that culling programs do not reduce the number of shark bite fatalities. For example, in Hawaii over 4,500 sharks were culled over nearly two decades. After an evaluation demonstrated that the cull did not affect the number of fatalities, the program was abandoned in favour of non-lethal measures.²⁰

A3.19 Culling programs can also fail to target the species of sharks associated with shark bites in a particular region. For example, the trial of drum lines conducted in Western Australia in 2014 is estimated to have killed 173 tiger sharks but did not kill any white sharks. White sharks were the species involved in the shark bite incidents that led to the trial, whereas tiger sharks have not been implicated in any lethal attacks in the region since 1923.²¹

A3.20 The New South Wales and Queensland shark control programs also do not prevent human–shark encounters. For example, the committee was advised that:

- Since the Queensland measures were introduced, 17 human–shark encounters have occurred at beaches with drum lines and/or nets, including one fatality. The fatality occurred at a location where eight drum lines were in place. It was also noted that shark encounters have increased at the Central Coast beaches since shark nets have been installed.²²
- In New South Wales, 40 non-fishing related human–shark encounters have occurred at netted beaches, including 24 incidents between September 1992 and the end of 2016 (almost one per year). It was also noted that no shark bite fatalities occurred between 1929 and 1937 (when the nets were introduced), or during World War II when the nets were removed.²³

A3.21 Given that serious injuries have resulted in recent shark bite incidents, when considering the low rate of fatalities, several stakeholders argued that improvements in medical responses (such as blood loss prevention) need to be taken into account.

A3.22 The location of lethal shark measures also mean that people involved in activities associated with a higher risk of shark encounters are unlikely to be protected. For example, divers are unlikely to be protected by drum lines or nets located near beaches.

20 Ms Natalie Banks, Chief Advisor, Sea Shepherd Australia, *Committee Hansard*, 20 April 2017, p. 11; Professor Jessica Meeuwig, *Committee Hansard*, 20 April 2017, p. 41.

21 See Professor Jessica Meeuwig, *Committee Hansard*, 20 April 2017, p. 36.

22 Sea Shepherd Australia, *Submission 57*, pp. 6, 8; Associate Professor Daryl McPhee, *Committee Hansard*, 2 May 2017, p. 38.

23 Dr Christopher Neff, *Submission 48*, p. 3; Sea Shepherd Australia, *Submission 57*, pp. 3, 6.

A3.23 Further evidence regarding the effectiveness of lethal measures is in Chapter 4.

Shark nets provide a barrier separating sharks and humans

A3.24 Shark nets have limited coverage and do not provide a barrier that separate people in the water from sharks. This is because the nets are only 150 metres to 186 metres wide, and are six metres deep with limited vertical coverage (bottom set nets result in a gap between the surface and the top of the net, whereas surface-set nets result in a gap underneath the net to the seafloor). The nets are generally deployed up to 500 metres offshore.

A3.25 It is not intended that the nets create an enclosed area: rather, they are a passive fishing device designed to cull sharks in the area.²⁴ Sharks can, and do, swim around them.

A3.26 There are new types of non-lethal devices that seek to provide a barrier between sharks and beachgoers, such as the eco barriers. These products are discussed in Chapter 6.

The Queensland shark control program is a model that other states should follow

A3.27 During this inquiry it was argued that due to the low number of shark-related fatalities and injuries in Queensland since the Queensland shark control program was introduced, other states should follow the Queensland Government's example and introduce nets and drum lines. Putting aside evidence received about the limitations of lethal measures in general, there are key differences between the marine environments in Queensland and other areas, such as Western Australia, that make comparisons problematic.

A3.28 The most significant difference is the species typically involved in shark bites (white sharks in Western Australia and bull sharks in Queensland). Although the lethal measures capture the shark species involved in shark bite incidents in Queensland, when drum lines were trialled in Western Australia they failed to catch any white sharks. The committee received expert evidence emphasising the need to account for how different species behave, such as white sharks being visual specialists whereas bull sharks rely on electro reception.²⁵ It was also noted that white sharks are migratory and travel great distances, whereas bull sharks are more territorial; therefore the risk in Queensland arises from bull sharks that spend significant time near the coastline. Furthermore, other differences between the marine environments were noted, such as Queensland being a semitropical to tropical environment where white sharks do not spend large amounts of time, and the difference in seal and sea lion

24 Queensland Department of Agriculture and Fisheries, 'Shark control equipment and locations' www.daf.qld.gov.au/fisheries/services/shark-control-program/shark-control-equipment-and-locations (accessed 6 December 2016).

25 Professor Shaun Collin, *Committee Hansard*, 20 April 2017, p. 38.

populations (these animals are present in Western Australian waters but not in Queensland).²⁶

A3.29 Overall, the evidence available indicates that copying measures used in one region to target a different species of shark in another region will not necessarily be effective.

The closure of a shark fishery in Western Australia has led to shark attacks

A3.30 The Western Australian Minister for Fisheries told the committee that there is a local myth about a shark fishery in Western Australia which was closed and that that this has contributed to recent spikes in human–shark encounters. The Minister informed the committee that:

There has never been a great white shark fishery. We have just never fished specifically for great white sharks for human consumption. There is a shark fishery still here in Western Australia in the southwest. It actually targets other species. My understanding is that most of the attacks have actually occurred where that shark fishery operates. There is a bit of confusion around: 'There's been a closure of a shark fishery.' People assume that that must have been a shark fishery where they were targeting great whites. There has never been a great white shark fishery as such, here in Western Australia.²⁷

The presence of whales has resulted in higher numbers of sharks off the coast

A3.31 A factoid discussed during the committee's public hearings is the suggestion that an increase in the number of whales off the Western Australian coast has attracted greater numbers of sharks and resulted in a higher number of human–shark encounters. When asked about this suggestion, Professor Bax warned that correlation does not prove causation. More specifically, CSIRO referred to a recently peer reviewed paper that examined coastal movements of white sharks off Western Australia. CSIRO explained that the paper found that, 'although the distribution of white sharks along the west Australian coastline overlapped that of humpback whales, there was no evidence to support the statement that white sharks were following the humpback whale migration'.²⁸ Instead, CSIRO suggested that many other factors are

26 Mr Blair Ranford, *Committee Hansard*, 28 July 2017, p. 64.

27 The Hon David Kelly MLA, Western Australian Minister for Water; Minister for Fisheries and Minister for Forestry, *Committee Hansard*, 20 April 2017, p. 57

28 CSIRO, Answers to questions on notice, 20 October 2017 (received 23 November 2017), pp .6–7. The research referred to by CSIRO is RB McAuley, BD Bruce, IS Keay, S Mountford, T Pinnell and FG Whoriskey, 'Broad-scale coastal movements of white sharks off Western Australia described by passive acoustic telemetry data', *Marine and Freshwater Research*, vol. 68, 2017, 1518-1531.

responsible for increased human–shark interactions, such as changes in near-shore fish species preyed on by sharks.²⁹

Electrical shark deterrents attract sharks

A3.32 The committee was also advised that some people believe that the technology used in electrical shark deterrent products, such as Shark Shield, attracts sharks. In response, Mr Lindsay Lyon, the Managing Director of the company that produces Shark Shield, explained that the electrical fields produced by the product are limited.

A3.33 Mr Lyon stated:

From a physics electronics perspective, it is extremely difficult to transmit electrical fields under water. The reason we have submarines in defence is when you have a nuclear explosion and it causes an electromagnetic pulse it does not affect the submarines because the water acts as a complete shield. The electrical field from these devices at about six or 10 metres is, in the technical marketing term, 'jack to none'. So it is very hard to transmit under water.³⁰

Perceptions on the risk of shark bites

A3.34 Finally, although this is not a myth as such, it is important to note that, statistically, the risk of a fatal shark bite incident is very low. According to data collected by the Taronga Conservation Society Australia (TCSA), in the last 50 years there have been 47 fatalities in Australia arising from unprovoked shark bites (an average of 0.9 per year).³¹ Although the overall number of shark bite incidents in Australian waters has gradually increased over the last few decades, the risk is very low when compared to other causes of death and when the millions of beach visitations that occur each year are taken into account. For example, Sea Shepherd Australia cited TCSA data indicating that, over a person's lifetime the risk of being killed by a shark is one in 292,525, compared to a one in 3362 chance of drowning at the beach.³²

29 Professor Nic Bax, CSIRO, *Committee Hansard*, 20 October 2017, p. 5.

30 Mr Lindsay Lyon, Managing Director, Shark Shield, *Committee Hansard*, 20 April 2017, p. 18.

31 TCSA, 'Australian shark attack file', <http://taronga.org.au/conservation/conservation-science-research/australian-shark-attack-file> (accessed 2 December 2016).

32 Sea Shepherd Australia, *Submission 57*, pp. 30–31.