QUEENSLAND GOVERNMENT RESPONSE TO SENATE REFFERRED INQUIRY INTO THE EFFICACY AND REGULATION OF SHARK MITIGATION AND DETERRENT MEASURES

Overview

The Department of Agriculture and Fisheries (DAF) administers the Queensland Government's Shark Control Program which was introduced in 1962 following multiple fatal shark attacks. The program protects 85 beaches along Queensland's east coast from the Gold Coast to Cairns.

In 54 years of operation, only one fatal shark attack has been recorded at a beach serviced by the program. This is despite the large increase in the number of people swimming at these beaches over the same period.

The purpose of the program is to reduce the possibility of shark attacks on humans in coastal waters of the state adjacent to popular coastal beaches used for bathing.

Apparatus used by the program consists of nets and baited drumlines. Drumlines are effective at catching species such as tiger sharks, while nets are a more effective measure for species such as the aggressive bull shark.

Program apparatus does not provide an impenetrable barrier between swimmers and sharks, it is effective in reducing the overall number of large sharks in an area, making it a safer place to swim. Sharks over two metres in length are capable of inflicting serious or fatal injuries and are considered potentially dangerous.

Annual shark catches vary between beaches. These natural fluctuations in shark numbers are generally relative to rainfall and available food sources. From 2005 to 2015 the average annual shark catch has been 632. Given the limited area of operation, around 0.5 per cent of the Queensland coastline, the program is unlikely to impact upon the sustainability of shark populations in Queensland waters.

The annual cost of the program is approximately $3.3 million. External contractors service and maintain apparatus including the removal of sharks. Apparatus and bait are provided by DAF as a quality control measure.

The government acknowledges non-target marine species are accidentally captured in program apparatus and is committed to investigating all avenues to minimise the impacts on these species. Significant resources have been invested into trialling alternative shark control methods and the program monitors the development and potential application of new technologies.

The program has strong support from local governments, Surf Life Saving Queensland (SLSQ), business and tourist agencies. Most beaches serviced by the program are patrolled by SLSQ.

The Queensland Government is committed to maintaining this important safety initiative.

Fisheries Legislation

The program is a legislative responsibility provided for in the *Fisheries Act 1994*.

The program comprises of 10 contract areas each serviced by an individual contractor. Contract areas and the apparatus used in each area are presented in Table 1. A total of 27 nets and 380 drumlines are used by the program.

Contract Area	No. of sites/beaches	Drumlines	Nets
Cairns	7	38	-
Townsville	8	54	-
Mackay	5	45	2
Capricorn Coast	9	54	-
Gladstone	1	12	-
Bundaberg	4	20	-
Rainbow Beach	1	12	3
Sunshine Coast	23	78	11
Nth Stradbroke Is	3	32	-
Gold Coast	23	35	11
TOTAL	**85**	**380**	**27**

Table: 1 Contract Area and Apparatus

Nets

The program uses large mesh nets with dimensions specifically designed to catch sharks over two metres in length (see Appendix A). Nets are manufactured to specifications and are 186m in length, six metres in depth and have a mesh size of 500mm. Nets are set adjacent to the shoreline according to the prevailing tides and currents. The distance from shore is determined by topographical features and sea conditions. A 2013[1] analysis determined bottom set nets caught more by-catch than top set nets whereas there were no significant differences in the shark catch between the two nets. All program nets are surface set.

Figure 1: Example of Net Configuration and Marking

Drumlines

Drumlines catch actively feeding sharks using a baited shark hook suspended from a large plastic float, which in turn is anchored to the sea bed (see Appendix B). Only natural bait such as mullet is used.

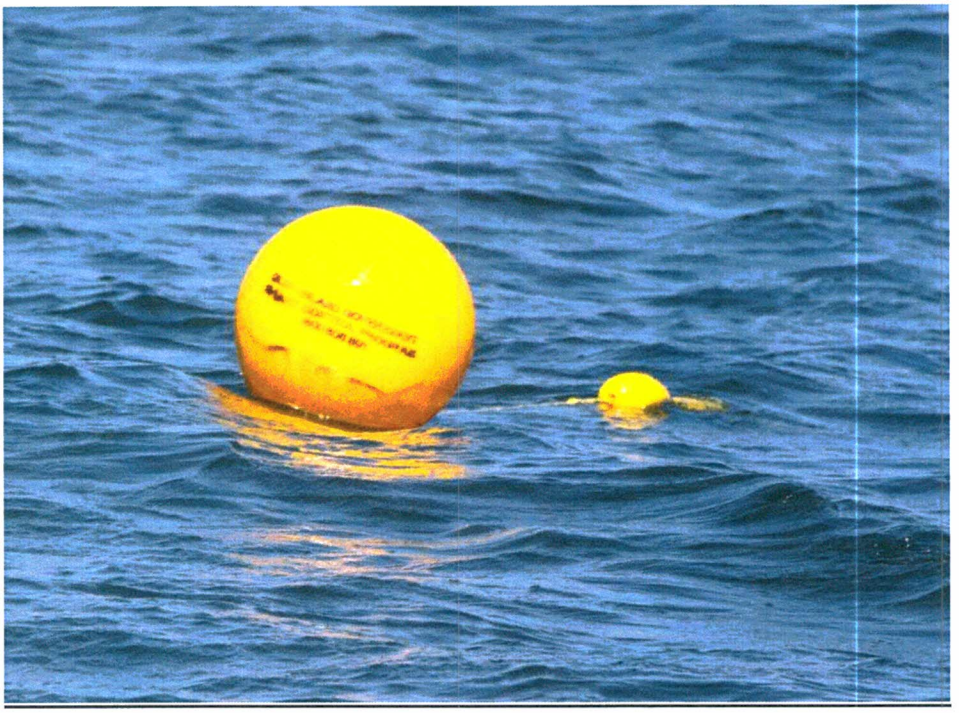


Figure 2: Example of Drumline Configuration and Marking

Servicing Apparatus

Program apparatus is serviced every second day, weather permitting. All apparatus is removed from the water for maintenance and replaced at least once every 21 days.

Contractors also assist with research projects associated with the program and provide a 24 hour, seven day emergency response e.g. for releasing entangled protected species or retrieving displaced apparatus.

Compliance with contract conditions is monitored by the Queensland Boating and Fisheries Patrol, a unit within DAF.

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides for the identification and listing of threatened species and ecological communities, the development of recovery plans for listed species and ecological communities, recognition of key threatening processes, and where appropriate reducing these processes through threat abatement plans.

The program was nominated as a threatening process (death or injury to marine species following capture in beach meshing(net) and drumlines) under the EPBC Act and the nomination assessed by the Threatened Species Scientific Committee (TSSC) in early 2005.

The threatening process is eligible to be treated as a key threatening process if the elements in section 188(4) of the EPBC Act are satisfied.

The 2005 report of the TSSC provides that the program does not meet the elements of section 188(4) and recommended that the program is not eligible for inclusion as a key threatening process under section 183 of the EPBC Act.

The program pre-dates the EPBC Act, has remained substantially unchanged since it commenced in 1962 and is covered by the lawful continuation provisions under s43B.

Research into Shark Numbers, Behaviour and Habitat

In 2009, DAF invested $125 000 over five years into research into the behaviour of large sharks. Ninety-five sharks were tagged including, White, Tiger, Bull and Dusky whaler sharks and their movements tracked. Research results illustrated several specific migratory patterns and a correlation with rainfall, sea surface temperature and water depth.

DAF currently provides financial and in-kind contributions for two research projects in south east Queensland waters. Research into the movement of White sharks continues in an attempt to provide a predictive ability to identify periods of potential increased risk of white shark-human interaction. Research into Scalloped Hammerhead shark pupping and nursery grounds commenced in 2014. The identification of these grounds is vital to the species existence.

The program has contributed data, specimens, samples and/or in-kind assistance for a number of research projects and will continue to do so if this doesn't interfere with its operation and all appropriate authorisations are in place.

The Range of Mitigation and Deterrent Measures Currently in Use

DAF is committed to investigating all avenues to minimise the program's impacts on non-target species. This includes using drumlines wherever possible, using bait that doesn't attract dolphins and turtles and releasing non-target species including non-target sharks as soon as practicable.

Priority is given to reducing impacts on 25 species of sharks deemed non-dangerous. These species include but not restricted to Grey Nurse, Tawny, Zebra, and certain hammerhead and whaler species.

Releasing entangled whales is a program priority. DAF has fully trained marine animal release teams located at Mackay, the Sunshine Coast and the Gold Coast. These teams at the forefront in the safe release techniques of these animals. Since 2006, 37 whales have been caught in program apparatus in Queensland. Of these entanglements, 36 whales have been successfully released alive by these teams with assistance from Sea World.

During the same timeframe 89% of marine turtles caught have been released alive.

Advances in acoustic alarm technology for reducing entanglement of cetaceans has led to the program using two different types of alarms on nets and selected drumlines in southern and central Queensland. In May 2014, all nets utilised by the program were fitted with a new type of acoustic alarm, which has assisted in a gradual reduction in the number of dolphins caught in the following years.

Injured protected by-catch species may be transported for rehabilitation to a suitable facility if possible.

A 24 hour shark hot line (1800 806 891) is in place for people to report sightings of trapped marine animals. This system has worked effectively since 1994.

Volunteer whale observers residing in selected high-rise residential buildings along Gold and Sunshine Coast beaches continue to report and verify entanglement in program apparatus equipment.

Surveillance cameras are strategically positioned on buildings adjacent to program apparatus on the Gold and Sunshine Coasts and Rainbow Beach. These cameras provide real time access to apparatus and have proven to be an effective monitoring tool for the early detection and release of entangled whales.

Council Life Guards and SLSQ staff are also engaged to report and confirm reported entanglements.

Emerging Mitigation and Deterrent Measures

DAF continues to monitor the progress of alternative shark deterrent technology trials being conducted in New South Wales. If new technologies are shown to be effective in preventing non-target marine life fatalities and are practical for use, they would be considered as part of the program.

Current evidence indicates traditional capture methods remain the most effective measures to reduce the risk of shark attack.

A shark spotter program was investigated for trial in Queensland. However, advice received from the South African Shark Spotter Program management team indicated Queensland beaches were not suitable due to a lack of suitable vantage points with adequate visibility and other oceanographic factors. Not all beaches serviced by the program were assessed.

The assessment of the New South Wales aerial beach patrols confirmed that sighting sharks is very difficult from the air. The overall sighting rates of less than 17 per cent suggests sharks sighted from aircraft observers can be missed if the water depth is too deep or turbid. Potentially dangerous species such as White, Tiger and Bull sharks may be near the surf break before being detectable aerially. Although the public may feel safer knowing that aircraft are in the air, the difference these flights make to an individual's safety from shark attack is likely to be small (Robbins et al. 2012)[2].

The installation of beach enclosures in areas where there is a large tidal range and/or significant levels of dissipating surf (high energy beaches) poses a significant engineering challenge. Other uncertainties include the ability to withstand multiple years of deployment and the potential escalating costs of cleaning of bio-fouling from marine growth (WA Government Review of the Dunsborough Beach Enclosure Trial 2014)[3].

Alternatives to Currently Employed Mitigation and Deterrent Measures, including Education

The Queensland Government places a high level of importance on education in ensuring safety of beach users. Presentations to school students, Surf Life Saving cadets and community organisations are provided by DAF staff and shark safety information is released through print, electronic and social media.

A recent review of bather protection technologies conducted by Cardno Pty Ltd and Bond University[4] (commissioned by the New South Wales Department of Primary Industries in 2015) determined the majority of alternative methods currently available could not demonstrate proof of concept and required further refinement before they could be considered for potential trial.

Some physical barriers and electronic shark detection systems are currently being tested in New South Wales (and elsewhere), and electronic barriers and personal protection devices also continue to be developed. Enclosures, electronic barrier shark detection systems and other non-lethal technologies may not protect all beach users but DAF will continue to monitor the development and trials of non-lethal safety measures and assess their potential application in the program.

The Impact of Shark Attacks on Tourism and Related Industries

Queensland's beaches are marketed locally and internationally as being safe with regard to shark attack. If Queensland did not maintain a shark control program there would be increased shark activity at popular beaches and possible fatalities with resultant tourist booking cancellations, and other negative economic impacts on regional economies.

The success of this community safety program is highlighted by the fact there has been only one fatal shark attack recorded at a shark control beach since the program's introduction in 1962. This is despite a large increase in the number of people swimming at these beaches over the same period. Queensland's beaches are utilised by swimmers all year round and the removal of the nets and drumlines would increase the potential risk of shark interaction with swimmers.

Any Other Relevant Matters

The Queensland Government has offered to provide support to New South Wales during the review of its measures to protect swimmers. This includes a proposal to train staff in large whale disentanglement procedures.

The program periodically assesses its catch to identify other potentially non-dangerous sharks. Assessments are undertaken as new research on species behaviour becomes available. Sharks deemed non-dangerous are identified as species to be released. The latest assessment conducted in 2014 saw an additional 16 species identified as non-dangerous bringing the total of non-dangerous shark species to 25.

Information on the program's shark catch information has been displayed on the DAF website and former department websites since the year 2001. Catch details of non-target species taken in program have been displayed on the DAF website since 2015. These species include whales, dolphins and turtles. Historical catches from 2001 are also displayed.

DAF receives a significant number of Right to Information (RTI) applications and enquiries from media outlets and student journalists requesting SCP catch information. There is a general misconception that large amounts of non-target species are caught in program apparatus. Making the non-target species catch information readily available and easily accessible provides the public with the actual statistics on non-target species, effectively reducing perceptions. Details on the successful release of non-target species are also displayed.

Making this information readily available also shows the government's commitment towards transparency and openness of data.

In July 2013, the nets at Cairns were permanently replaced with drumlines to reduce interaction with other non-target marine animals. Since this shift to drumlines, there have been zero non-target animals caught in Cairns equipment.

The Great Barrier Reef Marine Park Authority recently approved a variation to DAF's permit to permanently replace nets with drumlines within the Great Barrier Reef Marine Park at Mackay to reduce the incidence of by-catch.

The combination of both the Cairns and Mackay initiatives to permanently replace nets with drumlines will result in the Great Barrier Reef Marine Park being free from shark nets.

References

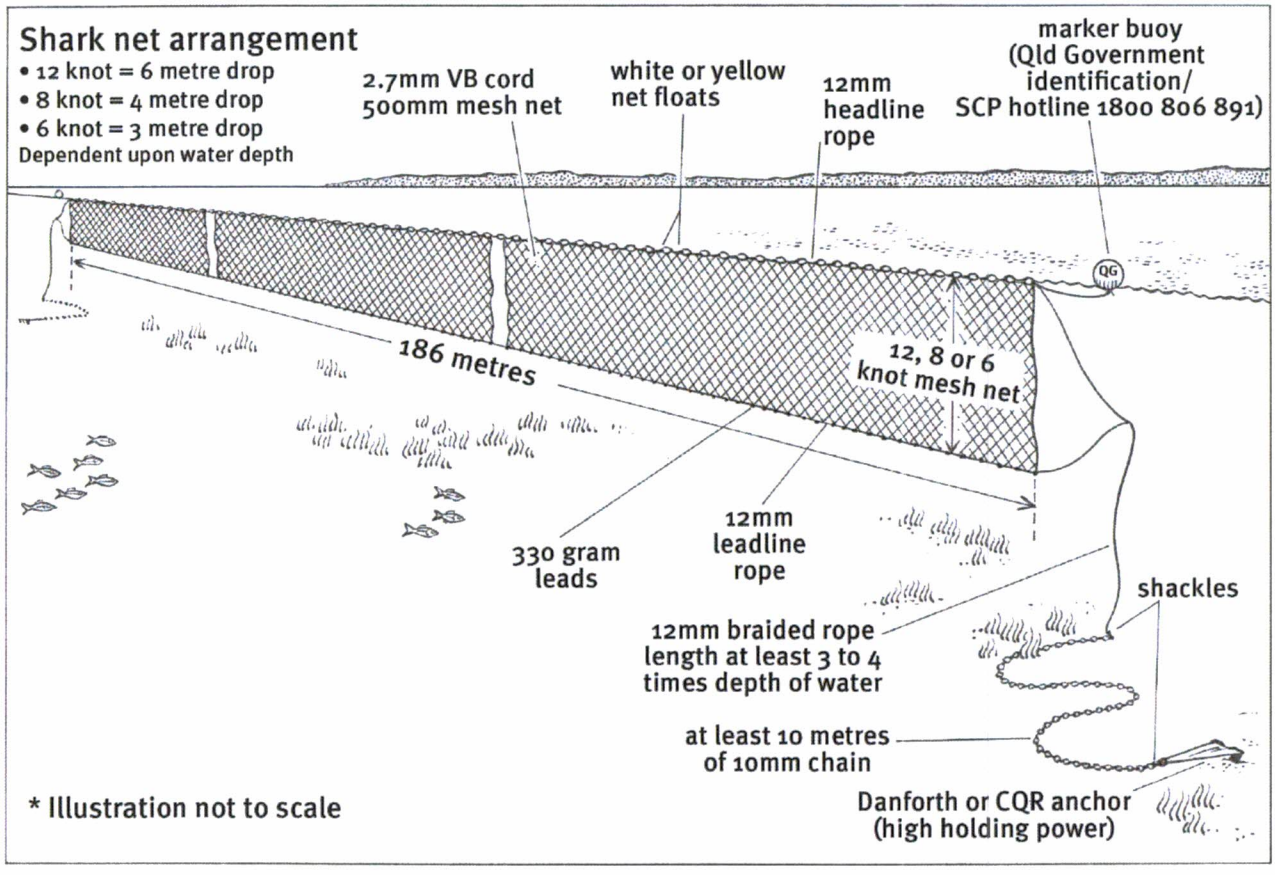
1. Queensland Government Department of Agriculture, Fisheries and Forestry (2013). *Selectivity of nets and drumlines used by the Queensland Shark Control Program in Mackay*. State of Queensland. 17pp.

2. Robbins, W. D., Peddemors, V. M. and Kennelly, S. J. (2012). *Assessment of shark sighting rates by aerial beach patrols*. NSW Department of Primary Industries, 40pp.

3. Hydrobiology WA Pty Ltd (2014). *Review of the Dunsborough Beach Enclosure Trial.* Completed for the Department of the Premier and Cabinet, Western Australia. 38 pp.

4. Cardno (NSW/ACT) Pty Ltd (2015). *Shark Deterrents and Detectors.* Cardno Pty Ltd, 42 pp.

APPENDIX A: Program Net Configuration



APPENDIX B: Program Drumline Configuration