# Public information package

# The Great Barrier Reef Marine Parks Shark Control Program

# Associated with application G33288.1

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# Contents

**List of acronyms and definitions**

| | |
|---|---|
| Bycatch | Any non-target species captured in Program apparatus. |
| DAF | Queensland Government Department of Agriculture and Fisheries |
| Great Barrier Reef Marine Parks (GBRMPs) | Means both the Great Barrier Reef Marine Park and the Great Barrier Reef Coast Marine Park |
| GBRMPA | Great Barrier Reef Marine Park Authority |
| MART | Marine Animal Release Teams |
| Program | The GBRMPs Shark Control Program |
| QPWS | Queensland Parks and Wildlife Service (Qld) |
| Target shark species | All shark species excluding those sharks listed in Appendix C. |

## Introduction

The responsibility for managing the Queensland Shark Control Program (the Program) on behalf of the Queensland government lies with the Department of Agriculture and Fisheries (DAF). The Program is a legislative responsibility provided for in the *Fisheries Act 1994*.

A permit for that part of the Program that operates within the Great Barrier Reef Marine Parks (GBRMPs) was jointly granted in 2005 under both the *Great Barrier Reef Marine Park Act 1975* and the *Queensland Marine Park Act 1982.* The purpose of the use and entry was for the "*conduct of a program to take animals or plants that pose a threat to human life, being the Queensland Shark Control Program"* and associated research. The Program operates within parts of the General Use Zone, Habitat Protection Zone and Conservation Park Zone areas within the Cairns, Townsville, Mackay, Capricorn Coast and Gladstone regions.

As the Program has been operational since 1962 approval under the *Environment Protection and Biodiversity Conservation Act 1999* was not required as the Program was operational before the Act came into effect.

Some minor amendments to the original Marine Parks Permit have been approved since 2005. These include minor changes to apparatus configuration and positions, in order to improve the effectiveness of the program or to reduce bycatch. Other than these minor amendments, the Program within the GBRMPs remains essentially the same as that approved in 2005.

The State of Queensland has applied for a permit for the continuation of the GBRMPs Shark Control Program. Pursuant to Reg 75 of the *Great Barrier Reef Marine Park Regulations 1983* (amendment 2008) and section 15 of *Marine Parks Regulation 2006* (Qld), public notice has been given of the application. Interested persons, especially those who believe that the proposed use will restrict their reasonable use or enjoyment of a part of the GBRMPs, are invited to lodge written comments on the proposal. This information package was developed to assist members of the public who wish to make a submission in relation to the application.

The purpose of the Program is to reduce the possibility of shark attacks on humans in coastal waters of the State adjacent to coastal beaches used for bathing. The main method of achieving this is by the removal of large and potentially dangerous sharks in the immediate vicinity of 85 popular beaches along the Queensland coastline. Significant resources have been invested into trialling alternative shark control methods and the program monitors the development and potential application of new technologies. The government maintains a strong commitment to maintaining the safety of beach users in Queensland.

Target shark species are all sharks excluding those species listed in Appendix C. The main target species in the GBRMPs include Tiger Shark, Bull Shark and other Whalers.

The success of this community safety program is highlighted by the fact that there have been no fatal shark attacks recorded at a shark control beach within the GBRMPs since its introduction in 1962.

The Program is not supported by all members of the community but continues to receive strong support from local governments, the Queensland Surf Lifesaving Association, the tourism industry and general business community.

The annual cost of the Program is approximately $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 that non-target marine species are accidentally captured and it is committed to investigating all avenues to minimise the impacts on these species. It is also committed to releasing non-target shark species.

# The Application

## Program apparatus

Application G33288 seeks the continuance of the GBRMPs Shark Control Program utilising the apparatus adjacent to the beaches listed in Table 1.

## Nets

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

**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, shark and ray 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.

## Proposed apparatus per location/beach within the GBRMPs

The Program operates at beaches in the Cairns, Townsville and Magnetic Island, Mackay, Capricorn Coast and Gladstone regions within the Great Barrier Reef Marine Parks. Specific apparatus locations are available on the DAF website.
www.daf.qld.gov.au/fisheries/services/shark-control-program/shark-control-equipment-and-locations

Table 1 shows the proposed locations and number of drumlines and nets associated with this application.

The Program commenced in **Cairns** in 1962 with a combination of drumlines and nets. In 2013, following an internal review of the catch records, five (5) nets were permanently removed and replaced with drumlines (DEEDI, 2012). This application is for a maximum of 52 drumlines in the Cairns region of the GBRMPs.

The Program commenced in **Townsville/Magnetic** Island area at in 1963 with a combination of drumlines and nets. In 1972 apparatus was positioned off Pallarenda Beach and The Strand (Kissing Point). Nets were permanently removed in 1999. This application is for a maximum of 51 drumlines in the Townsville/Magnetic Island region of the GBRMPs.

The Program commenced in **Mackay** in 1963 with a combination of nets and drumlines. This application is for a maximum of 24 drumlines and three nets in the Mackay region of the GBRMPs.

The Program commenced on the **Capricorn Coast** in 1969 with a combination of drumlines and nets. In 1992 nets were permanently removed and replaced by drumlines. This application is for a maximum of 72 drumlines in the Capricorn Coast region of the GBRMPs.

The Program commenced in **Gladstone** in 1983. This application is for a maximum of 14 drumlines in the Gladstone region of the GBRMPs.

Table 1: Proposed locations and maximum number of drumlines and nets.

| Contract Area | Location/Beach | # Nets | #Drumlines |
|---|---|---|---|
| **Cairns** | Ellis Beach | | 9 |
| | Buchans Point | | 4 |
| | Palm Cove | | 11 |
| | Clifton | | 6 |
| | Trinity | | 8 |
| | Yorkeys Knob | | 7 |
| | Holloways Beach | | 7 |
| | **TOTAL** | | **52** |
| | | | |
| **Townsville** | Picnic Bay | | 7 |
| | Nelly Bay | | 11 |
| | Florence Bay | | 7 |
| | Radical Bay | | 7 |
| | Horseshoe Bay | | 14 |
| | Pallarenda Beach | | 5 |
| | **TOTAL** | | **51** |
| | | | |
| **Mackay** | Blacks Beach | | 8 |
| | Eimeo Beach | 1 | 8 |
| | Bucasia | 2 | 8 |
| | **TOTAL** | **3** | **24** |
| | | | |
| **Capricorn Coast** | Emu Park | | 9 |
| | Fisherman's Beach | | 7 |
| | Tanby Point | | 7 |
| | Mullambin Beach | | 7 |
| | Kemp Beach | | 8 |
| | Lammermoor Beach | | 12 |
| | Cooee Bay | | 8 |
| | Yeppoon | | 7 |
| | Farmsbrough Beach | | 7 |
| | **TOTAL** | | **72** |
| | | | |
| **Gladstone** | Tannum Sands | | 14 |
| | **TOTAL** | | **14** |

# Management and mitigation strategies

## Strategies to minimise by-catch

DAF is committed to investigating all avenues in an attempt 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, fitting all nets with electronic warning devices (pingers) to warn whales and dolphins of the presence of nets and releasing non-target species including non-target sharks as soon as possible (refer Appendix C).

Arrangements are in place to minimise interactions with non-target species when they are most vulnerable. For example, the net at Eimeo Beach, Mackay is replaced with six drumlines during the turtle nesting season from October to March to help reduce turtle interactions.

A 2011 review of catch composition by apparatus under the Cairns contract identified there was a greater catch rate of dangerous shark species on drumlines than in nets (DEEDI, 2012). As a consequence, nets at Palm Cove, Yorkeys Knob, and Ellis, Clifton and Trinity Beaches were permanently removed and replaced with drum lines in 2013. This has resulted in a significant reduction in the recorded level of bycatch under the Cairns contract. From 29 January to 12 March each year the Cairns apparatus is completely removed to coincide with cyclone and stinger season.

Similarly, in 2013, an analysis of catch data from the net at Eimeo Beach (Mackay) indicated that it could be replaced with drumlines due to the similarity of catch recorded for both types of apparatus (DAFF, 2013). This potential change in apparatus is currently being considered.

## Strategy to minimise the impact on non-target sharks

In 2014 the Program reviewed its target species list to determine if, based of new evidence, shark species currently considered dangerous could be considered non-dangerous and, as a result, be released from apparatus as non-target species. An additional 16 shark species were added to the list of non-target species (see Appendix C).

## Other information

Over the past 53 years, the Program has invested significant resources into monitoring and trialling alternative shark control methods, including electromagnetic shark barriers. This technology is, however, still developmental and, as a consequence traditional control methods remain the most effective to reduce the risk of shark attack.

## Electromagnetic shark barriers

Electromagnetic shark barriers have been widely discussed and researched since the technology was first developed in South Africa in the 1980s. This technology is the basis of commercially available personal devices that are used, predominantly by recreational and commercial divers in high-risk areas, to reduce the risk of shark attack. The use of the technology on a broader scale to protect larger areas is still considered to be in the developmental stage. The technology currently has a range of engineering and logistical issues that need to be addressed before it can be used for anything other than personal protection. If these issues can be overcome and the technology eventually proven to be effective on a large scale then it may have application in some sheltered bays in Queensland. However, in its present form, this technology is unlikely to have any application in open ocean surf conditions.

## Swimming enclosures

The installation of shark proof swimming enclosures to permanently replace shark nets and drumlines is constantly being monitored. There are several types of enclosures on the market including, small-mesh netting and heavy duty plastic enclosures. These barriers are only suitable for installation at low energy (low wave) beaches and they are not suitable for Queensland's high energy surf beaches.

## Marine Animal Release Teams (MART)

In an attempt to further reduce its impacts on non-target species the Program has established Marine Animal Release Teams (MARTs) on the Gold Coast, Sunshine Coast, Mackay and Airlie Beach.

MARTs activities include the release of marine animals, mainly humpback whales, during the whale migration season (May-October). Entanglements generally occur later in the migration season around August and September. MART members are well-trained and have access to equipment that has been designed specifically for releasing marine animals. No whales were entangled in Program equipment in the GBRMP from 2005-2014 under Marine Parks Permit G04/8856.1.

## Lost apparatus

Several strategies are implemented to minimise the chance of apparatus being lost at sea. Apparatus is serviced (rebaited and inspected) every two days and removed prior to predicted serious weather events. Each contract area has a Contingency Plan for lost apparatus. This generally includes provisions for a local search to be conducted and notification to management. If lost apparatus is located by a member of the public this may be subsequently retrieved by the contractor.

# Other activities

- Bait for the program is sourced from commercial suppliers who are contracted to supply mullet, shark and ray for use on the drumlines.
- If a target shark species is still alive when the contractor conducts a service run then the animal is humanely euthanased. Some of the catch may be retained by the contractor for use as bait with the remainder disposed of at sea. Dead animals are disposed of at sea.
- Injured protected bycatch species may be transported for rehabilitation to a suitable facility if possible.
- Details of all protected species captured in program apparatus are reported to the Queensland Government Department of Environment and Heritage Protection and the GBRMPA.

# Proposed research

There are no current research projects being conducted by DAF within the GBRMPs. Permission to do the following will enable potential future DAF and other collaborative research projects to be implemented.

1. Tagging of any animal caught in the Program.
2. Installation of acoustic receiving stations at beaches within the GBRMPs for detecting tagged marine species.
3. The retention of any animals or samples of animals that have died in Program apparatus.
4. Collection of photographs and tissue samples from live or dead animals captured in Program apparatus in accordance with best practice. Further information will be provided to GBRMPA if any specific research is conducted.

5. Trialling of new technologies (e.g. sonar, radar, electromagnetic devices etc.), apparatus locations, bait and hook types for the purposes of improving target shark catch, reducing bycatch and improving safety of beach users.

## How the Program may impact on the reasonable use and access to the Marine Park by other users

The purpose of the Program is to improve the safety of swimmers by reducing the chance of shark attack and as a consequence apparatus is located adjacent to popular swimming beaches. There are no plans to increase the number of locations within the GBRMPs in which apparatus is deployed.

The position of apparatus is clearly identified with marker buoys (see Figures 1 and 2) to provide for safe navigation of vessels. Maritime Safety Queensland, a division with the Queensland Department of Transport and Main Roads, issues 'Notices to Mariners' - these notices provide marine safety information, including details of where Program apparatus is located To view the latest notice, visit the Maritime Safety Queensland website.

Appropriate procedures are in place to remove apparatus during inclement weather conditions due to the potential for apparatus to be lost. In these circumstances the public is notified by media releases issued by DAF.

## Results from previous permit

### Target shark catch and bycatch

During a ten year period of operation (2005-2014) under Marine Parks Permit G04/8856.1 a total of 3367 target sharks were caught in the Program.

The Program is not designed to reduce the shark population in Queensland waters; rather it seeks to catch large sharks that may pose a threat to swimmers in the immediate vicinity of popular swimming beaches.

Given the limited area of operation, around 0.5% of Queensland's coastline, the Program is unlikely to impact upon the sustainability of any shark population in Queensland waters.

The DAF acknowledges that non-target marine species are accidentally captured and is committed to investigating all avenues to minimise the impacts on these species. The DAF is also committed to releasing non-dangerous sharks. Tables 2-6 show the number of captured target shark species and impact on by-catch per location for a ten year period (2005-2014).

**Table 2:** Target shark catch and bycatch in the GBRMPs Shark Control Program Cairns region.

| | **# caught in nets** | **# caught on drumlines** | **# released alive** |
|---|---|---|---|
| Target shark species | 33 | 620 | NA |
| Bycatch | | | |
| Sharks | 24 | 19 | 31 |
| Dolphin | 8 | 0 | 1 |
| Turtle | 24 | 0 | 19 |
| Dugong | 2 | 0 | 0 |
| Ray | 133 | 0 | 77 |
| Other | 3 | 0 | 0 |
| Total bycatch | 194 | 19 | 128 |

Note: Data for all Cairns beaches included. Shark bycatch comprises Tawny and Zebra Sharks.

**Table 3:** Target shark catch and bycatch in the GBRMPs Shark Control Program Townsville region.

| | **# caught in nets** | **# caught on drumlines** | **# released alive** |
|---|---|---|---|
| Target shark species | 0 | 894 | NA |
| Bycatch | | | |
| Sharks | 0 | 128 | 124 |
| Dolphin | 0 | 1 | 1 |
| Turtle | 0 | 8 | 8 |
| Dugong | 0 | 1 | 1 |
| Ray | 0 | 21 | 13 |
| Other | 0 | 115 | 37 |
| Total bycatch | 0 | 274 | 184 |

Note: Data excludes program apparatus located at 'The Strand' as this falls outside the GBRMP. Shark bycatch comprises Tawny Sharks.

**Table 4:** Target shark catch and bycatch in the GBRMPs Shark Control Program Mackay region.

| | **# caught in nets** | **# caught on drumlines** | **# released alive** |
|---|---|---|---|
| Target shark species | 135 | 344 | NA |
| Bycatch | | | |
| Sharks | 14 | 11 | 23 |
| Dolphin | 1 | 0 | 0 |
| Turtle | 4 | 0 | 3 |
| Dugong | 2 | 0 | 0 |
| Ray | 80 | 1 | 51 |
| Other | 1 | 2 | 1 |
| Total bycatch | 102 | 14 | 78 |

Note: Data excludes program apparatus located at 'The Harbour' as this falls outside the GBRMP. Shark bycatch comprises Tawny and Zebra Sharks.

**Table 5:** Target shark catch and bycatch in the GBRMPs Shark Control Program Capricorn Coast region.

| | # caught in nets | # caught on drumlines | # released alive |
|---|---|---|---|
| Target shark species | 1 | 774 | NA |
| Bycatch | | | |
| Sharks | 0 | 6 | 5 |
| Dolphin | 0 | 3 | 3 |
| Turtle | 0 | 8 | 8 |
| Dugong | 0 | 0 | 0 |
| Ray | 0 | 17 | 8 |
| Other | 0 | 11 | 4 |
| Total bycatch | 0 | 45 | 28 |

Note: Data for all Capricorn Coast beaches is included. Some apparatus located at Lammermoor Beach is located outside of the GBRMP but could not be excluded from the dataset. Shark bycatch comprises Tawny Sharks.

**Table 6:** Target shark catch and bycatch in the GBRMPs Shark Control Program Gladstone region.

| | # caught in nets | # caught on drumlines | # released alive |
|---|---|---|---|
| Target shark species | 0 | 566 | NA |
| Bycatch | | | |
| Sharks | 0 | 1 | 1 |
| Dolphin | 0 | 0 | 0 |
| Turtle | 0 | 6 | 6 |
| Dugong | 0 | 0 | 0 |
| Ray | 0 | 1 | 1 |
| Other | 0 | 2 | 2 |
| Total bycatch | 0 | 10 | 10 |

Note: Data for all Tannum Sands apparatus is included. Some apparatus is located outside of the GBRMP but could not be excluded from the dataset. Shark bycatch comprises Tawny Sharks.

## Research

The DAF has invested significant resources into research in an attempt to minimise the impacts of the Program. The following research was conducted under Marine Parks Permit number G04/8856.1. A summary of the outcome of each research project is also provided.

**1)** Biology of the long nose whaler (*Carcharhinus brevipinna*) in southern Queensland based on catches from the Queensland Shark Control Program.

Outcomes:

Sumpton, W., Lane, B. and Ham, T. (2010). Characteristics of the Biology and Distribution of the Spinner Shark (*Carcharhinus brevipinna*) in Queensland, Australia Based on Data Collected from the Shark Control Program. *Asian Fisheries Science* 23: 340-354.

Additional Biological Research:

Holmes, B. J., Peddemors, V., Gutteridge, A. N., Geraghty, P. T., Chan, R. W. K., Tibbetts, I. R. and Bennett, M. B. (2015). Age and growth of the tiger shark *Galeocerdo cuvier* off the east coast of Australia. *Journal of Fish Biology* 87: 422-448.

Taylor, S., Sumpton, W.D. and Ham, T. (2011). Fine-scale spatial and seasonal partitioning among large sharks and other elasmobranchs in southeastern Queensland, Australia. *Marine and Freshwater Research* 62: 638-647.

**2)** Selectivity of nets and drumlines for capturing shark species in the Queensland Shark Control Program.

Outcomes:

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

Department of Employment, Economic Development and Innovation (2012). *Selectivity of nets and drumlines in the Cairns shark control program*. Unpublished report of the Queensland Government Department of Employment, Economic Development and Innovation, 13pp.

Holmes, B. J., Sumpton, W. D., Mayer, D. G., Tibbetts, I. R., Neil, D. T. and Bennett, M. B. (2012). Declining trends in annual catch rates of the tiger shark (*Galeocerdo cuvier*) in Queensland, Australia. *Fisheries Research* 129-130(2012): 38-45.

Sumpton, W.D., Taylor, S.M., Gribble, N.A., McPherson, G., and Ham, T. ( 2011). Gear selectivity of large-mesh nets and drumlines used to catch sharks in the Queensland Shark Control Program. *African Journal of Marine Science* 33(1): 37–43.

**3)** Spatial and temporal changes in the capture of sharks and bycatch caught in the Queensland Shark Control Program.

Outcomes:

Noriega, R., Werry, J. M., Sumpton, W., Mayer, D. and Lee, S. Y. (2011). Trends in annual CPUE and evidence of sex and size segregation of *Sphyrna lewini*: Management implications in coastal waters of northeastern Australia. *Fisheries Research* 110(2011): 472-477.

**4)** Tagging of non-threatening sharks.

Note: After initial trials of tagging tawny sharks in Cairns the project did not progress due to logistic issues.

**5)** Drumline research experimental work on bait and hook types.

Outcomes:

Sumpton, W.D., Lane, B and Ham, T. (2010) Gear modifications and alternative baits that reduce bait scavenging and minimize by-catch on baited drum-lines used in the Queensland Shark Control Program. *Proceedings of the Royal Society of Queensland* 116: 23-35.

**6)** Changes to positioning of drumlines.

Outcomes: No formal scientific research conducted.

**7)** Including more metal in nets to increase the “signature” of the net to marine mammals.

Note: Not considered feasible due to the composition of the netting. Unable to progress due to the net manufacturing process and other logistic concerns.

During the last five years research into shark catching technologies has concentrated mainly on reducing non-target catch while maintaining the shark deterrent nature of the current mixed fishing strategy of using nets and baited drumlines. Specific research initiatives and their results have included:

Advances in acoustic alarm/pinger technology for reducing entanglement of cetaceans has led the Program to trialling two different types of Future Oceans pingers on nets in Southern and Central Queensland. Monitoring of acoustic alarm/pinger technology will continue in an attempt to find effective methods to reduce marine mammal entanglements.

Plastic 'hook guards' were trialled to reduce turtle interactions with drumlines in southern Queensland. While they were effective at reducing incidental turtle capture, they reduced the catch of tiger sharks and were discontinued in 2009.

A trial was conducted to compare two hook drumline rigs and single hook rigs. It indicated no difference in the shark catching ability of either rig, although the single hook rig resulted in reduced turtle interactions. As a result, single rigs replaced double rigs in Townsville.

Alternative baits, drumline rigs and net modifications continue to be assessed.

A review of the Program in 2006 recommended that future research focus on improving shark apparatus effectiveness and reducing non-target take. Subsequent to that review, the following three programs that aim to improve the existing deterrent/catching technologies were implemented:

Analysis of the catches from a surface-set and a bottom-set shark net at Mackay showed that a net set on the surface was equally efficient as a bottom set net in terms of shark capture, but the surface-set net caught less non-target species. As a result, the bottom set net was replaced with a surface set net.

A large statistical comparison of bait type and drumline configuration was implemented subsequent to the 2006 review of the Program. This involved changing some apparatus on the Gold Coast,

Sunshine Coast and Rainbow Beach. Results showed that the current apparatus configuration and baits were logistically the most efficient.

Scavenging of drumline baits by marine animals reduces the effectiveness of baited drumlines. Mesh bait guards and other deterrents were trialled in three areas in Queensland and all deterrents had a short-term benefit in reducing scavenging, but dolphins were able to learn behaviours to circumvent these measures.

DAF is also in contact with the Natal Sharks Board in South Africa and New South Wales Department of Primary Industries (Fisheries), which also have active shark control measures in place. In addition, DAF officers regularly meet with members of the public, scientists and inventors to discuss ideas for minimising shark attack on Queensland beaches and reducing the non-target capture of marine life. Despite all these collaborations and discussions, there has not been any significant development in new shark-proofing technologies and traditional capture methods using nets and drumlines remain the most effective measures to reduce the risk of shark attack. DAF's ongoing commitment to collaborative research programs with academic institutions includes investigations into bull whaler movements in canals and feeding strategies of bull whalers. Recent programs include:

In 2009 the Queensland Government invested $125,000 over five-years into research in an attempt to better understand 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 the correlation with rainfall, sea surface temperature and water depth. This research has now been completed however the Program continues to contribute to research into White sharks.

The Program is currently supporting applied research into the scalloped hammerhead sharks.

# Frequently asked questions

## What can I do to stay safe at the beach?

Queensland's beaches are great places to swim and surf. However, it is important to be aware that sharks inhabit our coastline, as well as estuaries, rivers, creeks, canals and streams - both saltwater and freshwater.

However, people should still be discerning when choosing where and when they swim. Sharks are a natural part of the marine environment and when we enter the water we are entering their domain.

Any size shark can cause serious injury or death to people, however sharks more than 2 metres long are particularly dangerous and more likely to cause fatal injuries.

To reduce the risk of a shark attack, people should follow these swimmer safety tips:

- Swim or surf only at patrolled beaches and between the flags
- Obey lifesavers' and lifeguards' advice, and heed all sign and safety warnings
- Leave the water immediately if a shark is sighted
- Do not swim or surf after dusk, at night or before dawn when sharks are most active
- Do not swim or surf in murky waters
- Do not swim in or near mouths of estuaries, artificial canals and lakes
- Never swim alone
- Never swim when bleeding
- Do not swim near schools of fish or where fish are being cleaned
- Do not swim near or interfere with shark control apparatus
- Do not swim with animals.

## How does the Program work to improve the safety of swimmers?

The Program uses set nets and drum lines to catch large sharks that may pose a threat to swimmers in the immediate vicinity of popular swimming beaches. The apparatus do not form an impenetrable barrier.

## Why don't we use other measures to ensure the safety of swimmers?

Other technologies such as swimming enclosures and electromagnetic barriers are not currently suitable for use in in open ocean surf conditions which encompasses the majority of beaches in the Program. The Queensland Government monitors the development and potential application of new technologies.

## How much does the Program cost?

The Program costs approximately $3 million annually. The program is managed and funded by the Queensland Government.

## What do we do with the sharks that are caught in the Program?

Target sharks caught in the program are humanely euthanased and disposed of at sea. Some shark parts may be retained for bait, scientific research or for educational purposes. No material is sold.

## Where can I find more information about the Program?

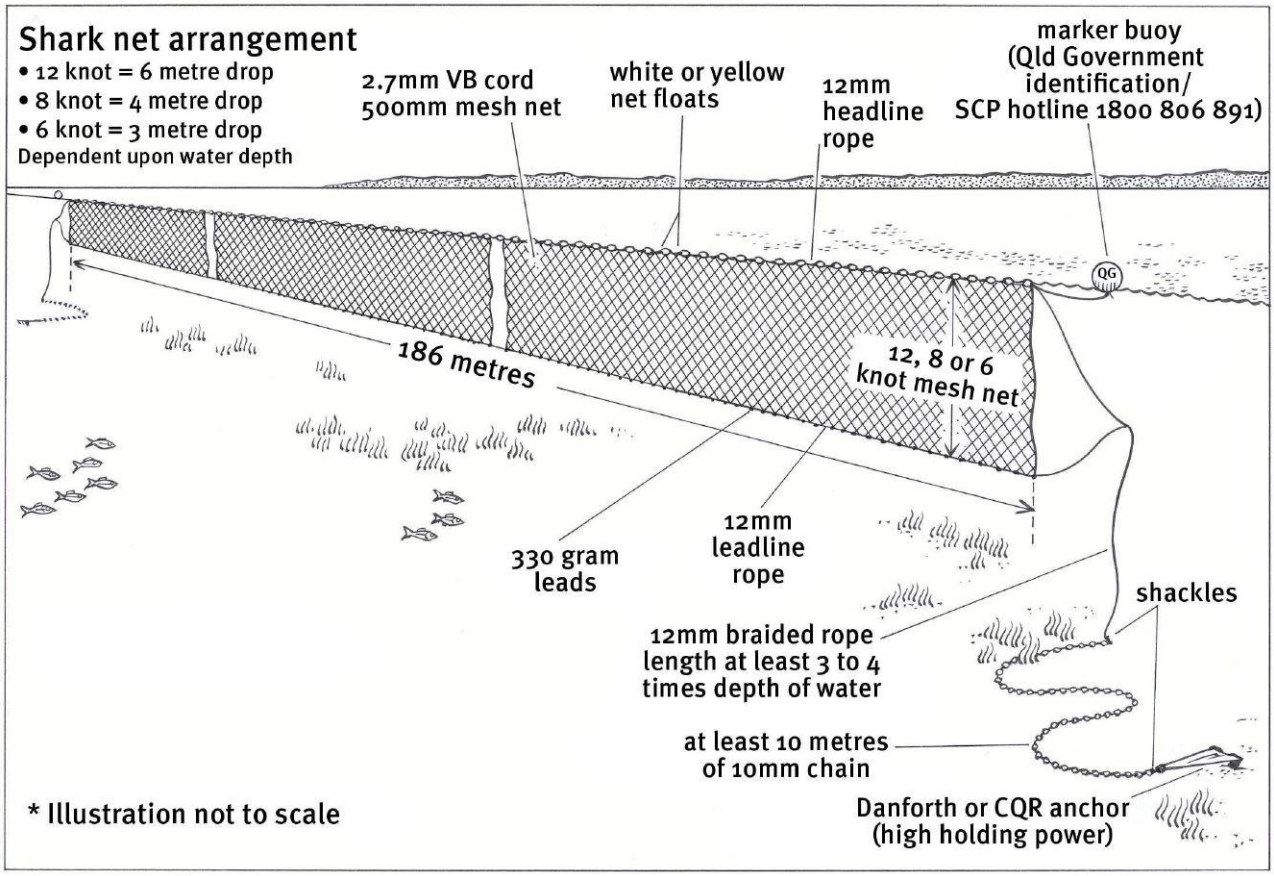
https://www.daf.qld.gov.au/fisheries/services/shark-control-program

## References

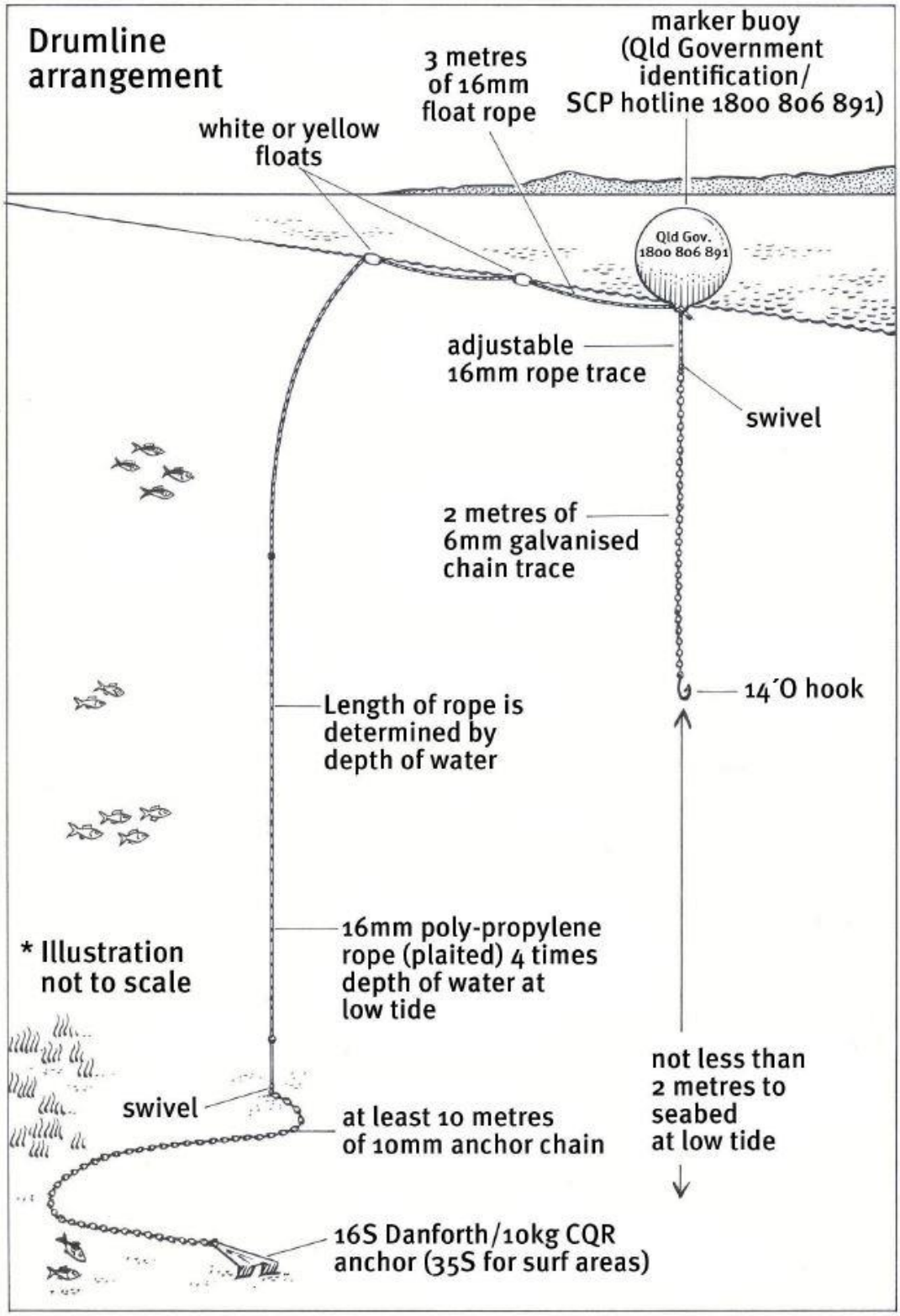
Department of Agriculture, Fisheries and Forestry (2013). *Selectivity of nets and drumlines used by the Queensland Shark Control Program in Mackay*. Unpublished Report of the Queensland Government Department of Agriculture, Fisheries and Forestry, 17pp.

Department of Employment, Economic Development and Innovation (2012). *Selectivity of nets and drumlines in the Cairns shark control program*. Unpublished report of the Queensland Government Department of Employment, Economic Development and Innovation, 13pp.

## Appendix A: Program net configuration



## Appendix B: Program drumline configuration



## Appendix C: Non-target sharks

Shark species assessed as non-target species.

| Common name | Scientific name |
|---|---|
| Australian Sharpnose Shark* | *Rhizoprionodon taylori* |
| Bronze Whaler Shark* | *Carcharhinus brachyurus* |
| Creek Whaler Shark* | *Carcharhinus fitzroyensis* |
| Fossil Shark* | *Hemipristis elongata* |
| Graceful Shark* | *Carcharhinus amblyrhynchoides* |
| Grey Carpet Shark | *Chiloscyllium punctatum* |
| Grey Nurse Shark | *Carcharias taurus* |
| Grey Sharpnose Shark* | *Rhizoprionodon oligolinx* |
| Gummy Shark | *Mustelus antarcticus* |
| Hardnose Shark* | *Carcharhinus macloti* |
| Milk Shark* | *Rhizoprionodon acutus* |
| Nervous Shark* | *Carcharhinus cautus* |
| Port Jackson Sharks | *Heterodontus* spp. |
| Scalloped Hammerhead* | *Sphyrna lewini* |
| Sliteye Shark* | *Loxodon macrorhinus* |
| Speartooth Shark* | *Glyphis glyphis* |
| Spot-tail shark* | *Carcharhinus sorrah* |
| Tawny Shark | *Nebrius ferrugineus* |
| Tropical Sawshark | *Pristiophorus delicatus* |
| Weasel shark | *Hemigaleus australiensis* |
| Whale Shark | *Rhincodon typus* |
| Whitecheek Shark* | *Carcharhinus dussumieri* |
| Winged Hammerhead Shark* | *Eusphyra blochii* |
| Wobbegong | Orectolobidae |
| Zebra Shark | *Stegostoma fasciatum* |

*species added to the list following the 2014 assessment.