MANAGEMENT OF SHARKS IN NEW SOUTH WALES WATERS

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A submission on behalf of Surfing NSW to the NSW Parliament 'Committee on Investment, Industry and Regional Development'

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address / 'The Pavillon', Marine Pde, Maroubra Beach NSW 2035 mail / PO Box 4005, Maroubra South NSW 2035 phone / (02) 9349 7055 fax / (02) 9349 7344 web / www.surfingnsw.com.au A submission to the NSW Parliament 'Department of Primary Industries and Fisheries' for consideration in the:

'Inquiry into the management of sharks in NSW waters and the economic impact of shark attacks on the NSW surfing community.'

Foreward

Surfing NSW (SNSW) is the peak governing body for the sport of surfing in New South Wales (NSW) and the largest and longest running state surfing association in Australia, SNSW convenes over 40 events held each year, 250,000 plus learn to surf lessons delivered annually by our licensed surf schools, and has over 100 affiliated clubs covering all disciplines of the sport.

I started surfing in 1963; my whole life has been around the beach and surfing. In 2004 I was appointed CEO of SNSW and for 20 years prior I held the position of Regional Director for SNSW. I also sit on the NSW Water Safety Advisory Council.

Over the past 30 years I have been involved in organising countless surfing events from grass roots club point scores, through to Regional, State and National Titles, as well as legs of the elite world tour, conservatively in excess of 800 events.

Sharks and interaction with them is a given for the sport of surfing and is something we take seriously, with the safety of competitors paramount as an event operator. Over the past 18 months, the frequency of interaction between sharks and humans has increased dramatically, which has been highlighted by the recent spate of attacks on the NSW North Coast.

Most of the information presented in this document is readily available online, this is a summary and skewed towards surfing and recreational surfers, boardrider clubs and surf schools.

Recently, I attended the NSW Government Shark Summit at Taronga Zoo which was convened to address this phenomenon. The Summit included some of the foremost experts on sharks and shark behaviour in the world. It was an interesting day and gave me the chance to see some of the technologies being worked on around the globe to minimize the risk of shark attacks.

Mark Windon, CEO, Surfing NSW

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Introduction

SNSW prepared this report to investigate the nature of a perceived negative impact arising from the recent increased shark activity along the local north coast area, and possible impacts on the broader NSW surfing community. This paper focuses on the affects specifically experienced by our affiliated boardrider clubs and surf schools and focuses, but is not limited to, our competitive members. Efforts have been made to include the broader surfing landscape, which included local north coast surfing business such as independent surf shops and surfboard shapers.

This report:

- a) Identifies, describes, and documents "relationships" between the NSW surfing community and sharks;
- b) Documents the environmental, economic and socio-cultural contributions the surfing community brings to NSW coastal regions; and
- c) Provides baseline data that will be informative and could be helpful toward the NSW surfing community's continued use of the ocean by:
 - Examining the impacts of shark attacks on residential surfers on the NSW north coast as well as other recreational and competitive surfers in NSW;
 - Investigating any economic impact of recent shark attacks on local north coast organisations and businesses in affected areas; and
 - Determining the surfing community's views and opinions on shark management strategies in NSW

This report is supported by literature published in scientific journals, grey literature (specifically from The Department of Primary Industries (DPI) and Fisheries, past and recent reviews on Shark Management strategies in NSW and various jurisdictions), internet information and personal communications with the surfing community.

Why study the NSW surfing community?

Surfers are by far the most heavily represented group among shark attack victims; they are attacked at nearly three times the rate of swimmers, and five times the rate of divers. According to research by Mr John West, the curator of the Shark Attack File and Taronga Zoo's manager of life sciences operations, there has been a





310% increase in attacks on surfers since 1999 (West 2011).

It is apparent that little research has been directed at this important group of defined individuals that make up this community of interest. With NSW in the midst of a variety of planning

challenges regarding new oceanic management strategies, our study was developed to fill the void of information about the NSW surfing community.

Until recently, the majority of surfers have not been discouraged by the occurrences of shark attacks, as the probability of an unprovoked attack had been judged as low. However, recent research indicates that the 14 unprovoked shark attacks and daily sightings of sharks in NSW waters during 2015 has provoked a cultural shift in the psyche of the surfing community of the NSW north coast. As the recent report prepared by Cardno states, when a series of unprovoked shark bites and continual sightings of these sea creatures are observed at a certain region over a short period of time, it becomes a societal problem which requires government intervention (Cardno 2015).

Understanding and including the surfing community within this inquiry is important for planning and decision making to ensure the acceptance and long term success of shark management and conservation in NSW.

Who comprises the NSW Surfing Community?

Generally, members of the surfing community are both residents of coastal communities and visitors from other regions of NSW. The community comprises people whose interest lies in surfing as a leisure pursuit and competitive sport which involves all disciplines; short board, longboard, paddleboard and bodyboard. Other subgroups that involve this community of interest include surf schools, boardrider clubs and local businesses associated with the surfing industry.

In NSW, surfing plays an important role in coastal communities. Lazarow (2009) describe the role of surfing in the coastal community: "It is clear that surfing's influence extends beyond recreation and tourism and it can bring a "social fabric" that helps define communities and people. Surfing as an activity and as a culture in particular link generations, bring people together, provide an avenue for outdoor-based physical activity, be good for business, and can help build towns communities."

It is estimated that in Australia there is over 2.7 million recreational surfers (Surfing Australia 2010). Currently, SNSW has a membership base of 1088, but this accounts for only a small fraction of the total surfer population in NSW.



Surfers at the Pass, Byron Bay Photo: Kirra Pendergast, (2)



A specific surf culture is evident on the NSW coast, and studies (Lazarow et al 2009) have found that surfers make important economic, cultural and environmental contributions to coastal communities. The State supports many surf shops in coastal regions, with many more

independent surfboard shapers, surfing camps and related organisations. Professional surf contests and events are held coast wide with a number of competitions been held in the problem areas of northern regions of NSW by SNSW, local boardrider clubs and independent organisations and surfing groups.

Sharks and surfers in NSW waters

CSIRO scientists have estimated there are 700-1200 adult Great White sharks in eastern Australian coastal waters (Insight 2015). Attacks and increased sightings have been most prevalent on popular surfing beaches around Byron Bay, Ballina, Lennox Head and Evans Head causing numerous beach closures.

The Great White shark has been the species most reliably assigned to the majority of recent incidents along the NSW North Coast. Research correlates with the global trend by data interpreted in the Australian Shark Attack File indicating that the Great White shark was the most common species to attack surfers in NSW (refer to figure 1). The Great White along with Tiger Sharks (Galeocerdocuvier) and Bull Sharks (Carcharhius leucas) account for 55.6% of all bites over a global thirty year period (McPhee 2014).







The SAMS shark deterrent wetsuit and surfboard (3)

A large shark photographed near Ballina Photo: Air T&G Helicopter Services (4)

A blacktip shark inspects a surfer paddling on a prototype surfboard fitted with a electronic shark deterrent built into its underside (5)

Data from the Australian Shark Attack File supports a global statistic revealing the majority of unprovoked shark attacks have been on surfers at ocean beaches (refer to Figure 1). Jan Gilbert, a marine ecologist, argues that there has been no increase in the shark population over recent years; in fact, her research suggests that the population of sharks has declined worldwide. However, she does suggest that there could be contributing factors as to why Great White populations have been more prevalent around the NSW north coast regions (Insight 2015). It was also suggested that sharks are known to come into shore to follow baitfish, which have been



prevalent in the shallow waters of beaches during 2015. Despite anecdotal reports from local surfers and fisherman, it is argued by Mr John West (2011) that the increased number of surfers in Australia during the past two-and-a-half decades was largely responsible for the inflated

number of attacks.



Figure 1 Data interpreted from The Australian Shark Attack File (ASAF 2015)

According to this research, surfing attacks increased by 50 % in the decade 1995 to 2004 from the previous decade's figures, and in 2005 to 2015 there was a further 150 % increase. There are perceived to be many contributing factors that make surfers vulnerable to a shark attack. For instance, most surfers seek out less crowded areas where ideal waves can be found which may include placing themselves in deeper water for longer periods of time at unpatrolled beaches. In recent decades, an individual is now capable of surfing all year due to improvements in wetsuit technology. There is no suggestion that wetsuits in themselves are the cause of an attack, but rather that their use has allowed people to extend their time in the water, increasing the risk of encountering a shark (West 2011).

Data from ASAF supports the concept that sharks are not actively hunting humans as prey, and that a bite is more often a "mistake" by the shark. The vast majority of bites that occur whilst surfing have been located on a victim's extremities (legs, arms), consistent with exploratory bites by scavenging sharks (ASAF 2015).

2. Methods

The target group was the NSW surfing community. The contributions of the NSW north coast surfing community were more heavily focused, but responses from other regions were certainly valuable as well. Therefore, this report evaluates responses with regard to two broader regional categories to investigate the direct impact on the north coast community and overflow impacts on other parts of NSW.



Survey Group 1 included recreational and competitive surfers in NSW, while Survey Group 2 consisted of local surf industry related businesses and organisations who were typically well connected individuals as business owners or organisation leaders of the sport.

Efforts were made to interview a diversity of ages and genders and not to restrict research to major areas of concern.

Most local surf shops were contacted in the north coast region. However, despite efforts to ensure a comprehensive study, few responses to our survey ensued which limited this research to address impacts on Surfing NSW's affiliated surf schools, boardrider clubs and members. Nevertheless, a few surfboard shapers in the area did respond and their feedback was greatly appreciated. Mr Anthony Wilson, president of the independent surf shops on the NSW north coast was also contacted with a number of interview questions that sought to explore the impacts on the retail end of the surfing industry. Unfortunately, the questions remained unanswered due to timing with annual leave. This study is mostly limited to addressing impacts on SNSW affiliated contacts.

The main limitation to gathering responses has been time. More research into this group of interest needs to be undertaken to examine more precisely the study population. Ideally, methods to reach out to recreational surfers should be examined for a more accurate view point from the surfing community. Out of interest, we plan to make an effort to gather more responses by extending the timeframe of this study to gain a more accurate viewpoint from this community of interest.

A mailing list was compiled for the survey portion of the study by utilising mailing databases. A survey was created online through the software "Survey Monkey". Two different surveys were created for the groups. A survey mailing list was gathered to conduct an email survey. Comprised of 7 – 10 questions designed to learn baseline information from the study population, their changing attitudes towards surfing, and their familiarity regarding management solutions and opinions on emerging technologies. Refer to Appendix A for survey and results of Survey Group 2. Due to a small study population and the potential for a bias result, we have only included results for this group; however, some results from Survey Group 1 will be referred in the paper. Please contact SNSW if you would like more thorough details of results.

A total sample of 94 NSW surfing community members were surveyed between the 7th and 15th of October 2015. The sub group respondents included: -

- n=47 recreational and competitive surfers in NSW;
- n= 28 North Coast, NSW Boardrider Clubs;
- n=12 North Coast, NSW Surf schools; and



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n= 4 Independent Surf Board shapers

The combination of knowledge gained from the involvement in the Shark Summit, research from literature and media reports, televised and online discussions with the surfing community, the

Department of Primary Industries (DPI) resources and email surveys provided deeper insight into the NSW surfing community to assist with an understanding of views and approaches towards shark management.

Sample Structures – Completed Surveys

Group Survey 1: NSW Surfing Community – Recreational and competitive surfers

Region	# Surveys	% Interviews
Central Coast –Far North Coast NSW	18	39%
Sydney – South Coast NSW	28	61%

Group Survey 2: NSW North Coast Surfing Community

North Coast Community Sub group	# Surveys	% Interviews
SurfSchools	12	27%
Board rider Clubs	28	63%
Independent Surfboard shapers	4	10%



Research review, results and discussion

Surveying impacts of shark attacks and attitudes to sharks and shark management

The occurrences of shark activity in NSW, along with Australian professional surfer, Mick Fanning's high profile encounter with a shark whilst competing in the recent J-Bay Open event in South Africa, is considered to have amplified the thinking of NSW surfers and ocean-goers in what they may perceive as a dangerous escalation in shark numbers (White 2015).

During 2015, two professional events managed by SNSW have been affected by shark activity. An international junior surfing competition the "Skullcandy Oz Grom Open 2015" at Lennox Head in July proceeded despite two shark attacks in less than 24 hours on the NSW north coast, near the contest site. The contest director of the event and Le-Ba Boardriders secretary Mr Tony O'Brien said there had been nothing like it in pro surfing before.



Competitors return to the beach at Lennox Head, on the NSW north coast, after their heat in the Oz Grom Open surfing competition 2015 (6)

Similarly, several sightings of sharks on the north coast posed a threat to the Australian Surf Festival at Coffs Harbour in August. The finals of the National Bodyboard competition were interrupted when a shark was spotted beneath a competitor. As a consequence, the competition was scheduled to continue at surrounding beaches although further shark sightings off these beaches prevented SNSW from running the heats.

Following the shark attack at North Coast beaches in 2015, SNSW has worked to enhance competitor confidence and safety by constant water patrols by lifeguards within the contest timeframe. Further, SNSW has reviewed risk management procedures regarding sharks. A shark bite blood constriction device is now on hand at all SNSW managed contests as a safety procedure for any potential attacks.

It has also been reported that operations and participation numbers of surfing at grassroots levels has been already affected. The Surfing Australia boardriders club system supported by the Australian Sports Commission is the most advanced in the surfing world and is a vital link in the sport development pathway. Boardrider clubs are the breeding ground for the champions of tomorrow, recognised as the grassroots level of surfing development; SNSW oversees 129 boardrider clubs of the 209 Surfing Australia affiliated boardrider clubs in NSW. SNSW works closely with these clubs to simulate, and nurture, skills that will inspire the next generation



of surfers and officials through coaching, development and judging education. This group of respondents made up the majority of the study population, possibly highlighting the extent of impact and the urgency for a solution.

Most boardrider clubs we surveyed have experienced operation impacts and a decrease in member ship and participation due to the perceived shark activity. Some clubs stated their participation base has declined by 50% compared to last year's rates, whilst others have noticed a cumulative participation decrease over the past months of up to 10 riders per competition, suggesting the increasing frequency of attacks and sightings over time are changing members surfing behaviour. A boardrider club in Lennox Head stated that their club had cancelled the last two rounds of competition and had half of their member's report they would not be returning because of the risk of shark attack. Similarly, a boardrider club at Evans Head stated that their most recent two competitions were affected, with one competition cancelled and the other experiencing a 30% decrease in competitors. Additionally, downturns in earnings have been noted. A comment from New Brighton's boardriders Incorporated club president stated: "We have missed one competition at the peak of the shark activity and have had a 50% to 60% drop in numbers in the last 2 competitions. The club makes on average \$400 a day at these comps from food and drinks so we are down in earnings as well. "

Club personnel were asked to suggest the nature of assistance that they consider would support the club through this time. Common responses included:

- Netting beaches used by clubs ;
- Increasing Public awareness;
- Shark warning systems, tagging sharks even (but not to harming them);
- More research into shark movements;
- Frequent aerial surveillance ; and
- Jet Ski monitoring

New Brighton Boardriders stated that they are currently fundraising to purchase a jet ski to patrol the competition area, and suggested it as a necessity with the changing conditions give confidence to the competitors and parents of junior divisions sufficient to let their children back in the water.



LeBa Boardriders Northern NSW Boardriders Battle Winners



Josh Grange at a NSW Wahu Surfer Grom Comp (7)



The following section describes surfing's contribution to tourism and explains implications of the shark activity for the region's local businesses and organisations.

Surfing is an increasing growth industry, and plays a major part in the tourism strategies for many coastal locations in NSW (Lazarow et al 2009). The value of surfing to Australian society and the imprint of surfing on our lives and lifestyles has grown significantly over the past three decades. This combined with the significant growth in participation and rising popularity of surfing means that the importance of the economic value of surfing to various regions cannot be understated.

Research has indicated that surfers contribute greatly to tourism with surf tourism contributing to over \$500M in to the NSW economy each year. Surfers are prepared to travel great distances to seek out uncrowded locations (driven by conditions and certain breaks). Moreover, SNSW coordinates numerous events within the State which require travel for competitors to compete. A study indicated that surfer's average more distance then most holiday goers so have found that their trips are slightly longer stays than others. They fight the seasonality and contribute to an increase of consumption in caring, accommodation, heritage and other resources, simultaneously identifying with local communities, position the destination as a true surf destination (Eardley and Conway 2011).

Surfing contests bring increased visitation of tourists to areas of NSW. Some National events as well as junior competitions are located on the north coast of NSW and these events attract large crowds to the region by drawing in competitors and their friends and family from all over the country. The three week long Australian Surf Festival (Surfing National Titles) at Coffs Harbour has been proudly supported by Destination NSW as it has been shown to benefit the region and local economy, particularly in the out of the peak tourism .

Moreover, surfing as a recognised sport has increased over the last fifty years, creating a surf culture and lifestyle which has the ability to attract more surf tourist segments; from surf camps to surf wear, through the sale and /or retail or rental of equipment. There are several business activities linked to surf, such as the manufacture of surf boards, accessories and raw materials, surf shops, surf school, media and specialised companies such as



"The Surbboard Warehouse" in Byron Bay (8)

travel agencies, hotels, bars, restaurants that are indirectly related to this sport; a highly specialised market segmentation, promoting job creation and regional development . A previous study states that surfers spent least on restaurant and bars but most on shopping and gear (Lazarow et al 2009). With outlets for gear readily available on the coast, surfers spend considerable sums on gear. Many surfers have multiple boards and most surfers regularly replace gear, with new surfboards roughly costing \$500-\$1000 or more, and wetsuits roughly \$150-600 (Surfstitch 2015).



The north coast of NSW relies heavily on tourism to support its local economy, and local residents are concerned that unsafe waters are

driving tourists away. Byron Bay, Ballina, Lennox head, Evans Head, Coffs Harbour and Port Macquarie are some prime locations on the north coast of NSW that accommodates



popular surfing and tourist destinations, unfortunately these towns, "All Above Board" surf shop in Lennox Head (9) between Evans Head and Byron Bay have been the hardest hit by the recent shark activity. The research clearly indicates that this is a difficult period for tourist destinations in northern NSW.

Mr Don Munro, a Ballina retailer and president of Le-Ba Boardriders Club stated that the attacks had already had a large impact on the whole three shires along the north coast. Numerous reports have stated people are steering clear of the region and cancelling holiday plans. Our study examined whether the recent increased incidence of shark attacks have deterred respondents from planning surf trips in certain regions of the NSW north coast region. Of the 66 survey respondents who answered this question, 65% (n=43) said yes, with surfers having avoided, changed plans or cancelled surf trips on the north coast due to the fear of sharks within the region. The implications for local businesses due to the attacks derive from a decline of tourist activity within the areas affected, and as a result Munro says tourism rates are at least 50% down compared to the same time in past years. It was stated in a local newspaper (Adams 2015) that sharks were causing tourists to cancel bookings in the Northern Rivers area, which correlates with our survey responses. Ballina Shire council manager of commercial services, Mr Paul Tsikleas said the return of customers was largely dependent on a reduction in shark activity. A Queensland state school which had run surfing camps at Flat Rock Tent Park for the past years had not rebooked. The loss in revenue from the school surfing camp is \$2,580 over two days. Flat Rock Tent Park operators told the Ballina Shire council that they continue to receive many calls about sharks and reported a "substantial reduction in bookings" this year. Figures showing occupancy rates of a Tent park in Ballina show a decrease by 50% in comparison to previous years (Adams 2015).

This problem has the potential to affect numerous stakeholders within the surfing community, rendering the viability of these businesses uncertain in the event of protracted incidences of increased shark activity. A reduction in trade affects many aspects of business in changing of the trading environment. This could involve altering of trading hours, reducing the number of staff, reducing wages and salaries as well as changing amounts of inventory held or on order.



Additionally, three surf shops have shut on the far north coast of NSW. Other independent surf shops are also suffering a downturn in trade with one store owner in Ballina stating that surfing accessories sales have fallen 80% (Broadhead 2015). All Independent Surfboard manufacturers

in the region who took part in our survey reported a down turn in trade. One surf board manufacturer in Ballina, Mr Wayne Webster said the future is very uncertain for his business, as in recent months he has gone from making 20 boards a week to four. According to an interview in the local newspaper, he said the situation was "frustrating" for his business as he was on the verge of expanding, but now he is considering downsizing and having to dispose of his current stock (Broadhead 2015). Similarly, another board shaper in the region commented on their estimated lost income, stating a weekly reduction of \$2,500.

SNSW licensed surf schools deliver over 300,000 learn to surf lessons each year. Surf school numbers have also reported a downturn and our surf school operators are reporting increased numbers of potential customers enquiring about sharks and participant safety. Ballina Shire Major, Mr David Wright said the impact has mainly been in Lennox Head.

Mojo Surf School manager, Mr Nat Folkes runs one of fifteen learn to surf schools in the north coast region. A media source stated they were out of pocket tens of thousands of dollars. Folkes commented "Every time that the beach is closed it impacts on our business because that trade moves on" he said (Forbes 2015).



All surf school respondents stated that they have experienced a dramatic decrease in surf school bookings. The majority of surf schools reported a weekly reduction of 50 % in bookings. Funding to support loss of revenue, positive media coverage and education programs were the main areas that were suggested to help support increase bookings through warmer months.

It was suggested by a few businesses that assistance in the form of funding could assist attracting surf school participation. Funds to support programs to help surf schools attract schools and groups back to the ocean to regain confidence and a positive outlook on ocean activity. It was also stated that the media has lest the general public in fear of entering the water.

The following section examines the extent to which a fear of the recent shark activity in NSW is altering behaviour towards surfing. It also discusses management strategies and suggests short and long term solutions.

Research states that surfers on the NSW north coast now actively avoid surfing through the dawn or dusk periods and now always surf with others in the water; quiet solo sessions at isolated breaks are not common and some have even refused to enter the water again (Insight 2015).



The majority of respondents from the surfing community on the NSW north coast stated they felt very unnerved by the recent

shark activity in NSW coastal waters. Not surprisingly, our results show that confidence differs from the respondents from the north coast to southern regions of NSW. It appears that the frequency of attacks on the north coast region is the underlying factor in changing behaviours of surfers with all respondents from the central coast to the far north coast respondents stating they are



A simple message in the sand at Ballina pays tribute to surfer Tadashi Nakahara, who was fatally attacked by a shark yesterday. Photo: Jack Houghton (12)

either "moderately unconfident " or "extremely unconfident" whilst surfing ,indicating psychologic; (11) on surfers.

Ms Monica Shweickle, a psychologist who appeared on a televised discussion on the BBC regarding the shark attack incidents in NSW, suggests that "surfing is greatly important to mental health and it is a major reason why a lot of people surf". Surfing is considered a spiritual, solitude, reflection and therapy and Taylor (2007) even describes a sort of 'surfing religious movement' that holds the "sensual practise" of surfing as its "sacred centre". Studies confirm that surfing is a significant part of life for this group of ocean recreationalists, it was noted that 97% of respondents for a study said that their surfing was "important" and 85% saying "very important (Lazarow et al 2007).



Left: Goldcoast surfer, Terry Teece describes the changing attitude of surfers towards NSW north coast waters; ""None of my mates will go and surf back on the beaches of Byron or Ballina. They wouldn't go near them, not with a 20-foot pole." (13)

In relation to these incidents, Schweikle highlighted that local residents and surfers are being hyper vigilant. She states that "being hyper vigilant is a normal response to trauma as people hearing of, or being exposed to, events where people are close to being eaten or having their lives threatened creates anxiety, resulting in individuals avoiding things (such as surfing) which perhaps have great meaning and importance" (Insight 2015). This discussion gave further insight into the impacts and implications for both the survivors and rescuers of recent attacks, including the tragic fatality of surfer, Mr Tadashu Nakahara. Despite obvious impacts of survivors such as loss of limbs, mental health and medical expenses, it was suggested that the attacks have also caused psychological damage on the community which has significantly changed their attitudes and behaviour to not only surfing, but their lifestyle. Mr Dave Pearson, who survived an attack at Crowdy Head, NSW, in March 2011,



indicates the extent attacks have on the community. With regard to his attack, Pearson reported about 100 people were significantly affected by the attack, including witnesses, rescuers, family, friends and acquaintances. Fred Pawle, 'The Australian' surfing writer states that many people suffer trauma, and if the attack is not fatal, recovery for the person involved, which is almost always only partial,

can take years (Pawle 2015). The discussion indicated that surfers are now reluctant to surf out of fear that had

arisen since Tadashi fatal attack in February. Amongst the conversation, one rescuer of Tanadshi reveals that he is seeing a psychologist as the impacts have been "devastating" and has affected the way he goes about normal life. It was stated, "Surfing in northern NSW

waters is no longer a place of relaxation, it is an ocean swept with fear" (Insight 2015).



Tadashi Nakahara (above), was fatally attacked by a shark at Ballina in February 2015 Photo: Jack Houghton (14)

Short term solutions

The majority of surfers around the globe understand that when surfing, they enter a world in which we are no longer at the top of the food chain, accepting that risk and the consequences associated with it are part of being a surfer. It is understood that governments cannot take away that risk at a general level; however, government's can help to mitigate the risk. It was found that effective shark management solutions is dependent on better understanding of shark behaviour and ecology, efficacy of mitigation technologies and techniques, and cultural attitudes and practises. As such, this section examines attitudes to sharks and management strategies. Recommendations have also been suggested.

i) NSW Shark Meshing Program (SMP)

Literature indicates that generally, most surfers hold a deep connection with the ocean and show strong environmental awareness and a strong pro-conservation attitude towards sharks than others (Stabmag 2015). As a result, studies suggest that surfers in Australia have a high degree of opposition to culling or killing sharks as a management strategy to the shark population. However, according to shark expert, Mr Hugh Edwards, when a geographic region experiences multiple fatal run-ins with sharks in a short period of time, talk of culling becomes louder and more frequent which may lead to drastic reactions like culling as viable solutions (Heisey 2013). This theory is the likely reasoning for the changing views and opinions of some local groups in the surfing community.

As a result of the observed changing attitudes on the north coast, our study also sought to understand the study population's views on shark management strategies, such as the NSW Shark Meshing Program (SMP). Despite



the sparked debate surrounding the sustainability off SMP on the marine ecosystems, there is still mixed discussion from local north coast surfers with regard to their views of extending nets on the north coast. Determining public opinion on the issue is fraught with difficulties and is strongly

influenced by recent events. After a whale gets trapped in a shark net, for example, the public is likely to favour their removal. But when a fatal shark attack hits the media, no matter where it has occurred, it's more likely the public would want the nets to stay. However, netting is said to be effective in sheltered and semi enclosed beaches, this is seen to be a limitation to the effectiveness of beaches on the north coast of NSW as they are wide open ocean beaches that are many kilometres long.

A change in attitude was witnessed on Sunday August 9, when a community meeting was held at Lennox Head to discuss a shark management strategy. Organized by La-Ba Boardriders club, the meeting was attended by about 200 people, mainly surfers. The meeting culminated in a strong consensus from the attendees for controlled management or culling. Surfers voiced their opinions regarding culling; "If that's what it takes, so that we don't have another death or mauling on our community, then so be it", was a recent remark from a local resident and surfer.

Results from our survey indicated that on a 4 point scale regarding ones extent to agreeing with nets in NSW, the largest group of respondents from both surveys (approximately) 65% either agreed or strongly agreed with the current SMP; a further 35% disagreed or strongly disagreed with it. Some respondents commented on their views on the program, identifying their rationale for support or opposition. Our results indicate that the majority of the study population agreed with the deployment of nets in NSW. Again, this may suggest support for the idea out of a local community response that they require some sort of protection, fast.

Although culling was ruled out by NSW Premier Mr Mike Baird, the meeting did promote understanding of the extent that attacks are impacting surfers if those who previously opposed culling are changing their attitude towards culling and now supporting lethal management solutions.

Meshing has been carried out on 51 selected NSW beaches; between Newcastle and Wollongong, as a safety measures to reduce the risk of a shark attack since 1937. The aim of the Shark Meshing Program (SMP) is to reduce the threat of shark attack within the area of the SMP whilst minimising impacts on non-target species. Despite few human interactions with sharks within netted beaches, effectiveness of this management solution is proven as there has not been one fatal shark attack at any meshed beach. This shark management solution has offered a level of protection to ocean-goers and has increased confidence for people surfing in NSW meshed beaches. Our study confirmed that during 2015, those who surfed at beaches where the SMP is deployed have not changed their attitude or behaviour towards surfing and they were confident in terms of protection against sharks in these areas. Whereas, those respondents who live around the NSW north coast (where nets are not in place) indicated how fear of the recent attacks in this area has altered community behaviour. In our survey it was found that most, if not all of the north coast respondents had changed their beach use since January 2015 by indicating they take greater precaution then previous times and surf less frequently.



Despite past statistics supporting the effectiveness of nets, the major concern with the SMP is its listing as a "key threatening process" for indiscriminately killing endangered species and

capturing non target sea life such as whales, seals, and endangered species of marine turtles, critically endangered grey nurse sharks and vulnerable great white sharks. 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. The respondents who did not support the deployment of the SMP appeared to be heavily pro conservationists as further responses highlighted their strong attitude towards conservation and the sustainability of ecosystems. In open ended responses, a few themes emerged strongly amongst those who opposed the SMP. The first was that they are entering the shark's habitat, and that people should understand the risks associated with surfing, and make decisions about their surfing based on these risks. These respondents were surfers from locations out of northern regions, so less impacted. A subset of this group also described sharks occupying a key role in ocean ecosystems.

Measures to minimise harm to non-target species and to improve bather protection have been implemented since the 2009-10 meshing season, the SMP has operated in accordance with Joint Management Agreements (JMAs) and an associated management plan authorised under the Fisheries Management Act 1994 and *the Threatened Species Conservation Act 1995*. Despite efforts to minimise impacts on non target and threatened species, it was indicated within the SMP 2014-2015 Annual Performance Report that entanglements of non-target species and threatened species over two consecutive meshing seasons exceed twice the annual average catch of the preceding 10 years for those species. Catch records indicate that 189 animals were reported entangled in the nets during the period from 1 September 2014 to 30 April 2015 and that 77% (145) were of threatened, protected and/or non-target animals (DPI 2015).

However, an increase in the number of animals released alive (albeit with fate unknown) since the JMA was implemented in 2009-10 could provide some indication of the effectiveness of the reduced net checking times from 96 to 72 hours. Research has indicated that there were a large proportion of animals released alive for the five years before and after the JMA for some major faunal groups. This suggests that reduced net checking times have been effective for many of those groups. Releases of live target sharks have basically doubled; while releases of live Grey nurse Sharks have increased by 50%; and there was approximately a 37% increase overall. Hammerheads and dolphins continue to show 100% mortality. Turtles and ray releases remained relatively constant over that period at about 25% and 68%, respectively (DPI 2015).

Given the successful relationship between the number of marine creatures released alive and reducing net checking times, it is recommended that a portion of the research funds be allocated to further increasing the



frequency of nets being checked, from 72 hours to 48 hours. This would further reduce the amount of by-catch that may have been caught and consequently, the SMP may be more widely accepted by groups in the community.

It was found in Western Australia that in terms of initiatives that make the community feel safer, shark tagging and Government-funded aerial surveillance for Perth and South West beaches offered a lot of reassurance (Gibbs and Warren 2015). Similarly, it is encouraging to see that funds from the \$250,000 north coast campaign are being invested into many areas to manage sharks. The Shark Tagging Project on the north coast is a crucial for a better understanding into shark ecology and behaviours. However, good research takes time and large resource allocations are needed to deal with infrequent events in between. Whilst research is obviously a valuable long term investment, in the mean time some sources suggest that the government should look at programs that are already working such as Smart drumlines and aerial surveillance.

ii) Smart Drumline System

Within the Queensland shark control programme, drumlines have been used either in conjunction with nets or alone since 1962. Despite concerns that sharks might actually be attracted to the area by drumline baits, the cost effectiveness and success of the Queensland programme in reducing the frequency of shark attack is favoured and of similar effect to that of the netting programmes of New South Wales and KZN (Dudley 1997).

Currently there is a trial of a Smart Drum Line in Western Australia and Reunion Island, which aims to reduce unnecessary shark and other marine deaths. The trail thus far has proven to have had significantly less environmental impact than other shark control programs around the world.

A drumline is usually defined as an aquatic device consisting of an anchored buoy (originally a drum) from which a single baited hook is suspended. However, the Smart Drumline being trialled is different and regarded as 'smart' or 'intelligent'. They are additionally equipped with a GPS, underwater cameras and sensors that raise alert signals when a shark gets hooked. If sharks get caught, the obtained information will allow personnel to intervene within two hours (Gulbin 2015).

A shark review of the programs deployment in Western Australia in 2014 reveals that by-catch is kept to a minimum with not one dolphin, turtle or seal being caught during the program. A total of 172 sharks were caught but none were White Sharks, catch data indicates no adverse effect on shark stocks. However 50 tiger sharks that were caught were three metres or greater (posing a threat to safety) have been caught on drumlins (Government of Western Australia 2014).



iii) Aerial surveillance

- Westpac Helicopters and Fixed Wing

Aerial surveillance has said to increase confidence when surfing. It is understood that aerial patrols cannot be undertaken around the clock. Even though many individuals surf at dawn and dusk, a large majority of individuals surf throughout the day and many of the attacks this year have not occurred within the dawn and dusk period. The Westpac Lifesaver Helicopter is a great resource and we are highly convinced that its operation, including its purpose of being an early shark detection method



Above: Westpac Rescue Helicopter Service on shark patrol (15)

and its comprehensive shark action procedure are highly effective in protecting surfers. However, the Westpac Helicopter has been underutilized in its capacity (refer to Appendix B). A submission into this inquiry by aircrew officer of the Southern Region SLSA Helicopter Rescue Service, Mr Euan McKenzie reflects positively on helicopter shark patrols being experienced by other states in Australia. Research discusses that the NSW state government is reluctant to fund aerial surveillance because previous studies show it is not the most effective risk deterrent measure. However, Mr McKenzie reports the findings of one author's helicopter shark patrol trial engaged a helicopter company with no prior shark patrol experience. Mr Euan further states that the patrols were concentrated in the populated areas from Newcastle in the north to Wollongong in the south, despite this region not experiencing an open water shark fatality in the last fifty years.

Due to lack of funding, Ballina Shire Council has had to put forward \$15,000 a month for a long helicopter patrol six days a week. The increased surveillance that took place over the northern region in the NSW holiday period was encouraging to beach goers.

Currently, the Northern Region Westpac helicopter averages six to seven missions a week with the duration or maximum flight hours on fuel is two hours with an average cost of a mission being over \$5,000. It is understood that the cost of aerial patrols are very expensive due to the input of services provided. For that reason, it was suggested that in the coming summer months, to reduce the costs of this service, the patrols could be reported daily to the community similar to the way that traffic, transit and weather information is currently reported to the community; allowing sponsorship opportunities of the service making it a far more cost effective operation...



as it is 100% tax deductible. Sponsorship could either operate for an entire season, or on a month or weekly basis.

Independent Aerial Surveillance Program - Gyro Patrol

A submission by an Independent Aerial Surveillance Program – the Gyro Patrol was also considered (refer to Attachment C). This craft is an interesting and exciting aerial shark surveillance innovation. The Gyro patrol boasts low running costs, also having a comparably greater endurance time (5 hours) in contrast to other aerial crafts. It is able to travel vast distances without refuelling and its reduced emissions compared to current alternatives make this craft more environmentally acceptable.

The Gyro Patrol has additional prospects that could assist shark management in the future including public awareness of sightings through mobile apps and websites future in aerial surveillance (Gyropatrol 2015).

However, funding in the form of sponsorship, similar to that of Westpac with the Surf Life Saving helicopter is essential for the concept to become reality.

- Drones



An aerial photograph taken from a drone recently showing two sharks in close proximity to a surfer. Photo Halden Boyd (16)

In Queensland (Dobney 2015), drones are being used to assist lifeguards to increase surf safety at patrolled beaches. Drones that carry inflatable rings can be dropped to people in distress while they wait for lifeguard assistance.

One CASA-licensed commercial drone operator, reported to film two large white pointers lurking close to a surfer off Evans Head in earlier months. He uses the drone to observe any baitfish and shark activity to pass on to the surf lifesaving club. Similarly, surfer and president of business Byron United, Mr Michael O'Grady has also been utilising the drones to transmit vision to surf lifesavers

since a fatal attack in September last year (Gulbin 2015).

Drones could be a long-term cost effective, feasible alternative to helicopter or fixed- wing surveillance with the added benefit of allow in multiple craft to operate at one time. However, drone operators have failed to convince authorities that their technology is capable of conducting shark patrol operations.

Coptercam founder Hai Tran said the low end of the drone market is not effective. Very low end drones (costing around \$2,500) have a flight time of approximately ten to twelve minutes before they need to be recharged again. He stated that "the appropriate technology was available but the complementary, high-end equipment necessary



was costly as optical equipment such as thermal imaging and infrared technology was also required" (Holland 2015). Mr Jim Gowing, an accredited drone operator says that new drone technological breakthroughs are making advancements in waterproof models that would be recent battery technology (Holland 2015).

equipped with recent battery technology (Holland 2015)

Research found that other smaller drones costing around \$20,000 lasted up to an hour before requiring a recharge; mid-range commercial drones, about the size of a car, cost between \$100,000 and \$500,000 and flew for 20 hours, while military drones were capable of remaining airborne even longer. One article also states that a council on the north coast is looking to



Bait fish seen at The Pass in Byron Bay captured with a drone (17)

offer commercial sponsorships to help cover the cost of the craft. Despite current concerns regarding effectively, SLSWA aviation services manager Peter Scott stated in a (36).engaging with any technology that help saves lives makes sense. Drone trials in conjunction with Surf Lifesavers and councils have occurred in Western Australia and NSW in Byron Bay and at Bondi Beach to see how the technology would complement their lifeguard service. The footage would be relayed to lifesavers that would quickly monitor the vision as part of their regular work. A spokesperson said, "The drone produced quite clear vision of the water and it's something we are still investigating and may consider using to provide lifeguards with an aerial perspective. The cost of a full-time lifesaver to patrol the beach is \$1000 per week and if we decided to use drones on our beaches permanently, we would need to do a full cost benefit analysis and go through a rigorous process "(Holland 2015).

iv) Increasing public awareness: DPI Website and Phone Apps

Surf Life Saving and Council Lifeguards do an amazing job but only cover about 5% of our beaches in NSW. Currently, most of the information that surfers rely on are from beach closures due to shark sightings. Studies confirm that many surfers believe that safety responsibility lies with individual as most surfers support strategies involving public action in the form of developing understanding and taking responsibility and adapting behaviour.

The DPI has a comprehensive website that is designed to impart that information. The SharkSmart Public Awareness and Education Program have also recently included a new SharkSmart App for the iPhone which ensures education at fingertips. A majority of respondents from our survey along with numerous studies emphasised the need for education.



Right: DPI's SharkSmart App (18)



The DPI online platform traffic is extremely low suggesting that the general public is unaware of the resources available. It is recommended that the DPI partners with a network that has high

traffic and reaches prime demographics. Coastalwatch receives over 500,000 views per month and is Australia's largest network of Surf Cams, Surf Reports and Surf Forecast used by surfers, fisherman, and beach goers. This strategy will increase the intel received and provide awareness of the information available.

v) Lifeguard patrols in popular tourism destinations

The popularity of the north coast region as a tourist destination continues to rise with a significant number of visitors recorded across patrolled beaches within the Byron Bay, Cape Byron, Ballina and Richmond Shires (SLSA). This year, Main Beach in Byron Bay is now patrolled year-round in response to the increasing number of visitors. The move has been warmly received and has increased the area's reputation as a premium tourist destination.

As an organisation, SNSW could not believe how many other north coast towns that rely heavily on tourism to sustain their local economy did not have at least one full time lifeguard year round.

Lifeguards do a fantastic job keeping tourists and locals safe at those beaches that are patrolled; having an all year permanent service which includes valuable resources including; extensive first aid hear, rescue boards, 4wd Ute and a Jetski, help save lives and prevent accidents in the surf, particularly in popular tourist destinations such as Port Macquarie and Coffs Harbour. Further, a permanent lifeguard would attract more people to visit or stay for a holiday or a break in the region.





Long term solutions

i) Emerging Technologies

Technology can allow for a greater understanding of the ecology and behaviour of sharks and can increase knowledge of why and where these large predators are likely to attack humans by following their movements over time, or through genetic studies that can assess effective population sizes.

Technology and our understanding of sharks have progressed significantly since lethal shark control programs were first introduced in the 1930s in NSW and 1960s in QLD. We now have the tools to improve ocean safety outcomes without killing threatened species.

It is an important time to look to the future and invest in programs and research initiatives that will not only protect ocean users, but also improve our knowledge and understanding of sharks. The Shark Summit proved that Shark control does not have to be lethal to be effective, providing numerous alternatives to non-lethal solutions.

- The CleverBuoy System

Research states that sighting submerged sharks is difficult, and could account for a high proportion of under reporting. Marine animals, located within sighting distance of aircraft could be missed if they are swimming too deep, or are in water conditions which decrease the visibility of their presence. Research states that White sharks preferentially inhabit in water depths shallower than 15 m deep, potentially remaining undetectable to aerial beach patrols when in close proximity to surfers and swimmers at many currentlypatrolled Australian beaches (Robbins et al 2014). One new device, the CleverBuoy -still has considerable development and testing to be carried out, but is in our opinion, one of the most exciting prospects on offer. The Cleverbuoy has been developed to detect distinct movement s of sharks with Sonar technology, which has the benefit over aerial surveillance in being submerged under water that provides accuracy through real-time data capture.





First top Right : The Cleverbuoy- Sonar Technology ; Right: Smart Drumline System ; Right middle: Satellite and Acoustic Tagging (19,20,21)



A section of our survey presented the series of emerging shark management strategies suggested at the Shark Summit last month. All respondents were asked to rank their top three most preferred management strategies without regards to any limitations surrounding funding, research or logistical issues. The most highly ranked strategies of both surveys combined were

the: (1) Smart Drumline System; (ii) Sonar Technology and (iii) Satellite and Acoustic Tagging.

The new technologies that were displayed at the Shark Summit last month will be the way of the future and are at best 18 months away from being a viable solution, quite possibly even longer, and still need considerable investment and testing prior to being rolled out. In relation to our survey results, it is suggested that most surfers support non lethal management solutions and hazard mitigation strategies, surfers are more likely accepted a strategy that is tested to be effective if employed.

4. Conclusion

The socio-economic value of surfing to these communities is believed to be significant and the negative impacts of the spate in shark attacks to the surfing amenity in affected locations may have serious consequences for the resident surfing population, visitors to the area and the local surf industry.

Our research can be contextualised by two features of the similar shark debate in Western Australia. First, intensive reporting of shark sightings, encounters and human injury generates heightened emotional response among the surfing community. Second, in generating an apparent crisis of ocean safety, public expectation has grown around NSW government instituting an appropriate response. Following a shark bite, there are often pressures placed on government to act, it is understood that the recent series of shark bites on the north coast of NSW is a controversial problem for government in trying to balance public safety whilst protecting wildlife.

It is good to see that the NSW government has already responded to the spate of high-profile attacks on the NSW north coast with a \$250,000 shark-tagging program and an independent review of detection and deterrence technologies. We are encouraged to see the NSW government on the front foot in looking for solutions to this problem. SNSW is at the beach 365 days per year, from our busy city beaches to remote locations across our beautiful coastline and offering support wherever needed. With consultation from the NSW surfing community and research knowledge, we hope to have shed some light on the impacts, views and suggestions from this group of interest.

To that end, we look forward to working with the NSW Government to ensure that the potential for shark attacks along the NSW coastline is effectively mitigated to restore confidence amongst the surfing community.



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7. Appendices

Appendix A	Survey Group 2 results
Appendix B	Copy of SLSA Helicopter Rescue Service inquiry submission: By Euan McKenzie, Aircrew officer of the Southern Region

Appendix A Results Survey Group 2

Business/Organisation type ?



Are you experiencing any downturn in trade or participation that you consider has resulted from recent increased shark activity in the local area?

0%

10%

20%

30%

40%

No Yes

A recent comment aired on the ABC suggested that 90% of the north coast surfing community is currently in favor of installing meshed nets or drum lines as a means of reducing the risk of shark attacks. If this is correct, it would appear that the opinion of the local surfing community have changed since the increased incidence of shark attacks. To what extent do you agree with the deployment of nets to mitigate the incidence of future shark activity along the north coast?

50%

60%

70%

80%

90% 100%



Has the recent increased incidence of shark attacks deterred you from planning surf trips in certain areas of the NSW north coast region?

Yes
Image: Constraint of the second seco

With no consideration into current limitations, please rank your top 3 most preferred shark mitigation strategies(1 = most preferred choice):



Please provide any general comments to make regarding the recent increased shark activity in the local area that may be relevant? These could include comments about:- current strategies to mitigate shark encounters;- the \$250,000 shark surveillance and tagging campaign; andthe Independent Review of Bather Protection Technologies by Cardno at the Shark Deterrents and Detectors workshop held at Taronga Zoo, Sydney in September 2015.

(Over Page)

The local authorities including Police, Council, and Life guards have had a poor communication in terms of beach management though this issue as we have found on some days different parties are unaware who has closed the beach or if the beach is even closed. The level of professionalism of the police and beach life guards has also been poor. For example when there has been sharks present in the area they either pull up in their cars and drive off after shouting out the window " there's massive sharks out there don't get in the water" and drive off. (Leaving our clients terrified) Common sense would think that they would ask who the senior surf coach is pull them aside away from our clients inform them of the situation so they can implement their own risk management procedures and relocate to a different beach. The way they have approached us is extremely un professional and a disadvantage to what we are trying to achieve -Promote surfing as a fun, safe & active sport -Promote tourism in the local area -Ensure Client safety is paramount In regards to the \$250,000 spent on shark surveillance and tagging I think the surveillance has definitely help prevent attacks as they can monitor the shark in close near surfers which has helped but it is not a long term solution. There are many talking point on this subject but all have opposition and everyone has a separate opinion on the matter. 10/15/2015 9:28 AM View respondent's answers

Money allocated to surfer education a waste of time. Shark activity has been atypical and unprecedented. Many technologies have been discussed but there are none that have been proven effective at this stage other than netting. We would like to see netting implemented in the short term with the view to replacing it with new technologies as soon as these become available. 10/15/2015 6:33 AM View respondent's answers

All of the people i have spoken to would prefer the sharks not to be killed. 10/13/2015 6:10 PM View respondent's answers

Netting systems already used in Sydney, Newcastle, gold coast, sunshine coast, over many years are proven to work. Having already lost a member of our club to a shark attack, and witnessed another at clarkes beach, i don't want to see another person or family member suffer when there is already systems in place that work. Human life must be protected. This is a major tourist destination. This is well overdue. 10/13/2015 10:28 AM View respondent's answers

Stop the deep sea over fishing 10/12/2015 5:37 PM View respondent's answers

Sharks have been spotted by light aircraft and reporting. 10/12/2015 7:05 AM View respondent's answers

I am not sure if there are more or if there are just so many more people coming to the beach and that the waters are so super clear that they are more visible we do have a huge seal that hangs around all the time now 10/10/2015 7:24 AM View respondent's answers

Lots of people with lots of numbers. still lots of sharks . Look how putten is dealing with Syria when he finished we should ask him

10/10/2015 6:19 AM View respondent's answers

Currently, helicopter surveillance doesn't give enough reassurance, although better than nothing 10/10/2015 12:11 AM View respondent's answers

The \$250,000 only managed to tag 8 sharks. I don't believe the numbers of Great Whites are correct and even if they are 8 sharks a=out or 1200 is not enough to protect anyone, another ten turned up in our area straight after these ones moved on, the only proven thing that works is what QLD has, there will be casualties but I'd rather casualties of fish than humans. The reduced commercial fishing on the east coast has increased the numbers. born in Evans there were 30 trawlers here, now there are 2. similar in Ballina with only 8. Tuna boats are no longer allowed to seine for bait due to marine parks increasing bait for predators. It's a recipe for disaster for future generations and all the government has done is mask the situation while no one surfs. Another attach will happen just a matter of time.

10/9/2015 9:17 PM View respondent's answers

Would have loved to be involved /invited to workshop love to be involved in any strategies etc :) Thanks 10/9/2015 3:35 PM View respondent's answers

I think having an animal on the endangered species list for so look has worked well..however maybe we can take them off as numbers have clearly grown to a healthy number.. Not saying cull them but allowed to catch a few 10/9/2015 2:26 PM View respondent's answers

Best to contract commercial fishermen to catch targeted species close to beaches. Netting is indiscriminate and catches animals other than sharks.

10/9/2015 1:22 PM View respondent's answers

We cancelled two Club Contests this season 2015 due to shark sighting at nearby Yamba. The shark presence was in all our minds, we called a community meeting with a large number of our town's population attending & a diverse range from commercial fishermen to Green activists. The common consensus was that there were more around & the sightings locally had been of rather large ones upto 5+ metres!!! We felt that there had not been enough research into the great white species to warrant the protected label, & our local commercial fisherman voiced that the large ones that were hanging around should be disposed of. A lot of parents of small surfers were not taking their children surfing.

10/9/2015 11:41 AM View respondent's answers

Shark deterrent strategies are working elsewhere. We don't need to re invent the wheel here. Its simple. Drum lines and netting are a solution that works. RELOCATING sharks seems absolutely ridiculous and costly to the tax payer. Let's utilise what we know works and can be done at a decent cost to the tax payer. May I also say that tagging sharks for research is fine. BUT giving the public access to shark whereabouts only creates further fears, amongst other inconsistencies. Keep it simple. Use what we know works. And what is cost effective. Would it be safe to say that "Great White Sharks" are not an endangered species anymore? Especially on the east coast.

10/9/2015 8:10 AM View respondent's answers

I feel the increased numbers of white sharks is a tipping point in the protection order for which we do not have any proven detterents from. Before we allow this species to flourish, we need a 100% deterrent as the results of these attacks a horrendous for which humans have no defence. 10/8/2015 8:58 PM View respondent's answers

We need action NOW . Do whatever works that is proved and tested regardless of the cost and 10/8/2015 8:21 PM View respondent's answers

It's their place. Fishermen could stop chumming off the point 10/8/2015 5:24 PM View respondent's answers

There needs to be a solution before there is any more attacks .while the attacks have been confined to adults so far the media, government and general population seem to be against harming of these animals in any way. But if a couple of young children are attacked i feel that this attitude will change dramatically and that is all to late .So if the scientists can solve the problem through no harm to sharks that's great but if more lives are lost in the mean time , more physical solutions need to be implemented immediately.

Appendix B

Copy of inquiry submission:

SLSA Helicopter Rescue Service

By Euan McKenzie, Aircrew officer of the Southern Region

Submission to the NSW Parliament 'Committee on Investment, Industry and Regional Development' for consideration in the:

'Inquiry into the management of sharks in NSW waters.'

By. Euan McKenzie, Aircrew Officer, Southern Region SLSA Helicopter Rescue Service.

Introduction.

In considering how recreational and professional, ocean users can best co-exist with sharks, I will draw upon my knowledge and experience in airborne surveillance roles and the collective aircrew experience gained over the last forty three years at the Westpac Lifesaver Helicopter, to explore the effective employment of helicopter patrols, for the prevention of shark attacks.

The Westpac Lifesaver Helicopter operates 365 days/year from our bases at La Perouse in Sydney and Moruya on the South Coast. Since 1973, we have provided rescue and surveillance helicopter services to the people of NSW through our parent organisation, Surf Lifesaving Australia. The 'action sequence' concept introduced here, describes how we deal with shark sightings that may become a threat to ocean users. Interpretation of the NSW DPI 2012 'Assessment of shark sighting rates by aerial beach patrols' will also be reviewed, with reference given to my practical experience and the collective wisdom of Lifesaver aircrew.

A shark patrol helicopter has identified a shark that may be a threat to swimmers, what happens next?

Action sequence.

Identify the shark, assess the threat.

Once the crew have identified a shark, they assess if it is, or may become a threat to swimmers and surfers. They consider its size, species, direction of travel and the lay of the land, in making this decision. Whilst crews will always err on the side of caution, it is important that the 'action sequence' only be initiated when a threat is identified, to avoid the development of a 'cry wolf' syndrome.

Assigning patrol times to recognise periods of high shark threat, that coincide with high numbers of ocean users, significantly increases the effectiveness of a helicopter patrol. Low wind speed and clear skies favour increased penetration visibility of the water, making the sharks easier to spot. These conditions are also the more appealing times for ocean users to frequent the beach.

Warn ocean users by siren and/or PA system.

The sound of a siren blaring from a recognisable Lifesaver helicopter (ie. Red and Yellow) is synonymous with a shark threat in the area. The helicopter may have to move forward or back along the beach, to the location of threatened swimmers and surfers, in the execution of this action.

Communicate the threat.

Once the shark has been identified as a threat, the crew inform relevant Lifeguards, Surf Lifesavers and SLSA Communication Centres via the state wide SLSA radio network. A helicopter that does not have the capacity to access the network should not be used for shark patrols.

Herd the shark away from ocean users.

The helicopters downwash on the water can be used to drive the shark in any desired direction by manoeuvring the helicopter in a low and slow hover. I have seen this technique applied on several occasions and was most recently employed to drive a Bronze Waler shark away from a Junior Surf Carnival, following an attack on a nearby diver at Narrawallee NSW. The inability of fixed wing

aircraft to manipulate the shark's direction of travel, is what sets the helicopter apart, as a far more effective solution.

Map the shark siting by time and location.

Should the need for dedicated shark patrol flights arise, our Surf Lifesaver Aircrew would photograph sharks with a GPS equipped camera. Photos with embedded position information and a time/date stamp would be imported into a satellite mapping program that may be accessed remotely at any time for assessment by stakeholder representatives.

Collate and interpret the data.

Collation and interpretation of the data would aid in the identification of 'hot spots', which may give rise to a more dynamic patrol roster, that favours areas of higher probability. Relevant stakeholders would have access to weekly, monthly and annual reporting, as well as immediate incident reports.

Effectiveness of helicopter shark patrols.

A brief comparative analysis of shark attack data between Western Australia and NSW since 2012, reveals a drastic increase in attacks in NSW, whilst WA enjoys a steady decline in attacks (taronga.org.au). Whilst I concede that there are many contributing factors to shark attack statistics, the steady reduction in attacks correlates with the Western Australian Governments' expansion of helicopter shark patrols with Westpac Lifesaver WA. In the financial year 2013/14 Lifesaver Helicopters conducted 703 flight hours of patrol and identified 243 sharks (surflifesavingwa.com.au). In 2015 thus far, WA has had only one recorded attack and no fatalities, compared to the 13 attacks so far in NSW (taronga.org.au).

Another perceived hotspot for shark fatalities is South Australia. With only one attack and no fatalities, this year to date (taronga.org.au), the Westpac Lifesaver Helicopter in SA will fly in excess of 1000 hours of shark patrols this year (surflifesavingsa.com.au). South Australia has not experienced a shark fatality since the extended patrols started in 2013.

Despite the positive reflection on helicopter shark patrols being experienced by other states, the NSW Government has chosen to reject this indicative success, seemingly based only on a token NSW DPI flight trial and the findings of Robbins *et al.* (2012) report 'Assessment of shark sighting rates by aerial beach patrols'. The NSW DPI commissioned, 2010/11 Helicopter shark patrol trial engaged a helicopter company with no prior shark patrol experience (Robbins *et al.* 2012) and concentrated patrols in the populated areas from Newcastle in the north to Wollongong in the south, despite this region not experiencing an open water shark fatality in the last fifty years (wikipedia.org).

The importance of contrast in aerial surveillance

For over twenty years, I have been a search and rescue aircrew member, operating out of helicopters and fixed wing aircraft and in that time it has been some form of contrast that has preceded the locating of a lost person or desired target. Be it an orange lifejacket contrasting against a blue ocean or the unnatural movement of a manmade object amongst the consistent motion of a natural environment. In the case of sharks, they are very easily spotted from a helicopter when their dark (moving) shadows are contrasted against the latte coloured (static) back drop of the shallower waters. The backlit areas of the shallower waters are a result of sunlight penetration to the sandy sea floor. This high penetration visibility zone also represents the area where the vast majority of ocean users congregate to swim and surf. In my view, Robbins *et al.* (2012) failed to recognise the importance of contrast in the undertaking of the shark patrol trial.

Methods used in the NSW DPI shark patrol trial that are potentially inconsistent with best practice for aerial shark detection include:

- The dummy trial in Jervis Bay was undertaken completely in deep water, not allowing the aircrews the benefit of contrast. This is also not reflective of the ocean profile where actual shark patrols would be undertaken or where the vast majority of ocean users congregate.
- The coastal aerial patrol flights were flown along an approximate line "500m seaward of the rear of the surfzone". This is in my view, to far out to sea and well away from most swimmers and surfers. For the aircrew to be able to identify sharks amongst the majority of the ocean users, they would be significantly hindered by reduced penetration visibility due to the increased angle between their eye line and the surface of the water. This position does not represent the flight profile of an effective aerial shark patrol.

 The authors discounted the movement of sharks as being not significant. The dummy trial in Jervis Bay featured only static analogues. This is quite obviously not representative, as sharks never stop moving. In my experience the movement of any marine creature is usually the most obvious indicator of its presence, particularly when contrasted against static features of similar shape, such as submerged rocks.

Despite these constraints, helicopter crews performed quite well in the trial, sighting up to 57% more sharks than the more experienced fixed wing crews (Robbins *et al.* 2012).

Effective 'border to border' helicopter shark patrols for NSW.

The NSW Government has the unenviable task of developing effective shark mitigation strategies for over 2000km of coastline. With historical data showing a relatively even spread of attacks over the entire coastline (West, 2011) and a decentralised coastal population, there are no recognised hotspots of shark activity to focus efforts on.

Whilst our two existing Lifesaver Rescue Helicopters (Sydney and Moruya) are available for response to significant sightings and attacks, they would not be cost effective in an extended patrolling role. Therefore we propose to compliment their primary response capability with two light turbine patrol helicopters, one to be based at Ballina in the north and the second at our Moruya base, on the far south coast. We envisage designated 'patrol days' to include weekends, public holidays and school holidays. This equates to 193 days per year.

The Ballina based patrol helicopter would be airborne for up to two hours for each patrol day, covering the coastline south to Coffs Harbour and north to the Queensland border on alternate days. The Moruya based patrol helicopter would be airborne for up to six hours for each patrol day, covering Wollongong to Newcastle on every Patrol Day. South to the Victorian border and North to Coffs Harbour would be covered on alternate patrol days. Both helicopters would be available to respond to significant sightings, incidents and attacks, 365 days/year. The end result being an effective border to border helicopter shark surveillance service for NSW.

Conclusion.

In considering the goal of shark attack mitigation strategies, I pose the question; Is this a matter of science or a matter of public safety? My fear is that a pure science based approach may not be in the best interests of public safety for all ocean users in NSW. Queensland, South Australian and Western Australian state governments continue to fund large scale helicopter coastal patrols, despite the significant costs involved. Why? Because it works!

Note: This document is submitted with the knowledge and support of the Southern Region SLSA Helicopter Rescue Service. However, the views expressed in this document belong to the author and may, in some cases, not be consistent with those of the Southern Region SLSA Helicopter Rescue Service.

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