

**Submission
No 59**

MANAGEMENT OF SHARKS IN NEW SOUTH WALES WATERS

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RE: Inquiry into management of sharks in NSW waters

Dear Mr. Anderson,

Although relatively rare, shark bite incidents draw a high level of interest from both the public and the media [1], as they often result in serious consequences for those involved. Globally, the number of negative shark encounters has increased, which has largely been attributed to population increases, more people entering the ocean [2], and ever-increasing methods of monitoring shark and community activities. Nevertheless, the Australian media continue to sensationalize the threat of unprovoked shark bites, despite being incredibly rare events (1.1 fatality per year [2]). We do not deny that these are personal tragedies, but the rate of incidents still remains very small when compared with the increasing number of people using Australian beaches. To put these numbers into context, in 1 year alone (1 July 2013 – 30 June 2014), 266 people drowned in Australian waterways [3]. It is important to recognise that natural random variation in the yearly rate of shark bite incidents, like the recent spike in incidents in New South Wales (NSW), should not be confused with a general increase.

The threat that sharks pose to ocean users in NSW has led to the adoption of a range of shark control programs over the years, including the use of lethal measures that involve the removal of sharks to reduce risk [4-7]. However, lethal control programs are at odds with the important ecological role that large predatory sharks play in ocean ecosystems [8,9], as they do not discriminate by species or size, and so they place increased pressure on non-target and potentially vulnerable species [10-13]. In fact, the Shark Meshing Program in NSW is listed as a 'Key Threatening Process' under both the NSW *Fisheries Management Act 1994* and the NSW *Threatened Species Conservation Act 1995* as it adversely affects two or more threatened species listed under those Acts. In addition, both shark nets and drum lines were rejected in Western Australia after an independent review [14], and the Environmental Protection Agency [7], found these methods to cause excessive impacts on ocean wildlife. The effects of removing sharks from our oceans, although complex and rather unpredictable, can be ecologically and economically damaging [9,15-18]. Therefore, we encourage you to look towards non-lethal mitigation solutions that will bolster research opportunities, and help to reduce shark bite incidents by allowing humans and sharks to co-exist safely.

The shark species typically involved in bites on humans are apex predators. As such, they play a critical role in the complex balance of oceanic ecosystems and their removal can cause problems with respect to the sustainability of important food chains in the marine environment [19]. Specifically, white sharks (*Carcharodon carcharias*), which are implicated in most fatal incidents [2], are protected in Australia, both under the EPBC Act, and also in state legislation. White sharks are globally threatened and as such we should be supporting recovery rather than adding additional pressure. Their population status is still not fully understood, and so measures that involve the removal of these animals will have unpredictable consequences for our marine ecosystems.

Current research suggests that there are a variety of non-lethal methods that could be used to protect ocean users from negative interactions with sharks, but no solution is likely to be 100% effective. As a result, individuals will always have to accept a certain amount of risk when entering the ocean. Non-lethal mitigation solutions that could be implemented immediately include the South African shark spotter program, the West Australian based Eco-Barrier, and the Brazilian tag and release program [20]. We are particularly interested in the shark spotter program as it has directly provided surfers with

increased knowledge about the timing and location of white sharks at popular surf breaks. Therefore, in addition to direct warnings, surfers have better information to evaluate risk.

Other solutions include the use of shark deterrents that manipulate a shark's behaviour based on the presentation of sensory cues [21-23]. There are a number of shark deterrent technologies available to the public, but only one, the Shark Shield™, has been independently tested in 3 separate studies, including our own (just being submitted for peer review and publication), and found to be effective against white sharks [24,25]. The Shark Shield™ uses electric fields in an attempt to over-stimulate a sharks' electrosensory system [24-28], and is thought to have minimal effect on non-target species that do not possess this sensory modality [29]. For high risk water users, such as surfers and swimmers, the Shark Shield™ could be an immediate solution. It is also important that other commercially available shark deterrents are scientifically tested to ensure that water users are not putting their lives at risk using unproven technology.

Ultimately, education and common sense are the best prevention of shark bite incidents. The conditions that provoke bites are well known [2], and avoidance of large predatory sharks is the most sensible public policy. Nevertheless, to increase the safety of water users, we recommend the adoption of non-lethal shark protection measures such as spotter programs, beach patrols, and scientifically proven shark deterrents, such as the Shark Shield™. We also recommend on-going investment to monitor local shark populations, and to test commercially available shark deterrent technologies to determine their effectiveness.

Kind regards,



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