Chapter 4

Evidence received about the need for, and effectiveness of, lethal shark control programs

4.1 The preceding chapters largely provide background information about the shark management techniques used in Australia. This chapter begins the report's examination of the evidence received by delving into the issue that is at the heart of the inquiry: whether the lethal shark control programs used in New South Wales and Queensland, and previously proposed for Western Australia, are effective and appropriate public safety measures. The evidence outlined in this chapter provides a foundation for the chapters that follow, including Chapter 5, which consider the exemptions granted to state governments to conduct trials of lethal shark control measures; Chapters 6 and 7, which examines the alternative shark mitigation and deterrence approaches and technologies available; and Chapter 8, which contains the committee's overall conclusions.

4.2 The need for, and effectiveness of, lethal shark control measures attracted significant and passionate debate. Accordingly, this matter is discussed in this chapter at length. The chapter begins by examining views on the extent to which state governments should have a role in protecting members of the public who decide to enter waters where shark populations exist. The chapter then examines the arguments received in favour of the lethal shark control programs, followed by the evidence questioning, or presenting arguments against, lethal shark control programs.

Role of government

4.3 Before examining the evidence received about the effectiveness of lethal shark control measures, it is instructive to consider the evidence put forward regarding whether governments have a legitimate role in providing such measures in the first place.

4.4 It is evident that governments within Australia and globally have taken different approaches in response to shark bites. For example, as this report has identified, lethal shark control programs have been used in New South Wales and Queensland for decades. Lethal measures are also used in South Africa and New Zealand.[1] However, the committee was advised that governments in the United States do not respond to shark bite incidents. Professor Colin Simpfendorfer remarked that the government policy there is 'essentially not do anything in terms of going out and

1 See Department of the Environment and Energy (DoEE), Answers to questions on notice, Senate Environment and Communications Legislation Committee, Budget Estimates 2017–18, No. 75.

trying to catch or reduce populations' as the potential of encountering a dangerous shark is seen as 'an assumed risk'.[2]

4.5 It is evident that significant amounts of public money have been spent on shark control measures and research. A non-exhaustive list of government expenditure on shark matters in recent years is at Table 4.1. The table also notes some private sector and community expenditure that was highlighted during the inquiry.

Table 4.1: List of programs and expenditure relating to sharks, various years

Program/activity	Funding provided/projected
Commonwealth	
National Environmental Science Program funding in relation to shark-specific research	$2.79 million(1)
Expenditure associated with the development of the Shark Recovery Plan	Not available
New South Wales	
Shark Management Strategy	$16 million over five years (including $7.7 million for surveillance, detection and deterrence measures; $7 million for research; and $1.3 million for education and community awareness) (2)
Meshing program	$1.4 million/year (estimate)(3)
Queensland	
Cost of shark control program	$3.3 million/year(4)
Research into behaviour of large sharks (2009)	$125,000 over five years(4)
South Australia	
South Australian Aerial Patrol	$400,000 (2015–16) (3)
South Australia Surf Life Saving Association expenditure on aerial surveillance	Not available(3)
Western Australia	
Beach and aerial surveillance	$12.24 million over 2012–2017(5)
Extended beach patrols in the south west to cover school holiday periods	$2.62 million (2014–15 to 2018–19) (5)

2 Professor Colin Simpfendorfer, *Committee Hansard*, 30 August 2017, p. 8.

Funding to Surf Life Saving WA for jet skis (2012) and a trial of drone surveillance technology (2016)	$1.28 million[5]
Various beach enclosures	$1.2 million by state government,[5] $510,000 by City of Joondalup (plus $40,000/year to maintain) [6]
Drum line trial	$1.28 million (2014)[5]
Serious threat policy	$2.8 million (2012–2020)[5]
Trial of Clever Buoy technology at City Beach (2016–2017)	$500,000[5]
Funding for the Shark Response Unit, SmarkSmart website and BeachSafe app	$4.43 million (2011–2020)[5]
Shark Monitoring Network and shark tagging and tracking	$3.7 million (2013–2020)[5]
Other science and research projects	$3.6 million[5]
Watchtowers at Cottesloe Beach	$175,000[5]
Private and community sectors	
Clever Buoy research and development	$2–3 million[7]
Shark Shield	$10 million over 15 years[8]
Australian Aerial Patrol	$500,000/year[3]

Notes: Date ranges for multi-year funding and future funding commitments is indicated where available. Figures given by third parties are indicative only.

Sources: (1) DoEE, *Submission 55*, pp. 8–9; (2) New South Wales Department of Primary Industries (DPI), "NSW Shark Management Strategy', www.dpi.nsw.gov.au/__data/assets/pdf_file/0006/581694/nsw-shark-management-strategy-factsheet.pdf (accessed 7 November 2017); (3) Australian Aerial Patrol, *Submission 6*, pp. 9, 19; (4) Queensland Department of Agriculture and Fisheries, *Submission 32*, pp. 1, 4; (5) DoEE, *Submission 55*, Attachment 3; (6) Mr Tony Pickard, Mayor, City of Joondalup, *Committee Hansard*, 20 April 2017, pp. 31, 33; (7) Mr Richard Talmage, General Manager, Shark Mitigation Systems, *Committee Hansard*, 17 March 2017, p. 44; (8) Mr Lindsay Lyon, Managing Director, Shark Shield, *Committee Hansard*, 20 April 2017, p. 4.

4.6 This section builds on evidence previously noted in this report about the relatively low risk of a person encountering a dangerous shark compared to the risks associated with many other activities that can result in fatalities or injuries. Evidence received about the effects of lethal shark control measures on the marine environment and the cost of the measures is also relevant.

Arguments in favour of government intervention

4.7 State governments themselves have made some of the clearest arguments in support of government action to help reduce the risk of people encountering dangerous sharks while engaging in water-based activities.

4.8 In correspondence provided in December 2016, the then Premier of Western Australia, the Hon Colin Barnett, advised the committee that his government was 'committed to addressing its duty of care to minimise the risk of shark attack'.[3] Similarly, the relevant New South Wales minister has stated that, '[a]lthough no government can guarantee complete safety', the New South Wales Government is 'committed to doing everything it can to ensure the safety of beachgoers, swimmers and surfers'.[4] The Queensland Government considers that the lethal shark control measures it operates are an 'important safety initiative'.[5]

4.9 The extent to which these declarations of government responsibility to minimise the risk presented by sharks rest with the states alone is less clear. The Department of the Environment and Energy submitted:

> It is the responsibility of state and territory governments to focus on public safety and manage the risks to people from sharks in their waters. States and territories are primarily responsible for determining which measures best provide for public safety in their jurisdictions.[6]

4.10 Yet in his correspondence to the Commonwealth Minister for the Environment and Energy, the New South Wales Minister for Primary Industries argued that shark encounters have national implications that necessitate the Commonwealth's attention. The Minister for Primary Industries commented:

> Public safety is a responsibility of all governments. Unprovoked shark interactions are not specific to NSW and are considered a national issue where State and Commonwealth Governments need to work cooperatively to ensure the protection of swimmers and surfers.[7]

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3 Correspondence from the Hon Colin Barnett MLA, Premier of Western Australia, dated 14 December 2016 (published as *Additional Information 1*), p. 2.

4 The Hon Niall Blair MLC, Minister for Primary Industries, and Minister for Lands and Water, *Hansard*, Parliament of New South Wales, Legislative Council, 9 November 2016, pp. 53, 55.

5 Queensland Department of Agriculture and Fisheries, *Submission 32*, p. 1.

6 DoEE, *Submission 55*, p. 3.

7 The Hon Niall Blair MLC, News South Wales Minister for Primary Industries; Minister for Lands and Water, correspondence to the Minister for the Environment and Energy, dated 10 November 2016; provided in DoEE, *Submission 55*, Attachment 6, p. 4.

4.11 Individuals and community organisations also commented on the need for government to play a role in public safety regarding sharks.

4.12 Mr Daniel Webber argued that the community, and therefore the government, has a duty to protect children through measures that directly reduce the risk of encountering a shark. Mr Webber argued that, at present, personal deterrents are not suitable for young surfers due to the electric shocks incurred (this is discussed in Chapter 6). Likewise, he argued that education measures have limited benefits due to the risks that teenagers are willing to take. Mr Webber explained:

> Surfing really is an addiction, and any young surfer who finds good waves going unridden will paddle out no matter what the conditions. Besides, teenagers thrive on risk, especially if someone is advising them against an activity. I should also add that younger surfers surf more often and longer than most adults, and smaller boards are more likely to be attacked. So they are a high-risk group.[8]

4.13 In its submission, the Ballina Lighthouse & Lismore Surf Lifesaving Club argued that the government has a role in supporting research that facilitates new technologies for shark deterrence. The Club noted that an additional benefit of government support for the development of these technologies could be the creation of an export industry.[9]

4.14 Mr Andrew Stark, Chief Executive Officer, Surfing Australia, commented that, in his view, the role of government in minimising the risk of a person in the water encountering a dangerous shark should involve a combination of approaches. Mr Stark explained:

> There is not any one particular answer: investment in technology and science, investment in education around the dangers of it, investment in current programs whilst you are working on new programs, investment in surveillance and investment in community consultation. A lot of things are already happening. There is probably more that can happen. It is not a one-key-fits approach. There are certainly a number of different strategies from different stakeholder groups to make sure that this is addressed holistically.[10]

8 Mr Daniel Webber, *Committee Hansard*, 17 March 2017, p. 29. Mr Webber referred to private correspondence with the curator of the Australian Shark Attack File and an academic research paper to support his evidence regarding sharks being more interested in smaller objects.

9 Ballina Lighthouse & Lismore SLSC, *Submission 52*, p. 3.

10 Mr Andrew Stark, Chief Executive Officer, Surfing Australia, *Committee Hansard*, 2 May 2017, p. 34.

Arguments against lethal measures based on the inability of governments to guarantee public safety

4.15 It was widely accepted that governments have a role in promoting the safety of beachgoers. However, some submitters and witnesses argued that it is not possible for governments to ensure a completely safe ocean environment. As governments cannot guarantee public safety, these submitters and witnesses reasoned that governments should not implement or maintain measures that damage the marine environment.

4.16 For example Ms Claudette Rechtorik, Manager, SEA LIFE Trust Australia/New Zealand, argued:

> The government has a role to play in the safety of the beach-going public. However, it is not the role of the government, nor is it even possible, to give the ocean-going community a 100 per cent safe ocean environment. The deployment of shark nets and drum lines is creating not only a false sense of security but one that carries a significant toll for tens of thousands of threatened and endangered marine life. Through multiple surveys in multiple locations, the consistent response from the majority of respondents is that they do not support mechanisms that kill our marine life.[11]

4.17 Ms Jessica Morris, Marine Scientist, Humane Society International (HSI), stated:

> Given the fact that the government can never guarantee public safety in the ocean, we wish to again emphasise that by-catch of protected, harmless and threatened wildlife in Australia's shark control programs is unsustainable and, therefore, should be unacceptable to policymakers.[12]

4.18 Similarly, Australia for Dolphins argued that governments 'cannot ever guarantee public safety in the ocean' and should 'adopt a risk management approach' with an emphasis on non-lethal shark management strategies.[13]

4.19 The Australian Marine Conservation Society (AMCS) acknowledged that human–shark encounters have 'the potential for very significant consequences for individuals, families and friends'. The AMCS also recognised that governments 'can and should implement beach safety mechanisms in relation to shark interactions'. However, the AMCS emphasised that shark interactions 'are still highly rare events' and 'it is not possible to mitigate the risk entirely'. Furthermore, the AMCS argued that there 'is no one perfect solution to keeping sharks and humans completely separated in

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11 Ms Claudette Rechtorik, Manager, SEA LIFE Trust Australia/New Zealand, *Committee Hansard*, 17 March 2017, p. 7.

12 Ms Jessica Morris, Marine Scientist, Humane Society International (HSI), *Committee Hansard*, 17 March 2017, p. 33.

13 Australia for Dolphins, *Submission 4*, p. 5. See also Greenpeace Australia Pacific, *Submission 50*, p. 4.

the marine environment, and there should be no expectation of such'. According to the AMCS, lethal shark control programs 'are doing more damage to the marine environment than providing benefit to ocean users' and is an approach that is 'both archaic and inappropriate'.[14]

Arguments emphasising the need for personal responsibility and a limited role for government

4.20 Several stakeholders who oppose lethal shark control measures asserted that individuals who choose to enter waters where sharks may be present are doing so at their own risk. As a result, these stakeholders reason that there should be a greater expectation that these individuals take personal responsibility for this risk. Accordingly, government actions to alleviate the risk presented by shark bites should be limited.

4.21 For example, Associate Professor Daryl McPhee noted that:

> From the perspective of governments there is a question as to how much a government should intervene, and to what cost, and to what extent, to provide mitigation for people to undertaken a leisure activity of their choosing, when and where they choose. Millions of dollars of taxpayers money is spent annually in response to unprovoked shark bite and its mitigation.[15]

4.22 Associate Professor McPhee asserted that 'individuals need to take greater responsibility for their own safety as the priority, and not rely principally on government'. In support of this view, the associate professor contrasted the programs in place to protect water users from sharks compared to the lack of specific and extensive public safety measures introduced for other leisure activities:

> Using an analogy from the terrestrial environment, a mountain bike rider or a rock climber does not expect a government to make an area 100% safe for those activities. They may expect a government to provide up to date information which facilitates them making a more informed decision, but not active programs to eliminate hazards.[16]

4.23 Associate Professor McPhee added that, in his view, there is a role for government in developing educational material and supporting research needed for 'developing the tools' to respond more effectively to the risk of shark incidents. However, the associate professor emphasised that governments do not need to fund such research in its entirety, particularly as there 'is a lot of commercial interest in this area'. Finally, Associate Professor McPhee suggested that the government could assist in improving the support provided following a shark incident. He explained:

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14 Australian Marine Conservation Society, *Submission 38*, p. 3.

15 Associate Professor Daryl McPhee, *Submission 58*, p. 2 (emphasis omitted).

16 Associate Professor Daryl McPhee, *Submission 58*, p. 3.

> I think there is a significant gap in support for victims, their families and first responders. It is a very acute post-traumatic stress disorder. Certainly the New South Wales government in the last round provided some funding for that area. I think that is an area Commonwealth health services could also look at. I do not know what that would look like, but to me this seems to be a very clear gap where a lot of support could be undertaken.[17]

4.24 Dr Sharon Burden highlighted the need for personal responsibility in relation to undertaking ocean-based recreational activities, with government-backed efforts to promote public safety playing a supplementary role. Dr Burden stated:

> To me, as individuals we play a key role in saying: 'What will I do when I choose a sport that is in the ocean? What personal protective equipment am I prepared to use and purchase? Given all that, the apps available, the information at the beach and the local knowledge I have when I step into the water, have I done everything I possibly can to keep myself safe?'
>
> If then, later, on top of that, you have governments working collaboratively together with surf lifesaving and local organisations to make that beach safer—whether it is through drones, shark spotting towers or whatever it might be—we have layered up the protection from both sides, and that is the best that we can do.[18]

4.25 Sea Shepherd Australia argued that state governments are not responsible for the conduct of marine animals. In comments similar to those expressed by Associate Professor McPhee (see paragraph 4.22), Sea Shepherd contrasted the risk of shark bite with that associated with other leisure activities that can have a higher rate of fatalities but do not trigger the same expectation for government intervention. Sea Shepherd submitted:

> While Sea Shepherd agrees that unprovoked, fatal shark attacks are tragic, traumatic events, the State Government is no more responsible for the actions of surfers and swimmers than it is in protecting hikers and bee-keepers from fatal attacks by bees. Providing an expectation for State Governments to be responsible for the actions of swimmers and surfers is placing massive obligations and excessive burdens on Government authorities.[19]

17 Associate Professor Daryl McPhee, *Committee Hansard*, 2 May 2017, p. 39.

18 Dr Sharon Burden, *Committee Hansard*, 28 July 2017, pp. 19.

19 Sea Shepherd Australia, *Submission 57*, pp. 14–15.

4.26 Although Sea Shepherd argued that state governments are not responsible for the actions of surfers and swimmers, it emphasised that governments are subject to legal obligations regarding the protection of the environment, including protected species.[20] Sea Shepherd argued that:

> …the duties on the State imposed by these legal instruments trump any perceived responsibility that the New South Wales, Queensland and Western Australia Governments cite as justification for their shark control programs.[21]

4.27 Evidence given by the Australian Aerial Patrol also indicates that some surfers ignore or are dismissive of the efforts put in place to enhance their safety. As noted in Chapter 2, Mr Duncan Leadbitter explained that when a patrol detects a shark, it conducts orbits until 'the shark is spooked and has swum away…or we are confident that people are out of the water'. Mr Leadbitter informed the committee that:

> Most of the time people will get out of the water. Surfers commonly do not. They will just give us the bird and keep surfing. On my local beach surfers see sharks on a relatively regular basis and most people just ignore them. You give people the chance to get out of the water and…we have on one occasion called the police to try to get people out of the water.[22]

Arguments for maintaining lethal programs

4.28 The principal argument put forward in support of the shark nets and drum lines is the low rate of shark bites that have occurred in the areas featuring lethal measures since those measures were introduced. For example, the Queensland Department of Agriculture and Fisheries submitted that since 1962, when the Queensland shark control program was introduced following multiple fatal shark bites, 'only one fatal shark attack has been recorded at a beach serviced by the program'. The department added that this 'is despite the large increase in the number of people swimming at these beaches over the same period'.[23]

4.29 Similar observations have been made regarding the New South Wales shark meshing program: since the program was introduced, only one fatal shark bite incident has occurred at a meshed beach.[24]

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20 Sea Shepherd Australia, *Submission 57*, p. 15.

21 Sea Shepherd Australia, *Submission 57*, p. 18.

22 Mr Duncan Leadbitter, Director, Australian Aerial Patrol, *Committee Hansard*, 17 March 2017, p. 19.

23 Queensland Department of Agriculture and Fisheries, *Submission 32*, p. 1. Surf Life Saving Queensland made a similar point: see *Submission 2*, p. 1.

24 DPI, 'Shark Meshing (Bather Protection) Program', www.dpi.nsw.gov.au/fishing/sharks/management/shark-meshing-bather-protection-program (accessed 5 December 2016).

4.30 The submission from the Queensland department responsible for managing the state's shark control program explained that the state government is committed to maintaining the program.[25] The department provided the following reasoning:

> Prior to 1962, regular shark attacks occurred on popular Queensland beaches and made them unsafe for recreation. Since the Government implemented the [shark control program], the number of shark attacks occurring on our beaches has decreased dramatically, with only 29.3 per cent of unprovoked and fatal attacks nation-wide occurring in Queensland.[26]

4.31 Some individuals and organisations agreed that the low rate of incidents at beaches that feature lethal shark control measures demonstrates the success of these programs.

4.32 In support of his conclusion that the lethal measures used in New South Wales have been successful, Mr John Heaton compared available statistics on shark incidents between the shark meshing program area (SMP) from Newcastle to Wollongong and the non-SMP area from Byron Bay and Yamba. He stated that between 1995 to 2015, 25 incidents occurred, comprising encounters that resulted in injuries and encounters that did not. Between September 2014 and October 2016, the Byron Bay–Yamba coastline has experienced 18 encounters, including two fatalities. Mr Heaton argued:

> This is the comparison between a SMP area and a non-SMP area – 25 in 20 years compared to 17 in 2 years. The odds are definitely in a person's favour if you use the ocean between Newcastle to Wollongong. The current SMP provides the many millions of public & tourists a certain level of reassurance. Therefore, it is a question of equality to afford other areas experiencing a high level of shark interaction, the same level of reassurance.[27]

4.33 Mr Heaton explained that he was initially opposed to the proposal to trial shark nets in the New South Wales north coast. However, he changed his mind 'after the continual attacks in 2016 and the "experts" not having a clue for the ongoing shark activity close to the shore'. Mr Heaton explained that he is willing to support any measure 'that will assist to prevent interactions between ocean users and sharks' and that, in his view, the measures should be used in any area that has a high rate of shark incidents.[28] Mr Heaton concluded: 'I make no apology for supporting measures that put human life above marine life'.[29]

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25 Queensland Department of Agriculture and Fisheries, *Submission 32*, p. 1.

26 Surf Life Saving Queensland, *Submission 2*, p. 1.

27 Mr John Heaton, *Submission 11*, p. 3. Mr Heaton noted that other measures used in the SMP areas would also assist to minimise the risk of incidents, including the greater resources available for surf lifesaving clubs due to the higher population in the SMP area.

28 Mr John Heaton, *Submission 11*, p. 1.

29 Mr John Heaton, *Submission 11*, p. 3.

4.34 At the committee's Byron Bay hearing, Mr Don Munro argued that, based on catch rates, drum lines in Queensland 'are an effective way of reducing the shark levels' and are 'definitely working'.[30] Similarly, Mr Alan Baldock stated that he is 'a strong believer in drum lines'. Mr Baldock stated:

> If you talk to…a lot of the professional fishermen in the Ballina, Yamba and Evans area, they will all tell you the same thing. The real drum lines[31] will thin them out on the coast so you do not have to be way out in the ocean and you do not have to go and kill hundreds of sharks. They will work just along the coastline. The system is they will hook the shark and kill it. The will let the shark drop to the bottom of the ocean. It will decay and send out a smell for miles and miles, and that is what deters the other sharks. That is how they work. That is why they work on the Gold Coast, and they have been since 1964. If you read the stats, you would know that.[32]

4.35 Mr Fred Pawle argued that the Queensland program has proven that 'nets and drum lines are an effective and cheap way of protecting people while causing minimal disruption to the marine environment'.[33] Mr Pawle stated:

> If a shark is caught in a net or on a drum line, sharks know to stay away. Even scientists acknowledge this. This happened off the Neptune Islands, when some orcas took out a great white. They did not see any more sharks for a month or two, if I am not mistaken. Similarly, off the Farallon Islands in Northern California a few years ago some orcas took out some great whites there, too, and the great whites disappeared. My theory—and, again, I am not a scientist—is that the sharks being caught in nets and drum lines off Queensland are deterring other sharks from coming close.[34]

4.36 Mr Pawle continued:

> I am not proposing the extinction of a species, I am simply questioning the wisdom of sacrificing one of the greatest aspects of life in Australia for the sake of several large, dangerous shark species being able to inhabit our beaches. The Queensland marine ecology has not collapsed as a result of

30 Mr Donald Munro, President, Le-Ba Boardriders; and Spokesperson, Lennox Head National Surfing Reserve, *Committee Hansard*, 2 May 2017, p. 9.

31 Mr Baldock is referring to the traditional lethal drum lines, not the SMART drum lines discussed in Chapter 6.

32 Mr Alan Baldock, *Committee Hansard*, 2 May 2017, pp. 10–11. As noted in Chapter 1, however, Professor Shaun Collin advised the committee that 'not all sharks are the same with respect to how they react to environmental cues'; although tiger sharks base 'most of their behaviour on smell', white sharks and bull sharks rely on vision and electro reception respectively. Professor Shaun Collin, *Committee Hansard*, 20 April 2017, pp. 37, 38.

33 Mr Fred Pawle, *Submission 56*, p. 4.

34 Mr Fred Pawle, *Committee Hansard*, 31 July 2017, p. 35.

> more than 50 years of nets and drumlines. Why can't these relatively cheap, effective protective measures be implemented around the country?[35]

4.37 Stakeholders who support the current lethal programs were optimistic that the level of bycatch associated with some of the measures could be reduced. For example, Mr Munro told the committee:

> Certainly no-one I speak to wants to see bycatch. We do not want to see that sort of thing happening at all, but we have to be practical. We are the apex predator. Human life must prevail over all other types of animal or marine life. So we are hopeful—and I am sure it is going to happen—that we will see an initiative or a system put in place where both human and marine life will be protected.[36]

Arguments questioning the effectiveness of, or in opposition to, lethal programs

4.38 The committee received a large number of submissions from individuals and organisations that oppose the use of lethal shark control measures on the following grounds:

- it is considered that the lethal measures are not effective in reducing the risk of encountering a dangerous shark;
- the impact of the measures on the populations of protected shark species (including species that are not considered dangerous to humans);
- the impact of the measures on the populations of other marine species; and
- concerns for the welfare of target and non-target species.

4.39 The following submission extract is an example of the overall argument against lethal measures:

> The management of sharks is a vexed and emotive issue. However…the current lethal measures in place are neither protecting humans from sharks, nor are they protecting marine life. Instead, they create a false sense of security for beach-goers. At the same time they indiscriminately kill thousands of non-target animals.[37]

4.40 This observation from CSIRO is also instructive when considering the effectiveness of lethal shark control measures:

> Although there is little doubt that these devices reduce risk of shark encounter by removing sharks, the actual amount by which risk is reduced has not been assessed. It is clear from research on movement patterns and

35 Mr Fred Pawle, *Submission 56*, p. 5.

36 Mr Donald Munro, President, Le-Ba Boardriders; and Spokesperson, Lennox Head National Surfing Reserve, *Committee Hansard*, 2 May 2017, p. 3.

37 Australia for Dolphins, *Submission 4*, p. 1.

> occupancy of beach areas by sharks that the number and frequency of attacks is often a poor indicator of the local abundance of sharks.[38]

4.41 Nevertheless, as Professor Colin Simpfendorfer observed, scrutinising the effectiveness of lethal control measures is challenging as 'we have nothing to compare [them] to'. Professor Simpfendorfer explained:

> There are lots of people who talk about the shark program being effective or not being effective and telling us they have proof one way or the other. The reality is that because we have nothing to compare it to, we don't know what it has done.[39]

4.42 The following paragraphs examine in detail arguments against lethal shark control measures, as well as other evidence received which raises questions about the effectiveness of such measures.

Perceived lack of effectiveness and inadequate information to evaluate effectiveness

4.43 Many submissions and witnesses either argued that lethal shark programs do not provide bathers with significant protection or questioned how reliable assessments about the effectiveness of the programs can be made based on the information that is currently available.

Limited coverage

4.44 An observation about lethal measures made by several stakeholders is that the measures do not prevent all sharks from approaching beaches. That is, mesh nets and drum lines may catch sharks, but these devices do not provide a physical barrier separating humans from sharks.

4.45 As noted in Chapter 3 (and illustrated at Figures 3.1 and 3.2), the nets range from 150 metres to 186 metres in width. The vertical coverage of the nets is also limited; bottom set nets result in a gap between the surface and the top of the net, whereas surface-set nets feature a gap underneath the net to the seafloor. Accordingly, some submitters argued that the relatively small coverage of mesh nets mean that nets cannot provide effective protection. For example, the Ballina Environment Society submitted:

> Shark nets could only be considered a placebo, due to the public perception of protection, as it is not possible for the four 150m nets deployed in Ballina Shire, within 500 metres of the shore to prevent shark attacks.[40]

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38 CSIRO, *Submission 33*, p. 4.

39 Professor Colin Simpfendorfer, *Committee Hansard*, 30 August 2017, p. 6.

40 Ballina Environment Society, *Submission 54*, p. 1.

4.46 The Sunshine Coast Environment Council wrote:

> On a beach kilometres long, a net only 186 metres in length does very little to stop a shark from reaching the beach. Sharks can simply swim around or underneath nets, which questions not only the economic viability of the measure, but the actual purpose of the program as a whole.[41]

4.47 Although the Sunshine Coast Environment Council questioned the ability of nets to provide a safe environment for bathers, it did argue that the nets are effective at 'creating a false sense of security'. The Council commented that this 'is likely due to a lack of education about how shark nets actually work'. In the Council's view, '[i]f the public were to become widely aware that nets are less than 200m in length and only 6m deep, this sense of security would likely fade'.[42]

4.48 In the submission authored by Ms Kathrina Southwell on behalf of Australian Seabird Rescue, Ms Southwell advised:

> Members of the public are often shocked when I have shown them the length of the shark net at Lighthouse Beach. Most people's response is "How is that supposed to protect us from a shark when they can swim over or around the net?"[43]

4.49 Ms Southwell added that many local residents and visitors 'still believe that the net covers the whole length of the beaches and that the sharks cannot get in to where people are swimming and surfing'.[44]

4.50 Available statistics support the argument that nets do not act as a barrier preventing all sharks from approaching beaches. A review of the New South Wales program conducted in 2009 noted that 23 shark encounters had occurred at meshed beaches since the program began.[45] Furthermore, submitters cited reports that 40 per cent of sharks trapped in nets are found on the beach side, meaning that the nets did not provide an area for beachgoers that is clear from sharks.[46]

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41 Sunshine Coast Environment Council, *Submission 35*, p. 5.

42 Sunshine Coast Environment Council, *Submission 35*, p. 6 (emphasis omitted).

43 Australian Seabird Rescue, *Submission 37*, p. 5.

44 Australian Seabird Rescue, *Submission 37*, p. 5.

45 New South Wales Department of Primary Industries, *Report into the NSW Shark Meshing (Bather Protection) Program: Incorporating a review of the existing program and environmental assessment*, March 2009, p. 27.

46 See Australia for Dolphins, *Submission 4*, p. 4 and Sunshine Coast Environment Council, *Submission 35*, p. 5. Professor Daniel Bucher explained that he understands that this figure is based on a South African study and that DPI has advised him there are no similar data for the New South Wales program. *Committee Hansard*, 2 May 2017, p. 46.

4.51 In addition to the evidence expressing scepticism about the effectiveness of mesh nets, evidence suggesting that drum lines also do not guarantee public safety was presented. Sea Shepherd Australia submitted that:

> Since the installation of shark control measures in Queensland, there have been 17 unwanted shark encounters at beaches with drum lines and/or shark nets including a fatality on 7 January 2006 when 21-year-old Sarah Kate Whiley was mauled by up to three bull sharks while swimming in waist-deep water with friends at Amity Point (North Stradbroke Island), despite the eight drum lines installed at the time.[47]

4.52 Associate Professor McPhee stated that:

> In an area where I spend a lot of time, and where I take students, there have been drum lines in place for 30 years and there was a fatal bite there with those drum lines in place. So you can get fatal shark bites right next to shark control equipment.[48]

4.53 The committee also received evidence of cases where dolphins have removed bait from the drum lines, rendering the drum lines ineffective for attracting sharks.[49]

4.54 Although CSIRO noted nets and drum lines do not provide a barrier stopping sharks from approaching beaches, it recognised that, as the devices remove sharks, 'there is little doubt that these devices reduce risk of shark attack'. However, CSIRO added that 'the actual amount by which risk is reduced has not been assessed'.[50] CSIRO's concerns in this area were explained using the following example:

> …if a single white shark was present off Bondi Beach on a particular day and it became entangled in the deployed net, then the risk of encountering a shark on that day, and hence attack risk, has been reduced to zero. If on another day there were 100 white sharks off Bondi Beach and a single shark was again entangled, the risk of encounter has not been significantly diminished despite the same catch rate. What is also unknown is whether any of these sharks were likely to be involved in a shark attack. It is clear from research on movement patterns and occupancy of beach areas that the number and frequency of attacks is a poor indicator of the local abundance of sharks and vice versa.[51]

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47 Sea Shepherd Australia, *Submission 57*, p. 8.

48 Associate Professor Daryl McPhee, *Committee Hansard*, 2 May 2017, p. 38.

49 Mr Tony Isaacson, DiveCareDare, *Committee Hansard*, 31 July 2017, p. 50.

50 CSIRO, *Submission 33*, p. 9. A similar point was made by Associate Professor Laurie Laurenson—see *Submission 9*, p. 1.

51 CSIRO, *Submission 33*, p. 9. See also Professor Nic Bax, Senior Principal Research Scientist, CSIRO, *Committee Hansard*, 20 October 2017, p. 6.

4.55 For many individuals involved in activities associated with a higher-risk of encountering a shark, such as divers, it is evident that lethal measures can be of limited relevance. This is because lethal measures are focused on beaches, whereas these activities take place further away from the coastline. The Western Australian Minister for Fisheries observed:

> It is blindingly obvious in Western Australia that the people who are most at risk are divers and surfers. Putting in place more drum lines, or anything of that nature, is not going to give protection to the people who are most at risk. If you are diving at a reef a kilometre off the coast, you are not going to be protected by a drum line placed at a beach.[52]

Number of dangerous sharks removed

4.56 Despite the logic that devices which reduce the number of sharks reduce the risk of humans encountering dangerous sharks, it was suggested that lethal shark programs could only ever have a limited impact. Mr Brendan Donohoe from Surfrider Foundation Australia argued:

> Taking out a couple of hundred sharks statistically makes no difference at all, and any surfer knows that. When you are out there, you are in their territory.[53]

4.57 The threat to humans posed by the sharks caught by lethal measures was also questioned. A group of academics from the University of Wollongong submitted that most individual animals of the target species caught in the New South Wales meshing program 'are too small to pose a risk to humans'. Furthermore, the species targeted by the program include 'some species that have not been implicated in dangerous encounters with people, such as the broadnose sevengill shark'.[54]

4.58 Other instances where lethal measures are considered not to have been successful include the following:

- The 2014 trial of drum lines in Western Australia was put forward as an example of where lethal measures were not effective at catching white sharks. Ms Jessica Morris, Marine Scientist, HSI, stated that the trial caught 'almost 200 sharks, and none of them were white sharks'.[55]
- Ms Natalie Banks from Sea Shepherd Australia and Professor Jessica Meeuwig referred to a cull in Hawaii of over 4,500 sharks over nearly two

52 The Hon David Kelly MLA, Western Australian Minister for Water, Minister for Fisheries and Minister for Forestry, *Committee Hansard*, 20 April 2017, p. 60.

53 Mr Brendan Donohoe, Northern Beaches Branch President, Surfrider Foundation Australia, *Committee Hansard*, 17 March 2017, p. 24.

54 Dr Leah Gibbs, Mr Lachlan Fetterplace, Associate Professor Quentin Hanich and Mr Matthew Rees, *Submission 21*, p. 2.

55 Ms Jessica Morris, HSI, *Committee Hansard*, 17 March 2017, p. 35.

> decades. After an evaluation demonstrated did not affect the number of fatalities, it was abandoned in favour of non-lethal measures.[56]

4.59 Under the first New South Wales north coast trial of shark nets, the nets caught nine target sharks, with target sharks representing three per cent of the total catch. These figures can be contrasted with results of the SMART drum lines used in the trial area. SMART drum lines, which are drum lines that are not designed to kill sharks, caught 36 target sharks. This represented 92 per cent of their total catch.[57]

4.60 Other submitters pursued the argument that mesh nets are based on outdated knowledge about shark behaviour and movement patterns. The Migaloo 2 Foundation explained:

> Shark nets were originally deployed around 80 years ago with the idea that short shark nets would deter sharks making that area their home base. Yet now with advanced tagging technology it has been discovered that most of the targeted sharks migrate large areas and wouldn't make that area home even if the nets weren't there.[58]

4.61 Associate Professor Laurie Laurenson, who has undertaken analysis indicating that lethal measures are not effective in reducing the number of shark interactions, submitted that:

> Part of the reason we think that culling is ineffective is because large sharks can travel very large distances in very short periods of time. So for a culling program to be effective, it needs to cull all sharks from a much wider range. That is, the current culling programs cannot protect single beaches without culling sharks from the entire area, with the area defined by how far and how quickly sharks can move (about 100 km per day).[59]

Evidence commenting on the location of lethal measures, incidents at protected beaches and developments since the measures were first introduced

4.62 Some stakeholders also questioned the argument that the low incidence of fatalities at beaches featuring lethal measures since the shark control programs were introduced demonstrate that lethal measures are successful.[60] This reasoning was challenged on several fronts.

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56 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.

57 Minister for the Environment and Energy, *North Coast Shark Meshing Trial, New South Wales: Statement of reasons for granting an exemption under section 158 of the Environment Protection and Biodiversity Conservation Act 1999 (Cth)*, 26 October 2017, http://epbcnotices.environment.gov.au/exemptionnotices/exemptionnotice/?id=a99fcc21-38c0-e711-b175-005056ba00a8 (accessed 9 November 2017), p. 6 [paragraph 26].

58 Migaloo 2 Foundation, *Submission 28*, p. 2.

59 Associate Professor Laurie Laurenson, *Submission 9*, p. 3.

60 For an example of this argument, see paragraph 4.29.

4.63 Regarding the New South Wales program, Dr Christopher Neff stated that the conclusion of one fatality since the nets were introduced in 1937 'fails to acknowledge that shark bite fatalities ended in 1929'. Dr Neff added that the absence of shark bites at beaches that do not feature shark nets should be taken into account, as should the absence of shark bites in the years during World War II when the nets were removed.[61]

4.64 The New South Wales program is chronicled and critiqued in the submission from Sea Shepherd Australia. Among other points made in the submission, Sea Shepherd responded to arguments commonly made in support of lethal measures which are based on the low number of fatalities in locations where the measures are used. Sea Shepherd asserted that these arguments do not explain the shark encounters that have occurred at beaches where lethal measures are in place.[62] Sea Shepherd submitted that:

- excluding fishing-related incidents, 40 shark incidents have occurred at netted beaches, including 24 incidents between September 1992 and the end of 2016—almost one per year;[63] and
- statistics indicate that 'the rate of unwanted shark encounters at the Central Coast's ocean beaches (the most recent location to receive shark nets) has increased since the shark nets have been installed, from 1 incident every 22 years, to 1 incident every 4.4 years'.[64]

4.65 Ms Natalie Banks from Sea Shepherd argued that the low number of fatalities which have occurred at netted beaches in New South Wales should be considered alongside evidence that dangerous shark encounters still take place at those beaches. Ms Banks explained that 46 shark encounters have taken place at netted beaches in New South Wales, with two cases in recent times that 'were very serious and it was only because of blood loss prevention that those people actually survived'. Ms Banks provided similar evidence with respect to the Queensland shark control program:

> In Queensland, where they have drum lines, in 2006 there was a fatality where there was not one or two but three bull sharks that went past eight drum lines at Amity Beach. You have also had 16 encounters in Queensland where there are shark control measures…I think people need to look at the whole story, rather than looking at just elements that suit their argument.[65]

61 Dr Christopher Neff, *Submission 48*, p. 3.

62 Sea Shepherd Australia, *Submission 57*, pp. 12–13.

63 Sea Shepherd Australia, *Submission 57*, pp. 3, 6.

64 Sea Shepherd Australia, *Submission 57*, p. 6 (emphasis omitted).

65 Ms Natalie Banks, Sea Shepherd Australia, *Committee Hansard*, 20 April 2017, pp. 12–13.

4.66 Submitters also commented on advances in medical responses, including better knowledge about how to respond to shark bites and improved transportation to hospitals. In addition, other developments that improve beach safety were noted, such as surf lifesaving clubs.[66] Furthermore, the HSI observed that various other activities permitted when lethal control measures were first introduced and which may have attracted sharks nearer to shore are now banned; examples provided included abattoirs discharging offal into the sea and the commercial whaling stations in southern Queensland and at Byron Bay.[67]

4.67 In some locations, lethal devices are not in place year-round—for example, it was noted that shark meshing in New South Wales is only carried out during the peak season (summer). Dr Daniel Bucher and Professor Peter Harrison remarked that improvements in wetsuits mean that a significant number of surfers, are 'in the water year-round, yet remarkably there continues to be no fatal attacks on netted beaches even at these times when the nets are not in the water'.[68]

4.68 It is also considered that comparisons between states with and without lethal shark measures fail to adequately account for differences in the marine environments. Mr Blair Ranford commented:

> Here in Western Australia we see the Queensland culling program held up to be the beacon of light for why it should be brought in here, but I think that ignore some very, very important facts—simply, they are completely different environments that we are talking about. Queensland, traditionally, does not have a history of a large number of great white shark attacks; very much, the majority of it is bull sharks, then, to a lesser degree, tiger sharks, and then, lastly, it is great white sharks in the history of attacks in that area. Bull sharks are far more territorial. Even though they still cover vast areas, they certainly are known to spend a lot more time inshore close to river mouths et cetera, and that is where the majority of their risk comes from. Also, Queensland is a semitropical to tropical environment; it is not an area where great white sharks spend large amounts of time. It is also not an area that has any seal or sea lion populations, which is exactly what we have here in WA. So, to compare the two of them together is really misleading. It doesn't really address the fact that they have two specifically different issues when it relates to shark attacks. For Western Australia it is great white sharks and for Queensland, in a completely different environment, the majority of the time it is bull sharks.[69]

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66 For examples of these arguments, see Mr Brendan Donohoe, Northern Beaches Branch President, Surfrider Foundation Australia, *Committee Hansard*, 17 March 2017, p. 24; Associate Professor Laurie Laurenson, *Submission 9*, pp. 1–2; and Dr Leah Gibbs, Mr Lachlan Fetterplace, Associate Professor Quentin Hanich and Mr Matthew Rees, *Submission 21*, p. 2;

67 HSI, *Submission 43*, p. 20.

68 Dr Daniel Bucher and Professor Peter Harrison, *Submission 23*, p. 4.

69 Mr Blair Ranford, *Committee Hansard*, 28 July 2017, p. 64. See also Mr Chad Buxton, Admin Officer/Volunteer, Coolum and North Shore Coast Care, *Committee Hansard*, 31 July 2017, p. 19.

Other observations on evaluating lethal control measures

4.69 Various submitters and witnesses highlighted difficulties in conducting meaningful assessments of lethal control measures. A key issue is the ethical difficulties involved in undertaking research in this area. Associate Professor McPhee commented:

> It is very difficult if not impossible from a range of perspectives, including an ethical perspective, to put together an experiment and conduct it to determine with a high degree of probability what the benefit of shark nets are in terms of actually reducing risk. That would involve putting people deliberately at risk and at a heightened risk without their knowledge. So that is off the table obviously.[70]

4.70 The low number of shark incidents also has implications for statistical analysis. Associate Professor McPhee commented that comparisons between beaches protected by lethal measures and those that are not are 'extremely difficult' because:

> You are comparing zero, zero, zero, one, one, zero, one and two, so you do not get anything that is particularly meaningful from a statistical perspective.[71]

4.71 Likewise, Professor Jessica Meeuwig argued that the effectiveness of lethal measures cannot be considered proven due to the low number of incidents. With reference to the Queensland program, the professor reasoned:

> If you look at where the drum lines are, you see that 83 per cent of the drum lines are in locations where there never ever had been a fatality before they came in…To say, 'Oh, look: since we brought drum lines in there have not been any fatalities,' when there were never any there before is awkward. At Magnetic Island there was one in 1923, and since they brought in a massive number of drum lines, yes, there has not been one, but how do you compare zero and one?[72]

4.72 Dr Leah Gibbs commented that a correlation between a low number of shark bite incidents and the presence of lethal measures 'does not prove causation'. Dr Gibbs added that correlation 'can be very convincing, especially to a poorly informed public', however, in her view, arguments based on correlation overlook various 'quite complex' social, biological and ecological factors.[73]

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70 Associate Professor Daryl McPhee, *Committee Hansard*, 2 May 2017, p. 36.

71 Associate Professor Daryl McPhee, *Committee Hansard*, 2 May 2017, p. 38.

72 Professor Jessica Meeuwig, *Committee Hansard*, 20 April 2017, p. 40.

73 Dr Leah Gibbs, *Committee Hansard*, 31 July 2017, pp. 3–4.

4.73 CSIRO submitted that it is 'disappointing' that the efficacy of lethal shark control measures on public safety and the effects of these measures on the long-term viability of the white shark population are unclear 'given the decades over which some of these programs have run'.[74] Professor Nic Bax from CSIRO observed:

> …if one was to set up a shark-netting program, a drum-line program, I think…from a scientific view of management…it would be important that there were clear objectives: what was it trying to achieve; and would you know whether it had been successful. Because, if you have no idea about whether what you're proposing is going to be successful or not, or there is no way of measuring that, then it's really just a guess. And so I guess our strong feeling is really that, in these areas where we're trying a very experimental form of management—be it lethal measures of shark removal or non-lethal measures—it's very important to get the information that we can from those activities. And, if there's another Senate inquiry in five years' time, there will be clear information on whether these techniques work or not, and we're not in the same position with different perceptions of how these different techniques work.[75]

4.74 CSIRO suggested that, while shark removal programs continue, the management arrangements for the programs should include 'effective catch monitoring, clear trigger points and decision rules regarding the level of catch for both target and bycatch species'. CSIRO continued that there should be agreed actions in place in response to the trigger points being reached and that all of these management arrangements should be 'linked to defined management objectives'.[76]

4.75 In light of the evidence about the limitations of the lethal shark control programs, the cost of the programs was questioned. Australian Aerial Patrol, which did not express a view on the effectiveness of the program, nevertheless questioned the efficiency of the program compared to other measures such as aerial surveillance. It submitted:

> The shark meshing program costs an estimated $1.4 million per year, involves about 5000 net lifts and takes a very small number of potentially dangerous sharks (about 30 or so). It is thus, incredibly inefficient.[77]

4.76 Professor Meeuwig provided similar criticism of the Western Australian trial. Professor Meeuwig explained that, although the actual figures are not publicly available, her best estimate is that the three month drum line trial which killed

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74 CSIRO, Opening statement, tabled 20 October 2017, p. 1. See also CSIRO, *Submission 33*, pp. 4, 9.

75 Professor Nic Bax, CSIRO, *Committee Hansard*, 20 October 2017, pp. 6–7.

76 CSIRO, Opening statement, tabled 20 October 2017, p. 1. See also CSIRO, *Submission 33*, pp. 4, 9.

77 Australian Aerial Patrol, *Submission 6*, pp. 18–19.

173 tiger sharks[78] and zero white sharks cost over $1.5 million. Professor Meeuwig concluded that the lethal measures were 'counterproductive' as 'by virtue of spending $1.5 million-ish on that program, we did not spend money on other things' that the professor considered should have received funding instead.[79]

4.77 The current state government minister, the Hon David Kelly MLA, also commented on the expense and limited effectiveness of the Western Australian trial. Among other observations about the trial, the minister noted that in the south-west of the state, an independent contractor 'was paid $5,000 a day and did not catch a single great white shark'.[80]

4.78 Dr Sharon Burden commented that at Bunker Bay, where her son Kyle died, there are no signs indicating previous shark bites and an ongoing risk of shark encounters. When the former Western Australian Government proposed the introduction of lethal shark control measures, Dr Burden explained that her 'immediate frustration' with the proposal is that basic measures such as signage were not implemented. Dr Burden argued:

> To me, when you haven't even done the basics of putting up some information signs that inform—not scare but inform—why are you taking this extreme measure when there is no real evidence that it is going to actually work?[81]

Impact on shark conservation and populations of other species

4.79 Submitters and witnesses highlighted the significant number of target and non-target marine species caught by shark nets and drum lines. For example, Ms Jessica Morris, Marine Scientist, HSI, reported that between 1975 and 2001, the New South Wales and Queensland shark control programs killed 11,899 sharks (including shark species and sizes considered dangerous to humans and those that are not considered dangerous) as well as approximately 53,000 other marine animals.[82]

4.80 As a result of the high numbers of sharks killed, concerns were expressed about the effects of lethal measures on the population of shark species and the efforts in place to conserve certain species.

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78 Professor Meeuwig noted that the tiger shark is 'a species that had not been implicated in any lethal attacks in the region since 1923'.

79 Professor Jessica Meeuwig, *Committee Hansard*, 20 April 2017, p. 36. Similar evidence was provided by Ms Amanda Elizabeth Morgan (see *Committee Hansard*, 28 July 2017, p. 1).

80 The Hon David Kelly MLA, Western Australian Minister for Water, Minister for Fisheries and Minister for Forestry, *Committee Hansard*, 20 April 2017, p. 55.

81 Dr Sharon Burden, *Committee Hansard*, 28 July 2017, pp. 18–19.

82 Ms Jessica Morris, HSI, *Committee Hansard*, 17 March 2017, p. 33.

4.81 Greenpeace noted that the deaths of sharks approaching or of reproductive age 'threaten the reproductive output and recovery of shark species populations'. In addition to the removal of sharks from the population, Greenpeace argued that a male–female population imbalance can be created—it indicated that four female tiger sharks are caught for every one male tiger shark that is caught. Greenpeace submitted that negative effects on population growth due to shark control measures 'will create problems for entire ocean ecosystems by creating an imbalance in population sizes of species consumed by sharks'.[83]

4.82 Submitters noted that the population of the grey nurse shark, which is a critically endangered species, is negatively affected by lethal shark control measures. Ms Jessica Morris, HSI, noted that the grey nurse shark is 'being captured and killed in numbers too great to sustain the population'.[84] The AMCS noted that the recovery plan for the grey nurse shark states that mortalities caused by shark control measures are considered a threat to the recovery of the species.[85]

4.83 The importance of sharks for the health of the overall marine eco-system was also addressed. Mr Jeff Hansen, Managing Director, Sea Shepherd Australia, questioned how seal and whale populations would be kept in check if sharks were killed in the large numbers that would be necessary for lethal measures to guarantee public safety. Mr Hansen remarked:

> Are we going to take control of a natural, wild environment and try to manage that? That is absolute insanity.[86]

4.84 Concerns were also expressed about the level of bycatch and the effects of lethal measures on the populations of other threatened and protected species besides sharks. HSI argued that bycatch from shark control programs is often 'more severe than bycatch associated with Australia's commercial fisheries'. Furthermore, many of the species caught:

> …are listed as threatened with extinction under state and federal laws, and international treaties. Australian state, territory and federal governments are

83 Greenpeace Australia Pacific, *Submission 50*, p. 18.

84 Ms Jessica Morris, HSI, *Committee Hansard*, 17 March 2017, p. 33.

85 Australian Marine Conservation Society, *Submission 38*, p. 8.

86 Mr Jeff Hansen, Managing Director, Sea Shepherd Australia, *Committee Hansard*, 20 April 2017, p. 17. Other evidence on the role of sharks in the marine environment was also received. For example, Professor Meeuwig noted that healthy shark populations can help resist crown-of-thorns outbreaks in coral reefs. Professor Meeuwig also referred to recent research that suggests shark populations can help mitigate climate change by keeping populations of animals such as sea turtles in check so they do not overgraze seagrass beds. Professor Meeuwig noted that 'Seagrass beds are one of the highest sequesters of carbon on the planet. If you remove your tiger sharks or reduce their numbers, turtles and dugongs go nuts. They graze on the seagrass, and you lose your blue carbon store'. Professor Jessica Meeuwig, *Committee Hansard*, 20 April 2017, p. 44. The role sharks play in shaping marine ecosystems is also discussed in Chapter 1.

> obliged to protect and promote the recovery of threatened species populations.[87]

4.85 Australia for Dolphins submitted that the 2015–16 annual report on the New South Wales program indicates that 86 per cent of the 748 marine animals caught 'were threatened, protected, or species not intended to be targeted by the shark nets'.[88]

4.86 To illustrate their concerns, submitters commented in detail on the implications of lethal shark control measures for particular non-target protected species. The AMCS provided the following evidence in relation to dugongs:

> Dugongs are classified as vulnerable to extinction by the…[International Union for Conservation of Nature] in response to global declines in population. Northern Australia is regarded as the last remaining global stronghold of this species, with numbers elsewhere having been reduced to small relict populations. As dugongs are long-lived animals with very low reproductive rates, it takes a long time for their populations to recover from declines caused by additional mortality. Even a slight reduction in adult survival due to incidental drowning in nets or other factors could cause a chronic decline in dugong populations. Thus, the 689 dugongs killed in the Queensland shark meshing program over 52 years to 2014 represents a threat to the population of this vulnerable species in that state. As dugongs tend to remain in the one area throughout most of their lives, this mortality is likely to have caused significant local declines in dugong populations.[89]

4.87 The effects of lethal measures on sea turtles were also discussed. The AMCS explained that turtles 'are one of the largest groups of bycatch in the shark control programs', with more than 5000 turtles captured in nets and on drum lines in total to date under the Queensland shark control program. The AMCS added that the recovery plan for marine turtles identifies the Queensland shark control program 'as an issue of concern which should be managed with the intent of reducing mortality'. The AMCS further added that the plan indicates the need 'to significantly reduce the take of green turtles in [shark control programs] and reduce the take of loggerhead turtles to zero'.[90]

4.88 A further group of marine animals that attracted comments in relation to shark control programs is whales. The author of the submission from the Migaloo 2 Foundation informed that committee that:

> During the last 7 years sailing with the humpback whale migration from Byron Bay to Hervey Bay I have heard of many whale entanglements in shark nets. Of these whale entanglements many have resulted in death by

87 HSI, *Submission 43*, p. 3.

88 Australia for Dolphins, *Submission 4*, p. 2.

89 Australian Marine Conservation Society, *Submission 38*, p. 9.

90 Australian Marine Conservation Society, *Submission 38*, p. 9. Further evidence about the impact on sea turtles was given by representatives of Australian Seabird Rescue: see *Committee Hansard*, 2 May 2017, pp. 65–70.

> drowning of both baby and adult humpback whales. Although some entanglements have resulted in the whale being freed on one occasion at least, I can testify that all of the ropes and floatation equipment was not cut off and the whale would most likely have died of exhaustion or starvation as it would not have been able to swim all the way to its feeding ground in the Antarctic as it would have been like swimming with a jumper and gum boots on.[91]

4.89 In addition to the above evidence, the submitter advised they have witnessed a humpback whale entangled in shark net ropes and floatation gear. A photograph was provided in the submission and the submitter reported that the whale 'was forced to stop swimming and rest about every 10 breaths'.[92]

4.90 Dr Jan-Olaf Meynecke provided further evidence about whales being entangled by shark nets off the south east coast of Queensland.[93]

4.91 The International Fund for Animal Welfare (IFAW) submitted that 'at a minimum', nets should be removed during periods of whale breeding and migration. IFAW explained that, for Queensland, this would involve removing nets from the start of June until the end of October, and for New South Wales the end date of the current seasonal removal of nets during winter would need to be extended to October rather than August.[94]

4.92 Some further observations about the implications of shark control measures on marine species are as follows:

- Although they did not support drum lines, some witnesses who oppose lethal measures acknowledged the lower rate of bycatch of non-target species associated with drum lines compared to nets.[95]
- Lethal shark control programs present 'a serious animal welfare problem' because the measures used cause many animals to experience prolonged and painful deaths'.[96]

4.93 Finally, Professor Daniel Bucher responded to the suggestion put forward by some supporters of lethal measures that the measures are appropriate as, regardless of questions about their effectiveness, the deployment of these measures help the public feel safe. Professor Bucher stated:

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91 Migaloo 2 Foundation, *Submission 28*, pp. 1–2.

92 Migaloo 2 Foundation, *Submission 28*, pp. 1–2.

93 See Dr Jan-Olaf Meynecke, *Committee Hansard*, 31 July 2017, pp. 9–10.

94 International Fund for Animal Welfare, *Submission 40*, p. 3.

95 Ms Jessica Morris, HSI, *Committee Hansard*, 17 March 2017, p. 38.

96 HSI, *Submission 43*, p. 3.

> To be honest, I do not think 'it makes people feel good' is a good enough reason to be killing dolphins, turtles and endangered animals. That is not on. I have always made the analogy that, if I wanted to go bushwalking in the Serengeti, would it be reasonable for me to ask the Tanzania government to shoot all the lions? 'Actually, don't shoot them, blow up some cluster bombs; I don't care if you knock off a few giraffes, elephants and zebras in the process, as long as you get a few of those lions, and then I can go walking in safety.' That would be a stupid thing to do. It would be laughed out…But that is effectively what we are doing with nets.[97]

Public opinion about lethal measures has changed

4.94 Some witnesses suggested that lethal measures such as nets are no longer supported by large sections of the community. In examining this evidence, it is important to note that reliably ascertaining community views on matters such as this could be quite difficult. Based on the evidence available to the committee, the level of awareness in the community about how lethal measures operate is also unclear, which has implications for interpreting information put forward measuring public opinion. Some of the evidence presented is also general in nature, or based on limited data. Overall, this evidence provides an interesting perspective, but conclusions are not drawn from it.

4.95 That a wide range of views on shark control measures can be identified is demonstrated by the following comments by Associate Professor Daryl McPhee:

> We are a coastal culture, a beach culture, as a nation, but there are a great diversity of views within that. Even when I look at surfing forums, there are surfers supporting shark culls and surfers opposing them, and there are surfers who, whilst obviously not happy that their fellow surfers and families have been injured, are happy that there are fewer people on their waves, particularly out-of-towners. So we have a very diverse range of views.[98]

4.96 Some of the evidence received questioned specific claims made about public opinion, such as the surveys conducted by the DPI as part of the first north coast trial of nets, and it was suggested that lethal measures were being introduced to satisfy a small group of vocal people.[99] Nevertheless, this section canvasses the DPI surveys while also focusing on broader comments about community views on lethal measures. One such argument put forward by opponents of lethal shark control measures is that these programs are out of step with current community expectations. In describing lethal measures as 'outdated technology that was used to address public fears at the time they were introduced', HSI argued that:

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97 Professor Daniel Bucher, *Committee Hansard*, 2 May 2017, p. 46.

98 Associate Professor Daryl McPhee, *Committee Hansard*, 2 May 2017, p. 36.

99 Ms Jann Gilbert, *Committee Hansard*, 2 May 2017, p. 59.

> Over the last five decades, the public's ecological awareness and understanding has grown to replace the misplaced fear and hysteria that once came from ignorance. Despite the heavy focus placed by some sections of the media on shark incidents, the community at large understands the importance of protecting our unique marine ecosystems, which include apex predators such as sharks and balancing this with protection for ocean users. This is especially true in areas of high ecological importance and diversity, such as the Great Barrier Reef, where nets and drumlines are still present year round.[100]

4.97 A similar position was held by the AMCS, which included the following statement in its submission:

> Lethal shark control programs are not a solution for shark interactions and the environmental awareness of the beach-going public has shifted in the many decades since the shark cull measures were first imposed in QLD and NSW. Ocean-users are now much more conscious of the need to ensure their safety when visiting our beaches and coasts and also the need to protect the marine environment and marine species such as sharks.[101]

4.98 As part of the first New South Wales north coast trial of shark nets, telephone and online surveys of residents were undertaken to test community attitudes towards the trial. In the report on the trial published in August 2017, results of surveys undertaken before and after the trial were presented. These results indicate that 'overall, Ballina Shire and Evans Head residents were more positive than negative towards the concept of nets in pre- and post-trial telephone interviews'.[102] However, opinions on whether the trial had been successful were influenced significantly by views on bycatch. The report on the first trial commented:

> There was a strong correlation between attitude to bycatch and the perceived success of the trial from the telephoned respondents. Of those who felt bycatches were acceptable, 82% felt that the trial had been a success. In contrast, 65% of the respondents who assessed the bycatch as unacceptable deemed the nets to be unsuccessful.[103]

4.99 The report continued:

> Despite differences in attitudes between residents and non-residents, most stakeholders within both groups were united on the unacceptability of bycatch in terms of the overall success of the trial. Of the sampled residents, 68% of telephone and 60% of online respondents thought that the bycatches in the nets were unacceptable (vs 91% of non-residents). These attitudes appear to reinforce perceptions regarding the overall success of the trial, with more Ballina Shire and Evans Head residents indicating

100 HSI, *Submission 43*, p. 17.

101 Australian Marine Conservation Society, *Submission 38*, pp. 10–11.

102 DPI, *NSW north coast shark-meshing trial final report*, August 2017, p. 42.

103 DPI, *NSW north coast shark-meshing trial final report*, August 2017, p. 26.

> that the nets were unsuccessful rather than successful during telephone interviews (48% vs 37%) and online questionnaires (55% vs 38%). Non-residents were more extreme in their views, with 87% saying that the nets were unsuccessful.[104]

4.100 Mr Leon Deschamps argued that lethal measures are still in use in Australia because of an aversion to change. Mr Deschamps explained:

> I was born and raised in the town that had 800 people in it. It is a small town and it is a small Australian town. One of the things small Australian towns hate is change. I think for the broad community of Australia that goes right through to our innate culture that defines us. We don't like change. We're presently using a 1950s technology, a technology that was introduced when domestic violence was still legal in the home. Times have changed; we have moved on.[105]

4.101 Dr Christopher Neff argued that attempts by government to prevent shark bites 'are not really about preventing shark bites, generally', rather they are 'more about preventing certain frequencies of shark bites in certain locations that produce political penalties'. Dr Neff explained:

> For instance, in New South Wales the political capital upon which shark nets rest is a narrative that there has only been one fatality at a netted beach since 1937. This is absolutely accurate. However, the data omits that there have been 29 shark bites at netted beaches in New South Wales over that same period. The goal is not to stop all shark bites, but rather to stop fatalities and clusters for which the threshold is low and the political penalty might be high.[106]

4.102 Dr Neff advised that the majority of respondents to studies on the public attitude to sharks following shark bite incidents he has conducted consider that no one is to blame for shark bites. The majority of respondents also consider that government should choose non-lethal measures in response and that the primary purposes of lethal measures is not to protect the public, but rather to 'calm the public' and to help tourism. Dr Neff concluded:

> Whatever the committee decides and whatever the states do regarding shark bite prevention, the simple fact is that Australians…get it. They get that these policies do not generally work and that killing sharks is not intended simply to protect the public. I think that shows an underlying level of confidence in government that is shaky and should be concerning to everyone.[107]

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104 DPI, *NSW north coast shark-meshing trial final report*, August 2017, p. 42.

105 Mr Leon Deschamps, *Committee Hansard*, 28 July 2017, p. 27.

106 Dr Christopher Neff, *Committee Hansard*, 17 March 2017, p. 1.

107 Dr Christopher Neff, *Committee Hansard*, 17 March 2017, p. 2.