Submission No 46

MANAGEMENT OF SHARKS IN NEW SOUTH WALES WATERS

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Parliamentary Enquiry into the Shark Management in NSW

Submission by No Shark Cull Inc

Written by Sharnie Connell
Submitted 22nd October 2015

Executive Summary

Shark attacks are incredibly rare events with less than 10 fatal incidents occurring worldwide on average per year. Shark bites occasionally occur in clusters in small localised areas causing fear in the population fuelled by sensationalist media reporting resulting in Government officials who feel that drastic action must be taken. Despite this there is little evidence to suggest that people significantly change their ocean based recreation activities and there is no negative impact on tourism to areas or beaches affected by recent shark incidents.

Serious declines in the abundance of shark populations have been recorded with 90% having been removed from global the ocean ecosystem in the last 60 years. Due to biological factors such as sharks being slow growing, late to mature and having low reproduction rates recovery plans for white sharks have not been in place for long enough to have a positive impact on population levels. Increases in the rate of shark bite have been documented and are a direct result of human factors such as 50% global population increase, changes to the abundance and location of food sources and habitat change. Shark bites are most likely to be caused by mistaken identity, curiosity, self defence and dominance displays no evidence exists to justify common misconceptions of sharks as mindless killing machines, sharks are not attracted to human blood or certain colours, they do not defend territories or target people for food.

Analysis of the shark management in NSW has lead to the conclusion of gross mismanagement practices over a number of decades. Culling programs such as the NSW Shark Meshing Program are designed to reduce the number of sharks and thereby reduce the chance of shark encounter by fishing down populations of large sharks. They are not effective in reducing the chance of shark bite and there is no scientific evidence of the efficacy of the bather protection program despite claims by the Department of Primary Industries (DPI) to deliberately mislead the public and misinform public policy. Factors such as increased medical technology, presence of lifeguards and volunteer lifesavers, large groups of people entering the water together and close proximity to medical facilities on meshed beaches are in combination more likely to influence the lower number of overall fatalities that have occurred on meshed beaches. The nets themselves are not a barrier and cannot guarantee that beaches are free from sharks, furthermore there have been 45 shark interactions on meshed beaches resulting in one fatality and several serious injuries. Shark nets themselves have resulted in the death of a child due to entanglement and are likely to attract sharks towards popular beaches with animals caught in the nets in distress and various stages of decomposition.

Many effective non-lethal deterrent and detection methods have been developed, trialled and have been in use in various parts of the world for over a decade however for many years the NSW DPI have claimed these alternatives do not exist or are not sufficiently advanced enough to trial in NSW. Counter to this the recent report prepared for the DPI and presented at the NSW Shark Summit in Sept 2015 has made recommendations for several alternatives that are ready to be trialled in NSW conditions.

The oceans are in serious trouble with ecosystems on the brink of destruction, the SMP has been responsible for the decline in many marine animal populations and drastic action is required to finally manage our resources in a way that promotes the health of the planet. Healthy oceans need sharks to keep these ecosystems that provide us with 70% of our oxygen from collapse and preventing catastrophic climate change. Around the world thousands of people and scientists have spoken out about culling sharks in Australia and are standing up for the future of our oceans its time for shark policies to reflect the wishes of the people.

The impact of shark attacks on tourism and related industries.

In the last 12 months there has been an increase in localised shark activity in Northern NSW resulting in a spate of shark incidents in the area. Spates of shark attacks have occurred throughout history in various locations around the world, in New Zealand from 1964-68, Brazil from 1992-2006, there was a spate in Hong Kong in the early 90's and in Cape Town South Africa at the same time in Hawaii in 1991-92 and Western Australia from 2011-2013 (Mcphee 2012). Shark bites sometimes occur in clusters and when this occurs the media typically report these events in sensationalist terms that have the resultant impact on the emotional state of people living in these areas.

Despite the fact that people are killed and injured on a much more regular basis as a result of vehicle accidents and drowning shark bite incidents typically strike fear into people to a disproportional extent that does not reflect the relative risk of the situation. To complicate things further despite people reporting higher fear levels in response to shark bites they also have a tendency not to alter their behaviour considerably in response to these fears. A recent SBS Insight aired the TV episode Shark! on 29th Sept 2015, the program explored the extreme fear that people living in Northern NSW felt in response to recent shark bite events. When asked which members of the community were still surfing most of those present admitted to changes in their surfing behaviour such as surfing in groups, or surfing in favourable clear conditions but the overall majority were still prepared to take the risk and pursue their ocean based activities despite the current increase in shark activity (SBS Insight 2015).

There has been no negative impact on tourism to the area and local beaches specifically this is reflected in beach attendance and tourism figures from the Australian Lifeguard Service that in excess of 1 million people have visited beaches the popularity of the region as a tourist destination continues to rise with an increase in 225,000 more people visiting beaches across Byron Bay, Cape Byron, Ballina and Richmond Shires in Northern NSW from July 2014-June 2015. (ALS 2015). Furthermore in response to shark incidents in the area Ballina Chamber of Commerce ran a survey of local businesses and found that 85% had not been affected by recent shark activity (Northern Star 2015).

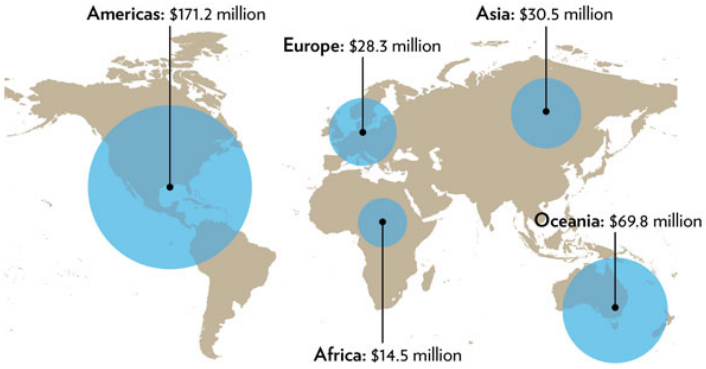
All over the world there is emerging an appreciation for sharks not only for their intrinsic value and the vital role they play in keeping the ocean eco-system healthy but also their commercial value in the growing area of eco-tourism. People are becoming more aware of the incredibly low risk of shark bite and in increasing numbers of people are seeking out interactions with sharks. It is now clear that countries that choose to embrace sharks and develop effective industries around conservation and eco-tourism ventures are benefiting greatly. It is estimated that the value of a single live reef shark is $73 a day and over the course of its life would add up to over $200,000 (Gallagher and Hammerschlag 2011). It should be noted for comparison that $200,000 is the current cost of running the NSW Shark Meshing program for a month which is designed to capture and kill sharks. It is clear that sharks are worth much more financially alive than dead and killing sharks is a costly exercise for the NSW Govt. The global shark eco-tourism sector is worth over US $314 million annually and is predicted to more than double in the next 20 years to an excess of US$780 million in tourism dollars. (Cisneros-Montemayor et al., 2013)

Growth of shark ecotourism

The shark ecotourism industry currently generates over US$314 million in expenditures per year. Projections indicate that global expenditures could double in the next 20 years.

BY REGION

Current Annual Expenditures (in US$)



GLOBALLY

Current total

US$314.3 million

20-year projection

up to US$785 million

Image by Paul Spielvogel - Shark Diver Magazine - Photo of the Day

Changes in shark numbers, behaviour or habitat

Evidence for serious decline in shark numbers

Generally speaking there has been a decline in overall shark abundance worldwide of 90% (Atwood et al., 2015) over the last 50 years due to a combination of commercial, recreational fishing and shark culling operations. It is estimated that somewhere between 63 million and 273 million sharks are currently caught each year and 74 million of these are for their fins alone (Worm et al., 2013). This level is unsustainable and if not addressed urgently will result in catastrophic irreversible changes to marine eco-systems worldwide. When top predators are taken out of ecosystems the result is a domino effect called a trophic cascade that ripples throughout the entire food web from the top level all the way to the bottom which is likely to result in mass ocean species extinction events as habit is destroyed along with the animals that inhabit them (Atwood et al., 2015).

The current species classification for the three most dangerous species of sharks are as follows: white shark listed as Vulnerable to extinction on the IUCN Red List of Threatened Species and as such are fully protected species under the Environmental Protection Biodiversity and Conservation Act (EPBC Act 1999). Tiger shark and bull sharks are both classified as Near Threatened with extinction on the IUCN red list which is one step away from Vulnerable (IUCN 2015).

Despite the anecdotal reports from fishers and surfers, the scientific evidence is clear that there has been a large decline in the number of white sharks in Australian waters in the last 60 years. (Issue Paper 2013). Information from the Queensland Shark Control Program (SCP) suggests a decline in tiger shark populations as the catch per unit effort data reveal a pattern of smaller catches of this species over time (Holmes, et al, 2012). Bull sharks population estimates vary around the world with increases in some areas and declines in others. (Simpfendorfer and Burgess 2009). The white shark was listed as vulnerable under the EPBC Act on 16 July 1999 and with the exception of culling programs in NSW, QLD and WA has been fully protected since. The latest review of the White Shark (Carcharodon carcharias) Recovery Plan, concluded that it was not possible to determine if the white shark population in Australian waters has shown any sign of recovery (DEWHA, 2008). Considering the lack of evidence supporting a recovery of white shark numbers - together with historical evidence of a greater decline in white shark numbers over the last 60 years as compared to other shark species - the review supports the white shark's current status as vulnerable under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC 1999). There is, however, historical evidence of a greater decline in white shark numbers Australia-wide over the last 60 years, and no evidence to suggest that white shark numbers have recovered substantially since receiving protection (Aust Govt 2013). The basis for this listing was calculated by assessing the evidence of declining population, the knowledge of this shark species biology in terms of life span, low levels of reproduction and slow rate of sexual maturation and, at the time of listing, significant ongoing pressure from the Australian commercial fishing industry. There was substantial evidence to suggest that a significant decline in the population size had taken place in Australia. Other data such as NSW SMP catch per unit effort showed a 70% decline in numbers and furthermore a 95% decrease in sport fishing catch in South Australia was documented between 1960-1999. (White Shark Recovery Plan 2013).

Australian white shark researcher Dr Barry Bruce (2015) has been working on a genetic sampling project and current adult Australian east coast populations are predicted at between

750 – 1200 adult animals. At the NSW shark summit on the 29th Sept Chairperson Sharnie Connell (author of this submission) from No Shark Cull spoke in person with Dr Barry Bruce who stated he has since found out with further sampling that this number is more likely to be around the 500 individual adult mark. We do not know if these animals are counted in other parts of the world as these animals are highly migratory and may represent not only the East coast Australian population but also populations from other parts of the world as well.

The SMP itself has been used as a sampling tool to assess and map the abundance of shark populations on the NSW coast. Over the last 60 years catch per unit effort has shown a marked decline in 5 taxa of shark caught in the SMP including hammerheads, whalers, angel sharks, white sharks and grey nurse sharks, furthermore the size of tiger sharks and white sharks has significantly decreased over the last 60 years (Reid et al., 2011). This suggests that these species are less able to grow to adult size due to human pressures such as over fishing, shark meshing impacting their likelihood of surviving until adulthood.

The risk of shark bite is incredibly low

There is evidence that the global rate of shark bite including fatal shark accidents has increased over the last 30 years, however most of this increase can be attributed to the 52% increase in global population during this time and also the increase in people spending more time in the ocean than ever before due to the commercial availability and development of exposure suits. Other contributing factors are likely to include changes in the abundance and distribution of food sources, and human factors such as habitat changes forcing sharks to be displaced into other areas (McPhee 2014). It is important to note that millions of people share the ocean with potentially dangerous sharks each day with minimal consequences as a result therefore the probability of a shark encounter is highly unlikely (Neff and Heuter 2013). On average less than 10 people worldwide die from shark bites each year, and so far this year 2015 in NSW there has been one fatality from a shark bite incident. (ASAF 2015). “There is no compelling body of evidence that suggests that the population abundance of relevant shark species is increasing, or increasing to the extent to explain the increasing trend in unprovoked shark bites”(McPhee, 2014).

Many theories abound regarding the cause of shark bite (West 2014), the following theories are that are highly unlikely to be true:

- Sharks and hungry and target people for food – if this were the case people would often be consumed by sharks which is rare, most shark incidents involve one bite and then the shark retreats.
- Sharks are attracted to human blood – sharks have not evolved to detect human blood in their environment and as a result show little brain activity in response to human blood as compared to the large response they exhibit to fish blood.
- Sharks are attracted to certain colours – sharks have recently been confirmed to be colour blind.
- Sharks are defending their territory – there is no evidence that any species of shark displays territorial behaviour by aggressively defending a physical area claimed as their own.
- Sharks are hungry due to overfishing – large migratory sharks have the ability to move vast distances to find food and feed infrequently so this theory is unlikely.
- Sharks in particular tiger sharks will eat anything – it is likely that metal objects found occasionally in sharks stomachs were eaten in response to the electromagnetic field given off by these objects confusing the shark that it is food,

or that objects such as rocks are swallowed accidently during feeding activities.

- The rogue shark theory – suggests that a single shark after acquiring a taste for human blood will bite humans again and again – there is no evidence to substantiate this theory.
- Shark populations have increased – there is much scientific evidence that points to the substantial decline in shark numbers of most species over the last 60 years, overall approximately 90% of sharks in the ocean have been killed by humans.

In some cases of shark bite incidents the following theories have scientific evidence to substantiate them and are likely:

- Mistaken identity - mistaking humans as natural prey items much as the silhouette of a surfer on a board resembles a seal or a turtle when viewed from below.
- Sharks are inquisitive and bite as an effective behaviour to sense an unfamiliar object to determine what it is by utilising the senses of smell, taste and feel simultaneously.
- Sharks are initially attracted by low frequency sounds and may approach to further examine objects using other senses.
- Sharks bite boat motors or shark cages as the metal they gives off an electromagnetic field that the shark is attracted to, it is not that the shark is trying to attack the people on the boat or in the cage.
- Sharks may be defending themselves if they perceive a human to be a threat, they will often posture with fins down and back arched to signal that they feel threatened and warn people to move away if this body language is ignored sharks may then bite as a defensive reaction to protect themselves against a human in the water.
- Sharks may be warning the human to stay away – sharks often behave this way with each other bumping, tail slapping or briefly biting each other to protect personal space, or in a dominance display.

Adequacy of management strategies

The NSW Shark Meshing Program (SMP) is a lethal shark mitigation policy that has been in place since 1947 in NSW. It is managed by the Department of Primary Industries (DPI) fisheries NSW, contractors (fishers) carry out the program. The nets are set on 51 of the most popular beaches from Newcastle to Wollongong. Each net on each beach is 150 metres long and 6 metres high and are set in 10-12 metres of water. Sharks are able to swim over them and around them. Nets are in the water approximately 17 days per month set 3 days at a time and must be set on weekends and public holidays. The SMP operates for 8 months of the year from the 1st September to 31st April. The nets are random and indiscriminate killers of marine life and it is reported that in excess of 17,000 marine animals have been caught in shark nets in NSW although NSW Fisheries dept reports state that this figure is an underestimation of total numbers of animals caught due to poor data collection prior to the 1990's (Review SMP 2009).

The SMP is a culling program designed to reduce the numbers of sharks to therefore reduce the likelihood of shark bite incident. "The objective of shark-control programs is to provide the public with protection against shark attack at popular beaches by a local reduction in large shark numbers. This is achieved by fishing for sharks directly off the beaches, using large-mesh gill-nets or baited drum-lines or both, thereby reducing the likelihood of a dangerous shark coming into contact with humans. Notable shark control programs are in operation in New South Wales, Queensland, and KwaZulu-Natal (South Africa)." (Mcphee 2012)

The effectiveness of the shark meshing program is not substantiated

Without conducting any scientific studies it is falsely claimed in the SMP annual reports and in statements made to the media by NSW DPI that the SMP has been effective at keeping people safe from shark bite incidents as there has only been 1 fatal shark bite at a meshed beach since the program began. What they fail to mention are the other factors that contribute to this low number of fatalities.

Fatal shark incidents are tragic events however with increasing medical technology and quick response first aid the vast majority of shark incidents are survivable – this was not the case prior to 1937 before the commencement of the NSW SMP program. The low numbers of shark bites fatalities on meshed beaches are more likely to be attributable to the presence of lifeguards who are able to detect sharks, chase them away from the area on jet ski's or inflatable boats, sound shark alarms and remove people from the water when they are sighted. Lifeguards and volunteer life savers also have the power to close beaches and erect warning signs to alert swimmers to the presence of sharks and provide immediate medical assistance in the event of a shark incident, reducing the chance of a bite becoming fatal. Beaches with shark nets are more populated and thus are closer to medical help if needed. These issues are more likely to be the cause of the low number of fatalities on meshed beaches. Furthermore sharks are much less likely to bite people at a crowded beach – the more people in the water the less likely the shark is to bite people this may be due to noise, or the fact that sharks are opportunistic predators who more likely to bite people and animals that are on their own in the water. Note that there has never been a shark incident between the flags at a beach

Since the 1930's when the SMP was first implemented there has been a reduction in fatal shark bites due to improvements in medical technology, people often died from blood loss or

subsequent infection this has been reduced considerably in the last 80 years following the increased training of the general public in basic first aid practices following shark bite such as application of a tourniquet, and leaving wetsuits on people that have been bitten this information was not widely available to the public historically.

In 2009 the SMP review report states that overall "the annual rate of shark attack is the same both before and after the meshing program commenced" (Review SMP 2009). This suggests that overall the SMP has not been effective in reducing the number of shark bites in NSW from 1937-2009.

There have been 45 shark interactions including severe bites and a fatality on meshed beaches. The following is a list of these incidents:
2 Jan 1938 - Cronulla (where Ernest Barker was thrown into the air and surf ski mauled)

1 Jan 1942 – North Steyne - Shark bites surf paddle

6 April 1947 – Palm Beach – Shark scrapes surfboard of 17 year old Max Watt

14 Nov 1947 – Nobby's Beach – Surf ski bumped while 16 year old John Martini and 17 year old Peter Curruthers while they were fishing

25 Jan 1948 – Mona Vale – Surf ski of David Button bitten

14 Jan 1949 – Mona Vale – Surf ski of Don Dixon bumped

14 Jan 1949 – North Bondi – Vince Wilson (32) chased by not one, but three sharks while surfing

1 Feb 1951 – Bondi Beach – Harry Sheen (14) has leg bitten while swimming

26 March 1951 – Avalon – Ken Davidson (23) fell off surf ski (and received minor lacerations to chest)

6 December 1951 - **FATALITY** Merewether – Frank Olkulich (21) local surf ski champion bitten fatally while treading water

01 December 1953 – Maroubra – Shark charged Jack Haynes surf ski

05 Jan 1956 – North Bondi – Shark bumped Ken Howell (25) surf ski

11 March 1956 – Cronulla – Ian Nolan (13) right thigh gashed while bathing

23 April 1957 – Merewether – Paul Wilson (15) suffered minor injuries from a shark while surfing

27 April 1959 – Maroubra – Peter Holland (22) received thigh lacerations while spear fishing

27 December 1960 – Bondi – Shark brushed past Despo Snow-Christensen (27)

21 Jan 1962 – Cronulla – Robert Smith (19) suffered from shock after being immersed underwater by speared shark

13 Sept 1963 – Wanda Beach – Shark bit surfer Peter Barron (18) on torso

27 Feb 1966 – Coledale Beach – 2.5m immature female white shark bit left leg and lower right leg of Raymond Short (13) while body boarding. The shark was still attached to Raymond leg when he was brought to shore.

26 December 1966 – Coogee – David Jensen (29) had right leg bitten while spear fishing

30 November 1967 – Wollongong – Jeff Short (15) incident with grey nurse while free diving

07 April 1968 – Stockton – Ray Weaver (47) suffered foot lacerations from a blue shark

25 March 1969 – Newcastle – William Hill (67) suffered foot lacerations from a mako shark

15 October 1992 – Avalon Beach – Scuba Diver Dave Gannicott receives minor injury on his foot when he was bitten by a female nurse shark who was caught in a net and delivering a pup.

25 April 1996 – Mona Vale – Aya Hamaea (16) and Luke Baker (11) both received puncture wounds in their leg by a suspected wobbegong while swimming

14 March 2000 – MacMasters Beach - Surfer Craig Roth (40) knocked from board by suspected tiger shark. Shark grabbed leash of board and pulled him seawards.

8 April 2001 – Bronte Beach – Andranik Markossian suffered wrist lacerations from wobbegong shark while snorkelling

12 April 2002 – Bar Beach, Newcastle – John Schneider (45) had foot bitten by bronze whaler while swimming

11 Feb 2003 – Coogee Beach – Tom Plumridge (24) received puncture wounds on heel, leg and buttocks while swimming

11 Feb 2004 – Caves Beach – Luke Tresoglavic (22) had his leg bitten by a wobbegong shark while snorkelling

21 October 2004 – Stockton – John Gresham (59) has his right foot lacerated while surfing

16 April 2005 – Bronte – Simon Letch (40) had surfboard bitten by bronze whaler

15 March 2006 – Bondi – Blake Mohair (15) had his surfboard nudged by a 2m bronze whaler

11 April 2006 – Newcastle – Luke Cook (15) received minor lacerations on his foot from a juvenile bronze whaler while surfing

12 February 2009 – Bondi – Glen Orgias (33) loses left hand after being bitten by 2.5m white shark while surfing

1 March 2009 – Avalon – Andrew Lindop (15) bitten on leg by suspected 2.6m white shark while surfing

26 December 2009 – Avoca - John Sojoski (55) received lacerations to lower leg after accidently stepping on shark

11 Feb 2010 – Mona Vale – Surfer Paul Welsh (46) bitten on left lower leg by a wobbegong shark while teaching son (10) to surf

7 December 2011 – Maroubra – Ronald Mason (14) bitten on leg by a wobbegong while surfing

3 Jan 2012 – North Avoca – Surfer Mike Wells (28) receives about 50 puncture wounds to right arm by a suspected bronze whaler

18 Jan 2012 – Redhead Beach – Glen Fokard (44) bitten by white shark on thigh while surfing

17 Oct 2014 – Avoca – Surfer Kirra-Belle Olsson (13) was bitten on left calf and ankle, and received puncture wounds to left foot while surfing.

5 Feb 2015 – Merewether – Body boarder Ben McPhee bitten on ankle by 1.8m shark (believed to be a bull shark).

8 Sept 2015 Shelly Beach Central Coast – Surfer Justin Daniels (42) bitten on his left hand shark type unknown.

Evidence of DPI misleading the public and ministers with false conclusions about the efficacy of the SMP

NSW DPI claims that the SMP has been effective in keeping bathers safe at the beach with absolutely no scientific evidence to back up this claim. There have never been any controlled studies between meshed and unmeshed beaches and none of the extraneous variables described above have been considered or included in any of the SMP annual reports. The SMP annual reports are scientific documents prepared and written by scientists and as such all extraneous factors should be considered in any valid scientific assessment and should be considered for their potential to influence the findings. Simply because a protective measure such as the SMP is in place on a number of beaches and there is a lower number of fatalities on those beaches does not imply causality, this merely implies a correlation and the effect of the SMP itself maybe completely negligible until further studies are conducted, first year science students at university level are taught this very basic concept as a primary rule for conducting all their scientific analyses throughout their careers, it is astonishing that the scientists that have compiled these reports have ignored this very basic premise underlying the scientific method. Not surprisingly when put under peer review by the Fisheries Scientific Committee (FSC) the SMP annual reports have been met with the same criticisms each year excepts below taken from the FSC letter in the appendix section of the SMP from 2010 – 2014.

- “the annual performance report contains no scientific data or information that would allow anyone to assess the success or lack thereof of the program itself” (SMP 2010).

- “first the annual performance report contains no scientific data or information that would allow anyone to assess the success or lack thereof of the program itself. The statement that the SMP has been effective at providing a safer environment for swimmers is unsubstantiated because no comparison of shark numbers or attacks is made between meshed and unmeshed beaches”. This is the same criticism that the FSC had in the 2009-10 assessment of the SMP, but which has not been addressed in the 2010-11 report. We encourage the SMP to provide this information in the 2011-12 Annual Performance report so that the program can be properly assessed” (SMP 2011).

- “The Annual Performance Report contains little scientific data or information with which to evaluate the success or lack thereof of the program itself. The statement that “The SMP has been effective at providing a safer environment for swimmers” is unsubstantiated because no formal comparison of shark numbers or attacks has been made between meshed and unmeshed beaches. This is the same criticism that the FSC had in both the 2009-10 and 2010-11 assessments of the SMP, but which has not been addressed in the 2011-12 report. We urge the SMP to provide this information in the 2012-13 annual performance report so that the program can be properly assessed. An assessment of the program is important because it is listed as a Key Threatening Process for several species of sharks. If the program is not effective at providing a safer environment for swimmers in meshed beaches than unmeshed beaches, then there may be a need for modification or discontinuation of the SMP (SMP 2012).

- “The annual performance report includes the statement that “The SMP has been effective at providing a safer environment for swimmers”. As the Committee has done in its review letters found in the appendix section in previous years, it reiterates that this statement is unsubstantiated because it is not based on a scientific comparison between meshed and unmeshed beaches of shark numbers, interactions or attacks. This is the same criticism that the FSC had in the 2009-10, 2010-11 and 2011-12 assessment of the SMP, but which again has not been corrected in the 2012-13 report. The FSC requests the SMP remove this statement from the 2012-13 annual performance report” (SMP2013).

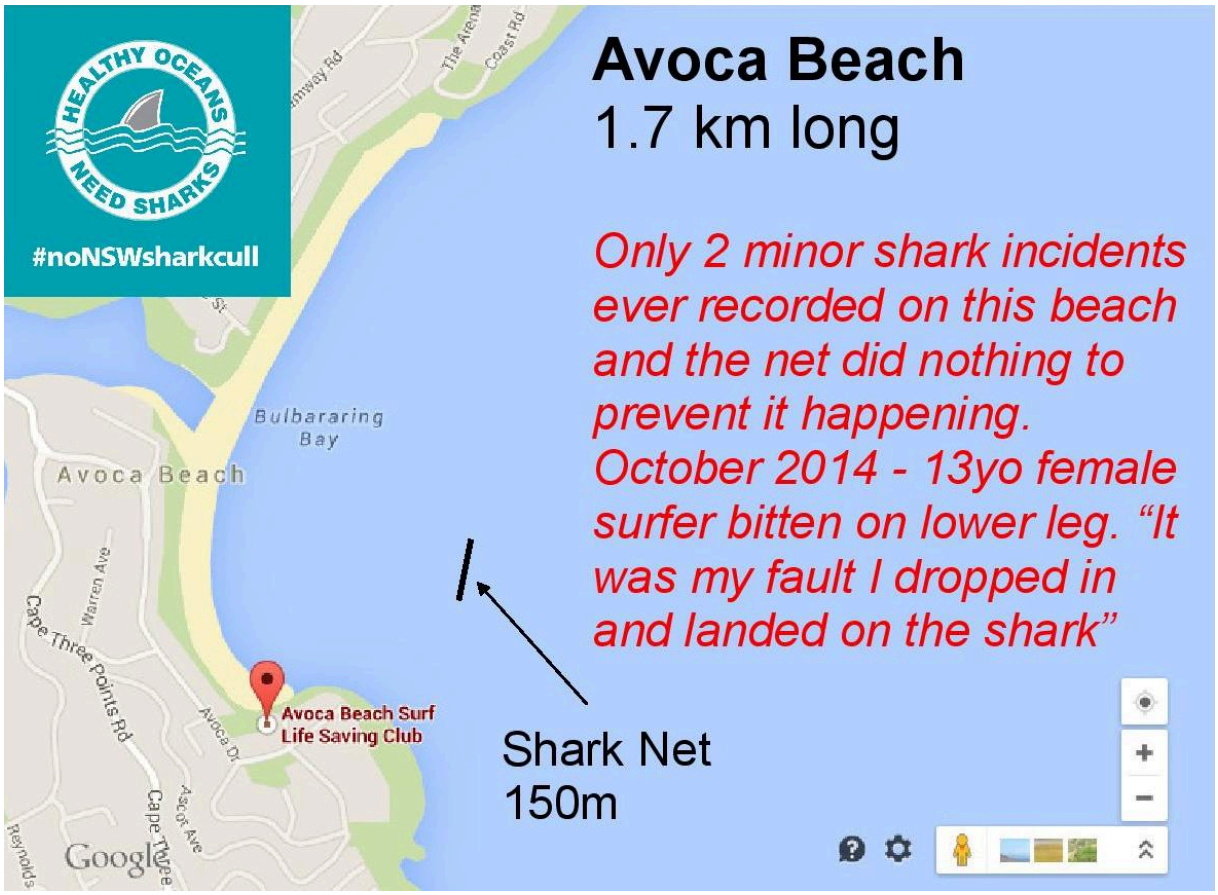
- “the FSC trusts that the superficial reporting of research and monitoring outcomes in annual SMP reports will not be promulgated in the 5-year review report, as without sufficient detail there can be no rigorous review, or transparency in the outcomes of the program. In particular, the Committee would like specific reporting and analyses in the following key issues to be included in the five-year review: - A rigorous scientific comparison of data within each management zone on shark sightings, shark attacks and beach usage rates between meshed and unmeshed beaches; At the individual shark level, more understanding of shark movements around nets and the beaches of NSW. Such data would provide critical information in the assessment of public safety and the efficacy of nets in preventing shark attacks” (SMP 2014).

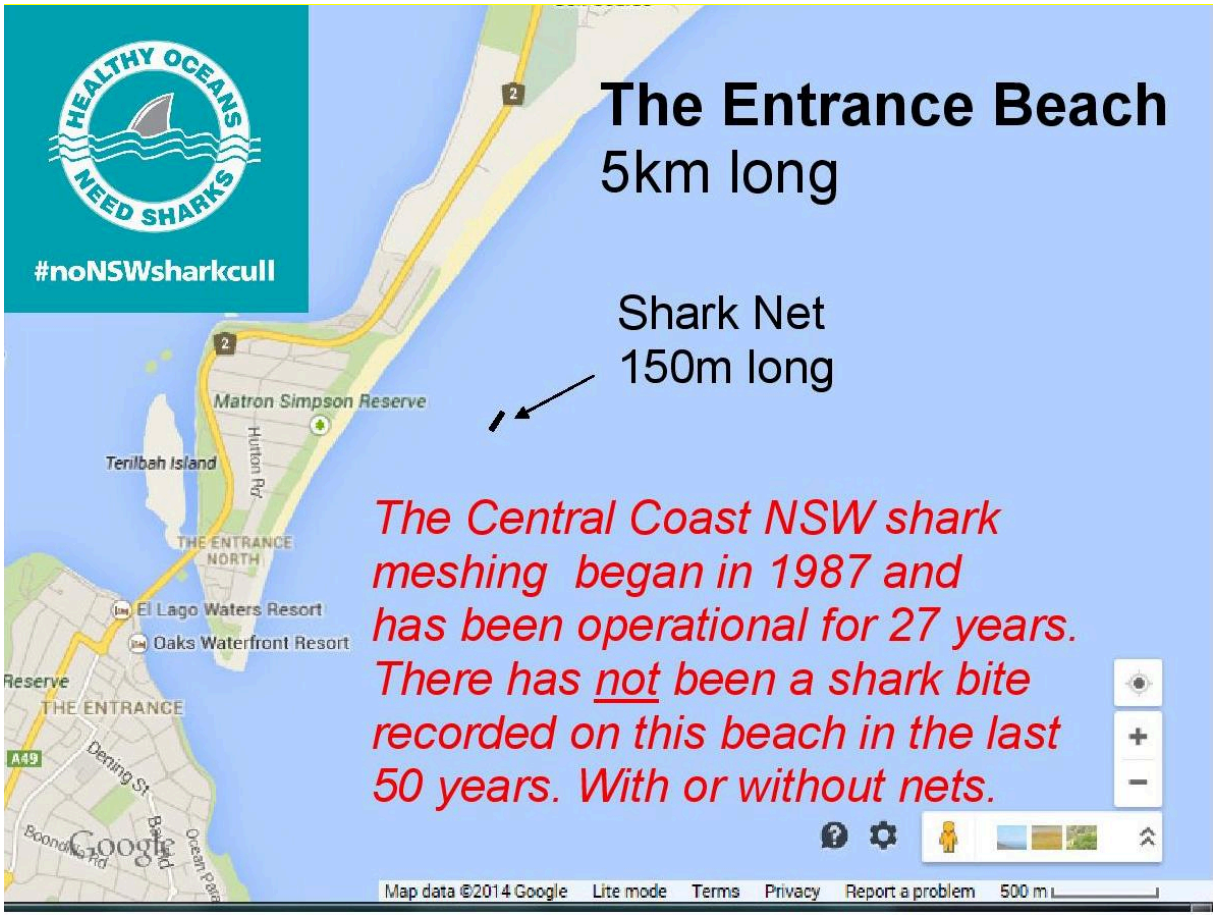
- It should be noted that the FSC letter and the NSW Scientific Committee letters have been omitted from the SMP (2015) Annual Performance Report. The SMP (2015) states that these documents are available to the public, extensive searches of the DPI website conducted whilst writing this submission have not yielded a result. An email on behalf of No Shark Cull has been sent to the FSC and follow up phone calls to DPI scientists have been made to attempt to obtain a copy of these letters to ascertain the peer review critique of the SMP without success (2015).

The nets are not a complete barrier headland to headland sharks can swim over and around the nets.

"Unlike small-mesh shark-exclusion nets that are deployed in waters sheltered from currents and wave action, shark-control gear on exposed beaches does not form an impenetrable barrier and hence does not eliminate the risk of shark attack" (McPhee 2012). Furthermore "use of other destructive methods such as baited drum-lines and shark nets do not guarantee that beaches are free of sharks of a size or species that pose a risk to humans" (McPhee 2012).

Shark nets as used in the SMP do not stop sharks from coming close to the beach evidenced by "the fact that 35% of the catch is caught on the shoreward side of the nets" (Dudley 1996).


HEALTHY OCEANS NEED SHARKS
#noNSWsharkcull
Avoca Beach
1.7 km long
Only 2 minor shark incidents ever recorded on this beach and the net did nothing to prevent it happening.
October 2014 - 13yo female surfer bitten on lower leg. "It was my fault I dropped in and landed on the shark"
Shark Net
150m
Bulbararing Bay
Avoca Beach
Avoca Beach Surf Life Saving Club
Cape Three Points Rd
Warren Ave
Avoca Dr
Ascot Ave
Google


HEALTHY OCEANS NEED SHARKS
#noNSWsharkcull
The Entrance Beach
5km long
Shark Net
150m long
The Central Coast NSW shark meshing began in 1987 and has been operational for 27 years. There has not been a shark bite recorded on this beach in the last 50 years. With or without nets.
Matron Simpson Reserve
Terrigal Island
Hutton Rd
THE ENTRANCE NORTH
El Lago Waters Resort
Oaks Waterfront Resort
THE ENTRANCE
Dening St
Google
Map data ©2014 Google
Lite mode
Terms
Privacy
Report a problem
500 m

Other issues with the SMP

Shark nets themselves pose a considerable risk to humans when they become dislodged or people swim or dive near them, there is one example in 1992 where an 8 year old boy drowned whilst surfing and became entangled in shark net in QLD Nobbys Beach. (The Australian 2012).

Losses of shark nets are reported in almost every year that the SMP has been operating – this poses an unacceptable risk to both humans and marine life with nets lost at sea becoming ghost nets which like serial killers continue to kill anything that swims into its path until the net itself washes up on a beach and can be retrieved which may be never "Sydney North contractor reported on 24th April 2015 the Avalon net was missing, this was due to the severe storm activity that week" (SMP 2015).

Shark nets themselves may become a threat if large sharks are brought into the area by the thrashing of entangled marine animals or their decaying bodies between fisheries contractor net checks "baited lines were not used in NSW in case they attracted sharks. It could also be argued however that sharks are attracted to animals captured in nets. About 4% of the sharks captured in the KZN nets were scavenging on other captured animals, and scavenging on dolphins and dugongs caught in the Queensland nets has been documented" (Dudley 1996).

Measures to prevent attacks by sharks, including strategies adopted in other jurisdictions

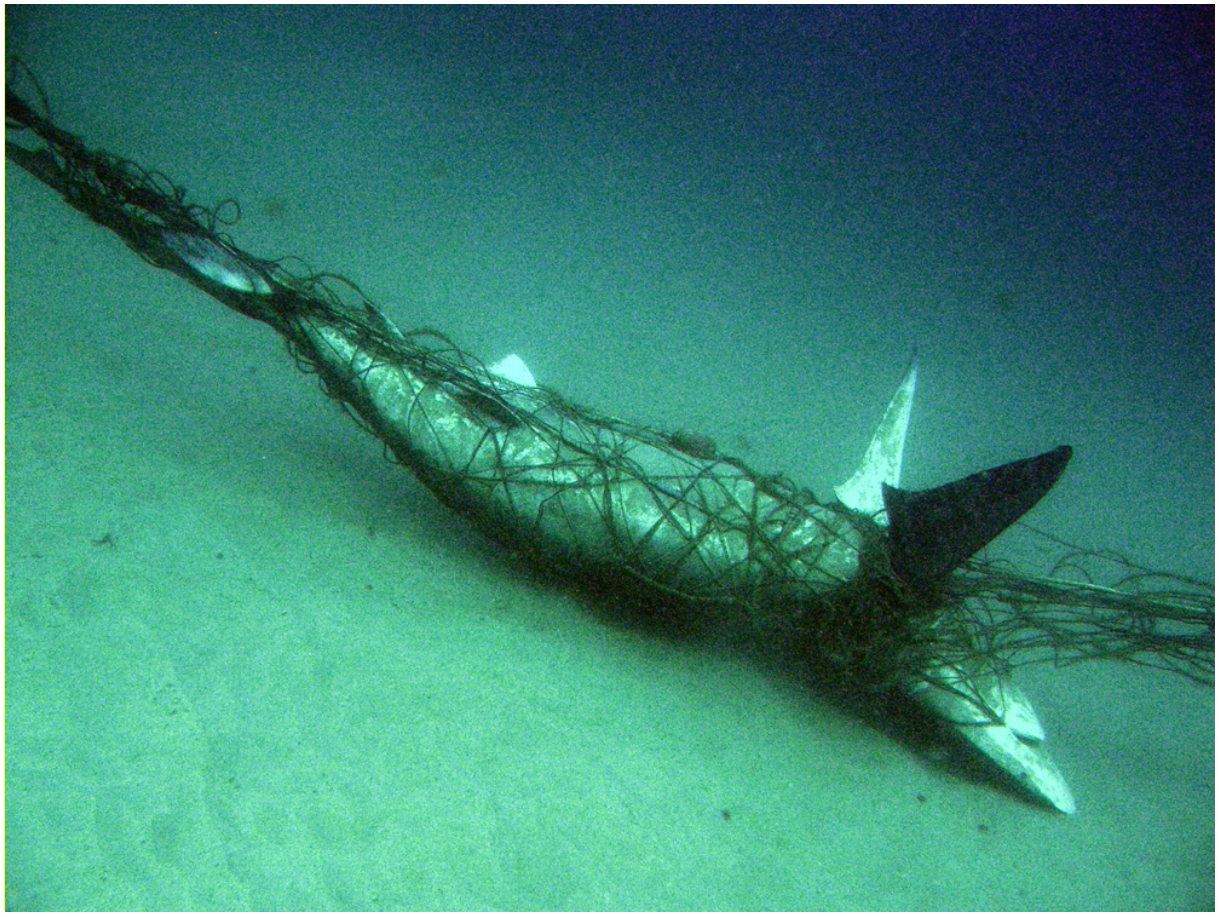
The NSW SMP is a shark culling program

The NSW DPI SMP reports in recent years have moved away from the wording that the SMP is a shark culling program. The SMP reports more recently state that the way the program works is to disrupt the swimming patterns of target sharks in order to deter them from setting up territories. "The SMP began in Sydney in 1937 and since then has had varying objectives including but not limited to reducing the risk of shark attack for surfers and swimmers, culling of large aggressive sharks, and deterring large sharks from establishing territories adjacent to metropolitan swimming beaches" (Review SMP 2009). This change in wording of the objective of the program is likely in response to the SMP being listed as a key threatening process for certain species of marine animal including targeted white sharks who are listed as vulnerable on the IUCN red list. However it should be noted that the home range of shark species targeted in the SMP varies widely from several hundred kilometres for bull sharks and a home range that extends several thousand kilometres for tiger and white sharks there is no conclusive evidence that any shark is territorial and defends that territory (Gruber, et al, 1988; Myrberg and Nelson, 1991). Furthermore at the recent NSW Shark Summit 2015 world renowned experts Barry Bruce (white shark) and Professor Colin Simpendorfer (tiger and bull sharks) were asked the question if these three species of shark display territorial behaviour and the response was a definitive "no sharks display territorial behaviour". "The white shark is not known to form and defend territories and is only a temporary resident in areas it inhabits. However, its ability to return on a highly seasonal or more regular basis implies a degree of site fidelity that has implications for repeat interactions with site-specific threats" (Bruce et al., 2005).

In an email exchange from a conservation group of stakeholders of which No Shark Cull is a member we asked NSW DPI fisheries what their' definition of 'territories' was – their answer was unexpected. According to NSW DPI the definition of a territory was any place the shark frequented for food, mating, giving birth or seeking protection from predators along their migration path. This is vastly different to most peoples understanding of the concept which involves an animal aggressively attacking another animal or human that enters an area it has chosen to defend in order to out compete with it for resources in that area. We would like to put forward that a more accurate way to describe these areas along the annual migration route of sharks as 'critical habitat' - necessary for the survival of the species.

Considering these animals they are targeting in the NSW shark meshing program are either vulnerable or near threatened with extinction on the IUCN redlist – 'deterring them from setting up territories' or more accurately from a scientific perspective 'killing them in their critical habitat' goes against the NSW fisheries own management plan for the protection of these species particularly the white shark which is a fully protected species. Therefore the importance of decoding and defining the specific language used by the DPI in this instance is important for understanding the objectives of the SMP. Furthermore the very thin gauge nets are near impossible to see until someone is right there next to them (in good visibility conditions) they are designed as a trap designed to catch, entangle and kill much the same way a spider web catches a fly, "it is unlikely however, that if a shark were aware of a net from a distance it would then be captured in that same net" (Dudley 1996). The fishing term for the particular nets used is gill nets – designed to catch in the animals gills so that they become stuck the more they struggle the more entangled they become. So when it comes to the language used by DPI - the use of the word 'deter' makes implies that the shark will see

the obstacle in this case the net and move away to another location away from the obstacle - however in this case ‘deter’ actually means ‘kill’. Therefore the SMP is really a shark culling program disguised as a deterrent program by the language used by the DPI.



Repeatedly throughout the SMP annual reports there is reference to the terms ‘catch effort’, or ‘fishing catch effort’ – the program is clearly designed to catch animals not to deter them. “The shark control programs of New South Wales (NSW). Queensland and KwaZulu-natal (KZN) are compared in an attempt to determine whether the fishing effort applied in the KZN program could be reduced. The stated mechanism in all three programs is to reduce shark numbers, and thereby the probability of an encounter between a shark and a bather” (Dudley 1996). Also “It was suggested that the NSW public would be reassured by a demonstration of declining shark numbers. The statement that shark control measures achieve their function by reducing shark numbers and thereby the probability of an encounter between a shark and a bather, has been re-iterated by various authors. An initial decline in shark catch and /or CPUE (catch per unit effort) after the installation of shark fishing gear was common to all three regions (Dudley 1996).

Approx Cost of the Shark Meshing Program in NSW = $1.6million per year for a program of shark nets: A single 150m long net is deployed on each of 51 beaches from Wollongong to The Hunter NSW for 17 days of the month, over 8 months per the year. Designed to cull sharks by catching, entangling and killing large sharks to keep the numbers low - the nets work on the principal that less sharks equates to less chance of shark encounter.
Cost = $200,000 per month.

Alternatives to the current lethal shark meshing program

The white shark recovery plan document (2013) outlines that the development and trial of non-lethal shark control alternatives to beach meshing and phasing out of the existing SMP is important in the recovery of populations of white sharks. There has been little progress made since the 2002 white shark recovery plan and the 2008 review of actions in this plan states that minimal action has been taken by the department and that alternative methods have been trialled. There is not detail given about what types of alternatives are trialled however are likely to be limited to trials of existing aerial patrol and shark towers methods that have been used for decades. DPI scientists have repeatedly stated that there are no viable alternatives to lethal methods. Quotes taken from The Manly Daily (2014) "Dr Vic Peddemors, a senior shark researcher at the NSW Department of Primary Industries, said the nets were doing "an amazing job" and had prevented shark attacks. He said the bycatch was a "concern" but that there were no viable alternatives to nets." It is concerning that DPI scientists continue to mislead the public and the ministers they report to with information that is not accurate as such no new development or trial of technologies has taken place by the department despite many advances worldwide in this area.

Research company Cardno (2015) was commissioned by the NSW DPI to conduct an independent review into existing and emerging technologies for bather protection and to evaluate each of these alternatives and shortlist the most successful with a view to advising the department and recommending technologies to trial along the NSW coastline. The findings from the report were presented at the NSW 2015 Shark Summit on 29th September 2015. Technologies were classified into two main groups shark deterrents and shark detectors. Recommendations from the report was limited to the Shark Spotter Program as it fulfilled all the criteria and scored the highest out of all technologies evaluated. Conditional recommendations were given for the Smart Drumline and Cleverbuoy systems if certain issues could be overcome such as more research whether there would be effectiveness in detection or ability to catch specific species of sharks for tagging purposes and if the potential for adverse impacts of wildlife were negligible, and the equipment is able to withstand the harsh conditions of the ocean environment of the NSW coast.

Below is a brief overview of the various technologies that have been developed many of them at various stages of use and testing throughout the world.

Shark Deterrents

Shark deterrents include large scale physical barriers which form a complete barrier between people and sharks and personal deterrents that are worn by the ocean user.

- **Fish Hoek exclusion net** successfully used in South Africa this net is deployed each day and monitored for bycatch so that a quick response is required to release caught animals alive,
- **Eco Shark Barrier** and other complete plastic barriers which form an impenetrable barrier on three sides between people and sharks which has been successfully trialled in WA in 2014 and 2015 with no bycatch associated with it since its installation.
- **Shark Safe Barrier** uses visual and magnetic barriers resembling a kelp field which has been successful and rigorous experimental trials were conducted this will be available commercially from early 2016.
- **Shark Shield** – commercially available shark deterrent personal device using

electric currents available for divers, surfers and swimmers this has been effective in deterring sharks.

- **Shark repellent cable** – tested in South Africa successfully deployed on a beach for 6 months with good results.
- **Necromone** chemical deterrents such as the commercially available canister useful for divers to open when sharks approach contains the synthetic decaying shark smell necromone which is effective in repelling sharks.
- **Bubble curtains** which create a visual barrier and require further testing and have not been deployed as yet anywhere in the world, not commercially available.
- **SAMS** (shark attack mitigation systems) camouflage wetsuits and surfboards which make divers look invisible to sharks with camouflage patterning on wetsuits and surfers look different to seals due to the black and white stripe pattern on wetsuits and surfboards – unlikely to work due to stripes contrast patterns not able to be seen by sharks looking up at the silhouette of surfers.
- **Shark Banz** – using electropositive metals and magnets in a personal wrist or ankle band to repel sharks – further testing is required.

Shark detection systems

- **Shark Spotters Program** – Dedicated land based shark observers program used in Cape Town successfully for 11 years and utilises on a beach flag alert system to warn bathers of shark sightings and the spotting conditions each day.
- **Clever Buoy** – Sonar buoys to detect sharks swimming patterns this method needs further testing to assess if it can accurately detect potentially dangerous sharks and also if it can withstand harsh coastal conditions.
- **Acoustic tagging and tracking** – various methods to capture sharks including clever drumlines (associated with high mortality rate for certain species captured) and then implant acoustic receivers in the shark along with acoustic listening stations along the coastline to warn of the presence of tagged sharks. Used in a number of locations around the world.

SHARK SPOTTERS
SAFETY CONSERVATION EDUCATION RESEARCH

Any other related matters

Shark meshing program is detrimental to many species including sharks that are threatened with extinction.
"The use of various methods to potentially reduce the risk from shark attacks can potentially result in impacts on non-target species of conservation significance. Further, a number of shark species that pose a risk to humans are themselves of conservation significance, including one species that is listed as a vulnerable species in Australia (i.e. the white shark)" (Mcphee 2012).

Many animals caught in the nets are endangered animals with protected status or are listed as near threatened. The SMP is listed as a key threatening process as it adversely affects many threatened species and could cause non-threatened species to become threatened.
Many animals caught in beach nets are now considered endangered as such the SMP is now listed as a key threatening process for the following marine animals: humpback, minke and southern right whales, Australian fur seals, dugongs, and three species of endangered marine turtles, critically endangered grey nurse sharks and vulnerable white sharks. Killing endangered animals in their ocean home for the purposes of increasing the safety to people who are visitors is unacceptable in this day and age. Environment Australia (2005) report lists some 99 species of marine animal who have been victims of the QLD shark control program (SCP) and the NSW SMP. Of these 99 species 73% are currently listed on the ICUN redlist as near threatened, vulnerable, endangered or critically endangered or are classified as data deficient, or not assessed yet so scientist are not able to ascertain if they too belong on the redlist. As animals and ecosystems face increasing environmental pressures, governments are obligated to ensure programs which threaten vulnerable and endangered species are replaced by less harmful measures to ensure human safety. Furthermore (SMP 2010) "Although covered by the Scientific Committee, the FSC is disappointed that the marine turtles and seal caught were not identified to species, making it impossible to assess the conservation importance of these entanglements".

It is likely that the SMP was partially responsible for the decline in the number of white sharks on the East coast of NSW today "catch data are incomplete prior to 1950. Stevens and Paxton reported that more than 1000 sharks were caught in the first year of meshing, although Coppleson gave a figure of 517 sharks. In 1950 the annual catch was 354 sharks, and the average catch from 1985-1990 was 162 sharks" (Dudley 1996).

The principal threats to the white shark in Australia are outlined (Issues Paper 2013) and include accidental or illegal commercial and recreational fishing and shark control activities such as beach meshing or drum lining. Objective 4 of the White Shark Recovery plan (2013) outlines the need to minimise the impact of shark control activities due to the lack of these animals released alive from the programs historically.

The FSC expressed concern about the trigger points set for the SMP "The Committee maintains its concern with respect to the way in which trigger points have been set within the program. Trigger points should be sensitive to the population parameters of particular species, however, as they are currently set, they are likely to be too coarse to initiate a change in management response for species with declining or recovering populations. The Committee therefore once again recommends reconsiderations of triggers points, taking into account population size, demographic structure, breeding biology and the cumulative effect of other

anthropogenic sources of mortality affecting each non-target and threatened species that interacts with the SMP." (NSW SMP 2010).

The nets are indiscriminate killers of marine life – approximately 5% of the catch consists of the 3 most dangerous sharks (White, tiger and bull) approximately 95% are other mostly non-dangerous marine animals such as whales, turtles, dolphins, little penguins, dugongs and critically endangered grey nurse sharks, 2 species of shark should not be included in the target species list including sharks such as the broadnose seven gill shark that have never been implicated in a shark attack on a human and mako sharks are a target species and the vast majority of cases of bites are provoked when fishermen land these animals and are subsequently bitten (Review SMP 2009). At odds with the objectives of the SMP The current manager of the program has stated publically the situation with shark decline is alarming and we need to do everything possible to protect sharks in a TED talk (Peddemors 2012).

The SMP has also been utilised as a tool for scientific research into the changes in abundance of various shark and other marine animals species as a method for sampling the changes in populations over time on the NSW coast. This method has been praised for providing data that would not have otherwise been available to inform sustainable management for marine animals (Reid et al 2011). However knowing that the declines in shark and other marine animal species in both NSW and worldwide have been so severely affected by human activity primarily overfishing and with the development of new technologies to tag animals both with satellite and acoustic systems to monitor populations without killing animal surely it is time to do away with antiquated methods of scientific sampling. The logic that killing animals to inform conservation initiatives and set sustainable fishing targets is no longer valid as the scientists of the world currently give an estimation at the current rates of over fishing, human population growth, pollution, climate change and other human factors unless drastic action is taken now to preserve them, the ocean ecosystems of the world will be in total collapse by 2048.

Over 300 top marine scientists formally spoke out in opposition to the W.A. shark cull in the record breaking EPA submission (over 30,000 submissions were entered) against the W.A drumline policy in Sept 2014. The EPA assessed the culling of sharks as unacceptable and recommended against it for environmental reasons. Culling sharks in NSW has exactly the same environmental impact on protected species such as the great white shark.

Sharks are helping to prevent climate change

Recent research has discovered that intact ocean predator populations are critical for preventing climate change, therefore overfishing, and culling operations are resulting in an overabundance of turtles, stingrays and crabs leading to a loss of marine vegetation which is vital for storing vast amounts of carbon. Important areas are seagrass, mangrove swamps and salt marshes that capture and store carbon 40 times faster than tropical rainforests. With 90% losses of ocean predators such as sharks these habitats that act as carbon sinks are being irreversibly damaged (Atwood et al., 2015).We should be doing everything possible to protect marine ecosystems as they are more fragile than ever. We need shark control methods that make the ocean safer for people and marine animals including sharks. Shark as apex predators are vital for the health of the ocean, without sharks scientists predict that the entire ocean ecosystem will collapse. The plankton in the ocean provides up to 70% of the oxygen on the planet for this reason we need to keep our ocean ecosystems in balance. Healthy oceans need sharks!

The majority of Australian public are not in favour of killing sharks
Dr Chris Neff (2013) conducted research into the public response to shark bite incidents 87% of people surveyed favored non-lethal responses and 69% of people surveyed supported public education as the best method for preventing shark bites. 4% of those surveyed supported the hunting of sharks and only 9% supported more shark nets as a preventative measure. This research clearly demonstrates that there is very little support for government lethal measures for shark mitigation.

Gibbs and Warren (2015) conducted research in light of the WA spate of shark attacks and the WA shark cull policy. The research found that people encounter sharks often, without harm and that most ocean-users adapt their practices in order to reduce personal risk. The majority of ocean-users oppose the kill-based elements of the WA shark cull, and kill-based shark hazard management strategies more broadly. Rather, ocean-users strongly support further research and education focusing on shark behaviour and shark deterrents, and approaches that enable people to understand and accept risks associated with ocean use. In recent research conducted more than 80% of residents in Northern NSW were opposed to shark culling following a spate of shark incidents in the area (Neff 2015).

Brief overview of the main political actions the public took against the WA shark cull policy.
4th January 2014 Protest at Cottesloe Beach and an estimated 5,000 people turned up and joined the speakers in condemning the proposed action, due to start in less than a month (http://www.abc.net.au/news/2014-02-01/shark-protests-wa-catch-and-kill-perth/5232480).

20th January 2014 The names of several organisations that submitted tenders to the WA Dept of Fisheries to carry out the cull off the metro coast were found out by the NoWASharkCull group and the resulting public backlash persuaded the companies to withdraw their tender bids. As a result, the State Government was forced to use Dept of Fisheries boats and crew to perform the cull activities. (http://www.abc.net.au/news/2014-01-20/plans-to-use-commerical-fishers-for-shark-cull-abandoned/5209628)

23rd January 2014 Significant social media attention started to occur, Twitter and Facebook were the key platforms, with many celebrities lending their support. These included notable contributions from Sir Richard Branson and Ricky Gervais, amongst MANY others (http://www.theguardian.com/environment/2014/jan/23/ricky-gervais-joins-celebrities-in-opposing-wa-shark-cull)

1st of Feb, 2014 another protest was organised, also at Cottesloe Beach. Approx 8,000 people turned up to this event and a total of approx 15,000 attended rallies over that weekend across Australia and New Zealand (http://www.perthnow.com.au/news/western-australia/shark-cull-protests-underway-at-beaches-across-wa-and-the-nation/story-fnhocxo3-1226815570086)

Early Feb, 2014 International protests started to gain ground. Premier Barnett was harassed at a protest in Capetown, South Africa, protests occurred in around 20 different countries including at London UK, Rome, Argentina, Israel, Italy, Canada, USA and New Zealand.

Feb 2014 Over 23,000 submissions were made to the EPA in Feb 2014, yet they decided not to assess the environmental impact. http://www.abc.net.au/news/2014-03-12/epa-rules-out-shark-cull-assessment/5315032

Late Feb 2014 Sea Shepherd took the State Government to court in late Feb, 2014, in a bid to delay the cull on the basis that the procedure was unlawful. This action ultimately failed on a point of law. http://www.abc.net.au/news/2014-03-05/sea-shepherd-legal-challenge-to-wa-shark-cull-fails/5299926)

18th Feb 2014 Another protest was organised, this time on the steps of Parliament House in Feb 2014, with approx 150-200 people turning up during the weekday. http://www.abc.net.au/news/2014-02-18/shark-protest-parliament-house-wa/5267790

Throughout Sustained monitoring of the metropolitan cull performed by the Dept of Fisheries was performed virtually every day by volunteers from Animal Amnesty, Sea Shepherd, community group noWAsharkcull and many individuals not linked to or associated with any specific organisations. Electronic and print media from many, many countries specifically came to Perth to document the cull, speak to the people on both sides and to report back. Money for fuel, for the crews, was donated, many thousands of dollars, though several individuals funded themselves.

Media coverage between January and around May 2014 was solid, sustained and a key factor in the success of the campaign. The 'shark issue' was the lead item, or near the lead, in virtually every news bulletin on all 4 news broadcasts nightly. Premier Barnett has publicly acknowledged that this matter and the period that it was in effect was one of the most difficult of his Government – "There was a lot of protests and maybe the Government got it wrong in some aspects, I don't deny that…"http://www.abc.net.au/news/2015-10-01/wa-shark-strategy-well-balanced-colin-barnett/6821338

July, 2014 over 300 scientists from around the world signed a document calling on the State Government to stop the plans to resume the cull for a further 3 year trial http://theconversation.com/why-were-opposing-western-australias-shark-cull-scientists-28653

Sept, 2014 the Environmental Protection Authority reviewed the drum line proposal for the 2014/2015 season and recommended against it proceeding. The call for submissions attracted 6,751 public submissions and two petitions with about 25,000 signatures http://www.abc.net.au/news/2014-09-11/wa-dumps-shark-drum-lines-after-epa-review/5737526

Sept 2014 The Government then abandoned the plan, but 'reserved the right' to implement the 'imminent threat policy' to hunt and kill 'rogue sharks' that threatened people or 'hung around' a beach too long. The 'Imminent Threat Policy' then became the 'Serious Threat Policy' and is still in place today. This policy was implemented several times in late 2014, including in Oct when two White Sharks were caught and killed near Esperance after an incident Controversy still surrounds the circumstances of the killing, with secrecy and avoidance by the Dept of Fisheries and the State Government. http://www.watoday.com.au/wa-news/no-drum-lines-in-wa-but-sharks-could-still-be-killed-20140912-10g8uj.html

In conclusion 172 sharks were caught on the drumlines off Perth and the south west coast. No White Sharks were caught, but 50 Tiger Sharks over 3m long were destroyed as well as 18 other sharks. The last recorded incident involving a Tiger Shark off the WA coast was decades ago. So, in summary, international embarrassment, massive local negative media coverage, consistent 70-80% of people surveyed not supporting the cull, massive costs and environmental vandalism. Since then No Shark Cull has hosted many events and rallies against the NSW shark cull educating the public and highlighting that this is not any different to the WA shark cull – Does New South Wales want to follow Western Australia down this road?

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