Australian Government

Department of the Environment and Energy

Key Threatening Process Nomination Form

This form is for nominations to amend the list of key threatening processes under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and is designed to assist in the preparation of nominations of threatening processes which are consistent with the EPBC Regulations.

The listing of a key threatening process under the EPBC Act is intended to prevent native species or ecological communities from becoming threatened or prevent threatened species and ecological communities from becoming more threatened.

Many processes that occur in the landscape are, or could be, threatening processes, however priority for listing will be directed to ***key*** threatening processes, those factors that most threaten biodiversity at national scale.

For a key threatening process to be eligible for listing it must meet at least one of the three listing criteria. If there is insufficient data and information available to allow completion of the questions for each of the listing criteria, state this in your nomination under the relevant question.

Important notes for completing this form

- Further information to help you complete this form is provided at Attachment A. If using this form in Microsoft Word, you can jump to this information by Ctrl+clicking the hyperlinks (in blue text).
- Please complete the form as comprehensively as possible – it is important for the Threatened Species Scientific Committee to have as much information as possible, and the best case on which to judge a process' eligibility against the EPBC Act criteria for listing.
- Reference all information and facts, both in the text and in a reference list at the end of the form.
- The opinion of appropriate scientific experts may be cited as personal communication, with their approval, in support of your nomination. Please provide the name of the experts, their qualifications and contact details (including state agency, if relevant) in the reference list at the end of the form.
- Keep in mind the relevance of your answers to the listing criteria.
- It is particularly important that the nomination addresses the impact of the threatening process across its national extent.
- Identify any confidential material and explain the sensitivity.
- Figures, tables and maps can be included at the end of the form or prepared as separate electronic or hardcopy documents (referred to as appendices or attachments in your nomination).
- Cross-reference relevant areas of the nomination form where needed.
- Nominations that do not meet the EPBC Regulations will not proceed – see Division 7.2 of the *EPBC Regulations 2000* (www.environment.gov.au/epbc/about/index.html). As noted under sub-regulation 7.06(2), if information is *not* available for a particular question please state this in your answer.

Nominated key threatening process

1. NAME OF KEY THREATENING PROCESS

Please note: there is a listed KTP '*Novel biota and their impact on biodiversity*' (http://www.environment.gov.au/cgi-bin/sprat/public/publicshowkeythreat.pl?id=20) that includes all invasive species. If this nomination is for an invasive species please contact the Department at epbc.nominations@environment.gov.au to discuss the proposed process prior to preparing a nomination.

'Death or injury to marine species following capture in the lethal shark control programs (nets and drumlines) on ocean beaches'

2. CRITERIA UNDER WHICH THE KEY THREATENING PROCESS IS ELIGIBLE FOR LISTING

Please mark the boxes that apply by clicking them with your mouse. The process could be eligible under one or all three criteria.

☒ Criterion A	Evidence that the threatening process could cause a native species or ecological community to become eligible for listing in any category, other than conservation dependent.
☒ Criterion B	Evidence that the threatening process could cause a listed threatened species or ecological community to become eligible for listing in another category representing a higher degree of endangerment.
☒ Criterion C	Evidence that the threatening process adversely affects two or more listed threatened species (other than conservation dependent species) or two or more listed threatened ecological communities.

3. CONSERVATION THEME

The conservation theme for the 2017 nomination period is "freshwater species and ecological communities".

Explain how the nomination relates to this theme. Note that nominations which do not relate to the theme will still be considered.

N/A

4. DESCRIPTION OF THE KEY THREATENING PROCESS

Describe the threatening process in a way that distinguishes it from any other threatening process, by reference to:

a. its biological and non-biological components;
b. the processes by which those components interact (if known).

Lethal shark control programs include mesh nets, lethal drumlines and culls of target shark species. Shark mesh nets and baited drumlines were originally designed to reduce the populations of potentially dangerous sharks and thereby lower the likelihood of a shark attack. However, several scientific studies including that from the CSIRO, Australian Shark Attack File, Deakin University and international trials from Hawaii show that there is no evidence that removing sharks from the marine environment reduces the risk of a shark bite. Latest research shows that there is no statistical difference between the risks of shark encounters at beaches with shark control programs and those without. Therefore, it should be considered that lethal shark control measures do not effectively reduce the risk of shark attack, and come at a severe cost to Australia's marine life.

A consideration of the issues associated with shark control programs must include the severe ecological costs of such programs, including the associated problems of a high degree of bycatch. Bycatch of protected, harmless and threatened wildlife in Australia's shark control programs is a significant issue. Often bycatch from shark control programs is more severe than bycatch associated with Australia's commercial fisheries. Given the threatened status of many of the species that are both targeted and killed as bycatch, the Scientific Committee should be concerned with the adverse impacts of shark control programs on marine wildlife. Many species caught as bycatch are listed as threatened with extinction under state and federal laws, and international treaties including, the Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act, 1999); the NSW *Threatened Species Conservation Act, 1995*; the NSW *Fisheries Management Act, 1994*; and, the QLD *Nature Conservation Act, 1992, the UN Convention on Migratory Species (CMS) and the UN Convention on Trade in Endangered Species (CITES)*. Therefore, Australian state, territory and federal governments are obliged to protect and promote the recovery of threatened species populations, rather than result in unnecessary mortality.

Description

Nets and / or baited drum lines are set off beaches along the coastline with the purpose of intercepting (and culling) sharks as they move into coastal beach waters. In New South Wales (NSW) the shark meshing program relies solely on beach meshing, and is referred to the NSW Shark Meshing Program

(SMP) while Queensland (QLD) employs both mesh nets and baited drum lines, known as the QLD Shark Control Program (SCP).

The latest shark control program to be introduced in Australia is the NSW north coast nets trial which has run from December 2016 and is set to finish in April 2017. This trial has been undertaken by the NSW Department of Primary Industries (DPI) under an exemption from the usual environmental impact and assessment processes in the EPBC Act because the trial of the nets was deemed to be in the 'national interest'. So far, the trial has seen the mortality of a range of threatened and protected species such as the great hammerhead shark and green and loggerhead turtles.

Nets do not act as a protective barrier for swimmers by enclosing the beach to exclude sharks. Shark control programs are intended to capture sharks but are not impartial and as a result catches are not confined to targeted shark species. In addition to non-target shark species, a plethora of other marine species including large rays, threatened and protected cetaceans and endangered marine turtles are also taken as by-catch (Cliff and Dudley 2011). Unlike small-mesh shark-exclusion nets, or the ecologically friendly eco-barrier that are deployed in waters sheltered from currents and wave action, shark control meshed nets does not form an impenetrable barrier and therefore do not eliminate the risk of a shark encounter completely (Cliff and Dudley 2011).

Baited drum lines consist of a float or series of floats moored by an anchor. Attached to each float is a stainless steel cable supporting one or more hooks with a 3-inch gape (Paterson, 1986). Baited drum lines are designed to target dangerous shark species and reduce by-catch, however studying the Queensland bycatch numbers shows that a significant amount of non-target species are still killed on drumlines. The QLD program has been criticised for its use of baited drum lines as they are suspected to actually attract sharks. Studies, such as Paterson 1986, defended the use of drum lines but only by noting that beach nets are just as likely as these methods to attract sharks. This is due to tiger sharks, whaler sharks and white sharks having been found feeding on meshed animals including dolphins and dugongs.

NSW and QLD are the only two states in Australia that have lethal shark net meshing, and QLD also has permanently set drumlines. As of 2014, Western Australia abandoned its trial of baited drum lines to target 'dangerous' sharks, at the recommendation of the Western Australian Environment Protection Authority. The said at the time, "At this stage, the available information and evidence does not provide the EPA with a high level of confidence. In view of these uncertainties, the EPA has adopted a cautious approach by recommending against the proposal." WA now has a "serious threat policy" in place for sharks deemed to be dangerous by the State and this measure should be included as part of lethal Shark Control Programs and considered as contributing to the Key Threatening Process.

The 'serious threat policy' involves targeting specific shark individuals if thought to be a threat to beach goers and public safety, and includes the use of setting drumlines to catch target sharks if they are deemed a threat. There are concerns regarding this method as set times of drumlines in WA have been up to 18 hours after a shark encounter, and drumlines would likely not be catching the suspected shark. The policy enables the Western Australian Government to deploy baited drum lines in the event or appearance of a shark or sharks, which they feel threaten the safety of beach goers, "A decision maker may rescind an order to take a shark/s if he/she is satisfied that the threat has passed". This policy could be as detrimental as the proposal rejected by WA EPA due to the effect on shark species.

The only other shark control program in the world exists in KwaZulu-Natal in South Africa (Cliff and Dudley 2011).

New South Wales Shark Meshing Program (NSW SMP)

New South Wales mesh netting was introduced to Sydney beaches in 1937, Wollongong and Newcastle in 1949 and the Central Coast in 1987. Today 51 beaches covering approximately 200 kilometres of

coastline between Newcastle and Wollongong are netted (with 5 more added in the new trial on the north coast of NSW). The nets are set parallel to the shore, have a length of 150 meters, depth of 6 meters and a mesh size of 50-60 cm. The nets are set in approximately 10-15 meters of water with the bottom of the net resting on the ocean floor (NSW Shark Meshing Program DPI Fisheries NSW, 2013). In 2003, after a nomination by Humane Society International (HSI), beach meshing (shark control nets) was listed as a Key Threatening Process (KTP) under the both the NSW Fisheries Management Act and the NSW Threatened Species Conservation Act due to the threat posed to the critically endangered grey nurse shark, marine turtles, humpback whales and other wildlife. However, even though this was listed 14 years ago, the NSW Government has not yet developed a Threat Abatement Plan (TAP) which could phase out the nets and investigate humane and less ecologically damaging alternatives. Instead the number of nets in NSW has been increased, as has the intensity of operation of the existing nets.

Previously it has been reported by NSW DPI that the SMP uses what is called a 'pulse fishing operation', whereby the nets are set for approximately 50% of the year from September to April. During the winter months of May to August, these nets are removed from the water completely (Report into the NSW Shark Meshing (Bather Protection) Program, 2009 (NSW SMP Report, 2009)). Beach meshing is carried out by private contractors, who prior to January 2016 were required to mesh each beach a minimum of thirteen times per month. Each net must be left to fish for a minimum of 12 hours on weekdays and 48 hours on weekends. It is general practice to join two nets together thereby meshing a beach twice on the one day (Krogh and Reid, 1996). However in January 2016 the 5 year Joint Management Authority (JMA) review report for the SMP was released and declared changes to the way contractors set. Nets are now left in the water and checked every 72 hours instead of being hauled, rather than the previous JMA obligation for "12 meshings per month plus every weekend of the meshing season".

Queensland Shark Control program (QLD SCP)

Queensland has used a combination of both mesh nets and baited drum lines since the beginning of its Shark Control Program in 1962 and shark gear is now in place at 85 beaches along the QLD coastline (QLD DAF, 2017). In QLD, during the first 15 years of the shark control program 14,328 marine animals other than sharks were caught in the nets and drumlines. Between 1975 and 2001, 11,899 white sharks, tiger sharks and bull sharks were killed in nets and drumlines. Over the same period 53,098 other marine animals were killed.

The nets used in the QLD shark control program have a mesh size of 25cm and are 186m long (Paterson, 1986). The Queensland program initially set the nets to rest on the ocean floor however this practice was ceased as many rays were caught in the low lying nets, attracting sharks and causing costly damage to the gear. Today the nets average a depth of 6.4m (Paterson, 1979). The QLD shark control program can be divided into ten areas, where each area consists of several beaches. At each of these beaches there are usually 1-3 nets used and up to 6 drum lines (Gribble N.A et al, 1998). Unlike the NSW shark control program, shark gear in QLD remains in the water the entire year round, and is not removed during the winter periods as it is in NSW waters (QLD DPI, 2006).

Shark control programs, nets and drumlines are also present within the world heritage and marine park the Great Barrier Reef (GBRMPA). A shark control program in the GBR is not only unnecessary due to the differing swimming and beach conditions, but also more concerning due to the fact this is a World Heritage Area and is one of Australia's most highly unique and biologically diverse ecosystems, and is currently being subjected to a range of detrimental human effects. The GBR is already under ecological pressure which will be compounded by a loss of important top predators, including tiger sharks and white sharks, as well as marine turtles, dolphins and whales.

In a review of the QLD Shark Control Program sent out for public consultation in December 2001, the Queensland Department of Primary Industries states, "*The risk of shark attack is extremely low. For example, it is much more likely that swimmers will die in an accident getting to the beach than by a*

shark attack at the beach." The review goes on to say that despite such a reality, it is the issue of a potential shark attack that poses the most fear in the beach visitors.

The majority of coastal areas within the GBRMPA in which nets and/or drumlines are placed have never witnessed a shark interaction of any kind. In fact, the main reason for the original implementation of the Queensland Shark Control program (QLD SCP) was due to a small number of incidences which occurred in Southern Queensland. Surfers are among the main ocean users at risk to shark interactions due to their appearance and frequent presence in the water. Although there is already an extremely low risk of a shark interaction occurring while surfing, surfers are at an even lower risk in the GBRMPA as there are few if any suitable surfing beaches due to the presence of the Great Barrier Reef producing different wave and beach conditions. Marine stingers also lessen the amount of beach goers within the GBRMPA. During October to June there are areas right along the Great Barrier Reef (GBR) coast that are in fluxed with marine stingers. When stingers are present in the GBR there are significantly less people in the water. Those that do choose to swim during stinger season usually do so in allocated stinger net areas, or in the outer reef taking suitable precautions. It is nonsensical to have drumlines and nets present in the GBRMPA coastal waters during this time. These beaches would be far more suited to have eco-barriers installed. Eco-barriers are a non-lethal technology and do more for beach protection than shark nets and drumlines without the ecological impacts.

Bycatch

The NSW, QLD and WA shark control programs have a significant toll on non-target species or by-catch, and we believe this is a nationwide concern as species are being targeted along the majority of Australia's east coast and now the west. The effects of shark control programs on non-target marine species and populations communities can vary and be difficult to predict. Certain species can congregate in areas at different times of the year for breeding and migration, therefore the season and extent of distribution of a species; the characteristics of the site of meshing and drumlines, and physiology of a species can determine the likelihood of mortality and impact on population. Species differ in their response to entanglement, and some are more likely than others to be affected by either meshing or drumlines e.g. marine turtles such as loggerheads are more prone to be caught on drum lines, than cetaceans, and sometimes even white sharks (RPMT 2003; Cliff and Dudley 2011). In general, marine populations can cope with single events of capture, but over time frequent, entanglement leading to mortality (which may occur after the animal has been released) can change the populations of marine inhabitants, to the detriment species and ecosystems and lead to changing of conservation status.

Species such as the critically endangered grey nurse shark are closer to extinction as a result of shark control programs with the 2014 Commonwealth recovery team stating the take of one individual could constitute a significant impact on the species, due to the species' critical conservation status. It says that the New South Wales and Queensland shark control programs are a significant and ongoing source of mortality for the Australian east coast grey nurse shark population, which is genetically isolated from the Vulnerable listed Australian west coast grey nurse population. Therefore, there should be concern on a Federal level for the species affected by shark control programs within Australia.

The NSW Fisheries Scientific Committee recommended the NSW SMP for listing as a KTP in NSW due to its adverse effect on two or more threatened species, populations or ecological communities and due to the fact it could cause species, populations or ecological communities that are not threatened to become threatened. The fisheries scientific committee found that '*Captures of great white sharks, tiger sharks and the combined whaler sharks in the shark meshing program total 3670 for the 52 year period. The bull shark makes up a small proportion of the 2800 whaler sharks captured. Therefore at least 8000 sharks of other species have been captured in the last 52 years*' (1950-2002).

The latest shark meshing seasons in NSW have seen 748 interactions with marine life between September 2015 and April 2016. In this period 49 percent of animals were killed. There were in total 90

interactions within this period with threatened or protected species including white sharks, grey nurse sharks, marine turtles and dolphins. As of March 2017, the North Coast meshed nets trial has resulted in the capture of 149 animals and of these 60 deaths including 16 great hammerheads, 6 manta rays, 2 bottlenose dolphins, and 4 marine turtles.

In the past 4 meshing seasons the NSW SMP has captured 996 non-target sharks, rays, marine mammals and turtles. In 2010, the NSW government released reports showing that in the last 2 decades 4000 animals had been killed in NSW shark nets. In November 2009 in NSW alone two threatened species, a white shark and a dugong were trapped and killed in the nets.

The by-catch in the QLD shark control program is equally concerning. During the first 15 years of the program (1962/63-1977/78) 468 Dugongs, 2654 Turtles, 317 Dolphins and 10, 889 Rays were caught (Paterson, 1979). In 1992 initiatives began to reduce the by-catch in the QLD program. However, since 2001 almost 500 endangered loggerheads have been caught on Queensland drumlines. All sharks captured in the Queensland program are euthanised – including protected species such as the white shark.

Additionally, there is no follow up research undertaken on the individual species, (eg. sharks, turtles and dugongs etc), which are caught in the nets and released as to whether or for how long they survive after being entangled in the nets or hooked on the drum lines. Injuries and fatigue are likely to contribute to death post-release, tagging helps to determine these events however, often these mortalities can go unrecorded. Although tagging of animals caught in SCP's is attempted, it is not always successful (QLD DPI 2014; NSW SMP Report 2013-2014), therefore the bycatch rates from the NSW and QLD shark control programs could indeed be much higher. Greater transparency from the Queensland Government in regard to tagged animals and their dates could improve this concern.

Statistical evidence against shark control programs

Shark meshing was introduced to Sydney beaches to protect bathers following a series of fatal attacks off Sydney beaches and in Sydney Harbour (Krogh and Reid 1992). The perceived success of the NSW program and fatal shark attacks at Noosa Heads and Mackay in December 1961 prompted the introduction of the QLD Shark Control Program in 1962 (Paterson 1979). As stated above, the argument that the NSW and QLD shark control programs increase swimmer safety is based on the idea that when the populations of potentially dangerous sharks are reduced so too will the probability of being attacked. Indeed those who support the programs use the fall in shark attacks since the introduction of each program as proof of their success. The statistics on shark attacks do demonstrate a dramatic fall in attacks. In NSW there were 27 attacks in the years immediately prior to 1937, the commencement of the program, which fell to 3 in the subsequent 50 years (Krogh and Reid 1992). In QLD the annual average frequency of 1.5 attacks over the years 1919 - 1962 has fallen to only one since the program's beginning (Paterson 1986). Additionally, studies have shown that between 1937 and 2008, 65% of shark attacks occurred on beaches with meshed nets. John West at the Australian Shark Attack File has shown that any increase in shark encounters can be explained by an increase in beach goers and people entering the water.

Figures on shark attacks in fact exaggerate each program's effectiveness. Over the study period shark populations have come under many threats, which have reduced population numbers significantly. There have been substantial commercial fisheries for sharks in NSW, Queensland and Western Australia. Therefore, any objective analysis of the efficacy of the programs must take into consideration the distorting effects these additional threats – especially commercial and game fishing – have had on overall shark populations. Additionally, it was recognised in the recent Commonwealth publication, "Draft Recovery Plan for White sharks" (December 2001) that changes in some industry practices have also contributed to the fall in shark attacks. When shark control activities were introduced, other activities now banned, such as abattoirs discharging offal into the ocean, could have led to a higher incidence of shark attacks (DRPGWS 2001). There were also shore whaling stations in Southern QLD and at Byron

Bay in NSW that processed 7423 humpback whales between 1952 and 1962. It is very likely the closure of these whaling stations would have contributed to the observed fall in shark attacks in both QLD and NSW (Paterson.R.A 1986).

The goal and justification for the QLD shark control program - to increase swimmer safety by lowering the frequency of interactions between sharks and swimmers, is thrown into serious question by points above, including the concern that drumlines are assisting in attracting sharks to beaches. The safety measures offered by the NSW shark control program must also be questioned when one considers the fact that 35% of the sharks caught in the shark nets have been found on the beach side of the net (AMCS 2001).

Shark meshing is an outdated practice that was used to address public fears at the time it was introduced. In the last five decades the public's ecological awareness and understanding has grown to replace the fear and hysteria that once came from ignorance. Data from tagging shows that white sharks are not permanent residents at any one site. Research confirms that the species is highly migratory, travelling thousands of kilometres up and down the Australian coast, as well as across the Pacific Ocean to New Zealand, which makes culling at local beaches futile. To remove the risk of attack from highly migratory species you would need to reduce the populations at beaches across their range to a level of local extinction.

The recent shark net trials also do not draw any conclusions about the risk of shark attack when nets are in the water. The risk of shark attack is so low that it is not statistically significant difference for risk between beaches with lethal shark management to those without. Anthropogenic environmental impacts have increased substantially since lethal shark control methods were introduced. The cumulative impacts that presently threaten the marine environment, including over-fishing, habitat degradation, pollution and climate change, require a shift towards better management and conservation of marine ecosystems. This shift should begin with the removal of unnecessary, ineffective and lethal shark control methods.

In addition to human impact on the environment, these programs are in response to a relatively small threat - shark attack is less likely to occur than being struck by lightning – and with such a high ecological cost, are no longer acceptable. This nomination sets out the evidence to demonstrate that lethal shark control programs are a key threat to species listed as threatened under the EPBC Act. In particular we provide evidence that the grey nurse shark could move from critically endangered to extinct, white sharks could be up listed to endangered and marine turtles such as the loggerhead species could become critically endangered as a result of lethal shark control. As well as this non-listed species such as the tiger shark, and species of hammerhead sharks could become eligible for listing under the EPBC Act due to the continued high level of mortality of these animals in nets and on drumlines.

5. INDIGENOUS CULTURAL SIGNIFICANCE

Is the key threatening process known to have an impact on species or country culturally significant to Indigenous groups within Australia? If so, to which groups? Provide information on the nature of this significance if publicly available.

N/A

For a key threatening process to be eligible for listing it must meet at least one of the three listing criteria. You do not need to provide details of the eligibility for all questions 6-11, however the more information you provide the more evidence is available to undertake the assessment. If there are insufficient data and information available to allow completion of the questions for each of the listing criteria, state this in your nomination under the relevant question.

Criterion A: non-EPBC Act listed species/ecological communities

6. SPECIES THAT COULD BECOME ELIGIBLE FOR LISTING AND JUSTIFICATION

Provide details and justification of non-EPBC Act listed species that, due to the impact of the key threatening process, could become eligible for listing in any category, other than conservation dependent. For each species please include:

a. the scientific name, common name (if appropriate), category it could become eligible for listing in;
b. data on the current status in relation to the criteria for listing;
c. specific information on how the threatening process threatens this species; and
d. information on the extent to which the threat could change the status of the species in relation to the criteria for listing.

Hammerhead Sharks

Great hammerhead
- NSW: Listed as Vulnerable (Fisheries Management Act 1994)
- IUCN: Endangered
- Migratory
- CITES Appendix II

Scalloped hammerhead
- NSW: Listed as Endangered (Fisheries Management Act 1994)
- IUCN: Endangered
- Migratory
- CITES Appendix II

Smooth hammerhead
- IUCN: Vulnerable
- CITES Appendix II

Hammerhead sharks are the most caught non-target shark species in the NSW SMP. Estimates of age at maturity vary widely for hammerheads between species and regions, but like all shark species they are categorised as having low fecundity, and late sexual maturity, making population rebound difficult with declines from anthropogenic mortality sources. The great and scalloped hammerheads, are threatened with extinction in NSW, and are on the IUCN global endangered species list. The great, scalloped and smooth hammerhead species are currently listed on the Finalised Priority Assessment Lists (FPAL) awaiting determination this year to be listed under the EPBC Act.

On average the number of captures of hammerheads per year from 1990 to 2014 in the NSW SMP was 37 individuals. Hammerheads have now also been caught in substantial numbers in the NSW North Coast Shark Nets. And in the 2015/2016 NSW shark meshing season, 112 smooth hammerheads were caught and killed. At February 2017, the shark net trial in Northern NSW had killed 14 great hammerhead sharks.

In NSW hammerheads are not targeted by the program, but simply caught as bycatch, since hammerhead species have not been implicated in any NSW attacks from the review period of 1900 - 2008. The total number of hammerheads caught from 1950-2009 in the NSW SMP is 4666. Overall from 1950-2008 there has been a substantial reduction in the total number of sharks caught per year and in the CPUE of shark meshing (calculated as the number of entanglements per 1,000 net sets)

(Green et al 2009). Before the listings of great hammerhead and scalloped hammerheads on the NSW Fisheries Management Act in 2012, there was no attempt to record hammerhead catches down to a species level of identification. However, it is likely the majority of the animals caught are smooth hammerheads.

Data for hammerheads in the NSW SMP consistently reflects marked declines from the first decade of the program through to the present, aside from a peak from 1971/72-1972/73. This peak period represented a modification of the netting protocols in 1972, ultimately resulting in a 20% increase in effort, and was reflected in a substantial surge in shark catch of almost 300% in its first year of implementation (Green et al 2009). The resultant increase in catch was borne substantially by hammerhead species, whose capture grew from 20% to 50% in the Sydney region in the 22 years before and after (respectively) modifications were implemented (Green et al 2009). Catches returned to pre-modification levels by 1983 and have continued to decline since, despite the addition of the Central Coast region's beaches to the SMP in 1987, whose inclusion failed to level catch rates, and which mimicked catch cycles already exhibited by other SMP regions; that is, catch rates initially peaking followed by constant and steady decline. Catch rates from the first 9 years of Central Coast implementation were three times the catch rates from the second 9 year period, and were driven primarily by the decline in hammerhead species, which account for 72% of the Central Coast catch (Green et al 2009).

Data from Queensland's SCP is less extensive than that of NSW. From the start of the program in 1985 to 1993, hammerhead data was amalgamated. Some effort appears to be made to distinguish the scalloped hammerhead from other hammerhead species around 1993, but appears to coincide with a complete absence of great hammerhead specimens from catch totals, which then appear in 1996 and steeply rise the following year, correspondingly directly to a similar sharp drop in 'other species' catch totals, suggesting possible misidentifications at species level. Taken at face value, QLD 'species-specific' statistics on hammerheads catch trends, such as the scalloped hammerhead, fluctuate unpredictably, incompatible with steadily declining trends consistently documented in fisheries records obtained internationally and from within Australia; however when the data for a specific species are amalgamated at familial level with other hammerhead species i.e. just using scalloped hammerhead statistics, catch trends more closely mirror the declines increasingly reported in modern fisheries catch records and abundance estimates from the world's oceans.

Hammerheads have never been responsible for an unprovoked attack on a swimmer or surfer. Yet, these species' populations are under increasing strain from nets and drumlines. Post-release mortality is also a concern for the species because they have a low survival rate after being caught in nets and drumlines.

Tiger Shark

- "Near Threatened" by the International Union for the Conservation of Nature (IUCN)

Tiger sharks are one of the most captured shark species in shark control programs in Queensland, NSW, and Western Australia (Reid et al 2011). Between 2010 and 2015, 1278 tiger sharks were captured and killed in the QLD SCP. In 2014 almost 165 tiger sharks were captured on drum lines in Western Australia's 3 month shark control trial period. In total 352 individuals were killed in nets between 1950 - 2008, and these figures suggest a decline in catch rates with catch per unit effort of tiger sharks having diminished in the past two decades on the NSW coast (Reid et al 2011; Ferreira et al. 2014).

Tiger sharks are currently listed as near threatened by the IUCN. The amount of capture in QLD and NSW is concern, as it implies changes to population size of sharks and this continual decrease in the proportion of large sharks suggests present impacts are unsustainable. Tiger sharks are known to congregate in large areas at certain times of the year, leading to the overestimate of population size,

and making shark meshing programs more of a threat to individual sharks and the entire population (Ferreira et al. 2014).

Tiger sharks are apex predators and little is known about their patterns of residency and movement, meaning it is difficult to determine population sizes in areas such as NSW, WA and QLD, and the connectivity, if any, among these tiger shark populations (Ferreira et al. 2014). Recent evidence has emerged showing the importance of tiger sharks within an ecosystem. Tiger sharks are apex predators and have been negatively affected by anthropogenic activities such as over fishing and shark control programs. Although they are believed to have relatively fast age and growth characteristics compared with other shark species (IUCN), continuing to have high numbers of tiger shark individuals, including many females, snagged on drum lines and in nets is going to continue to put unnecessary pressure on an unknown population, especially considering the amount of mortality from over fishing and bycatch as well as in shark control programs.

Rays

In QLD, 1205 rays were captured in the thirteen years between 2001 and 2013 (DAFF QLD). During the years of 1962-1987 a total of 13,765 rays were caught in the QLD program (Paterson, 1989). Especially high numbers were caught in the early years of the program when the nets were set to the bottom of the ocean (Paterson, 1989). Species caught have included; Devil Ray (Manta alfredi), Pigmy Devil Ray (Mobula diabolus), Spotted-eagle Ray (Aetobatus narianari), Cowtail Ray (Dasyatis sephen), Long-tailed Ray (Himantura uarnak), Brown Stringray (Dasyatis fluviorum) and the Coachwhip Ray (Himantura granulata) (Paterson, 1989).

Rays including skates, and stingrays and various other rays make up the largest group of by-catch in the NSW shark meshing program. At least 2074 rays have been caught between 1950 and 1993, with this number again likely to be an underestimate due to poor monitoring (Krogh and Reid, 1996). In the 2013-2014 meshing period in NSW 92 rays were captured (NSW SMP 2013-2014). A third of these died in nets. Similar results occurred in earlier meshing seasons, with an average of 32% of rays and skates killed in nets. Although numbers caught has diminished rays and skates continue to provide the largest component of all catches in each region of NSW (NSW SMP 2012-2013). In the latest 2015/2016 shark meshing period in NSW there were 425 interactions with rays, 23% resulted in the mortality of the animal.

Manta rays are now also being impacted on by the NSW North Coast nets trial which has seen 9 captures and 6 deaths of this species in three months. Manta rays are listed as vulnerable under IUCN and are listed on a number of international treaties, including CMS and CITES, for which Australia is a party. Once again we do not know the impact these large and sustained catches in both the QLD and NSW shark control programs have and continue to have on the species and populations that make up this group. Our limited understanding of their ecology and the high catch rates call for a cautious management approach.

Dolphins

[Note: Dolphins have been grouped together because most of the data we do have on catches is often not species differentiated.]

Irrawaddy River Dolphin (Orcaecella brevirostris)

- Rare ~ QLD ~QLD Nature Conservation Act, 1992

Indo-Pacific Humpbacked Dolphin (Sousa chinensis)

- QLD - Listed as Near Threatened (Nature Conservation Act 1992)

Bottlenose Dolphin (Tursiops truncatus)

- This species is listed as the 'Data deficient' in the 2012 Commonwealth publication 'The Action Plan for Australian Mammals' as information population size and trends is insufficient. A 30% reduction of size of population within three generations cannot be ruled out for the bottlenose dolphin, and in Australia regional populations face a number of threats (Action Plan for Marine Mammals 2012).

Dolphins have been one of the species highly impacted by the sharp increase in the numbers of animals killed in nets in NSW. In 2002 the Recovery Plan for the Grey Nurse Shark recommended the Commonwealth work with State governments to put appropriate regulations in place to stem the adverse effect of gill netting, in particular beach meshing on cetaceans (RPGNS, 2002).

In the 2015/2016 NSW meshing season, more than 48 dolphins were captured in nets, including 2 indo-pacific humpback dolphins. The majority of animals that were caught were killed. In 2014, 7 dolphins died in nets, including 2 more indo-pacific humpback dolphins. The sharp increase in dolphin captures in 2015/2016 is cause for serious concern.

The species most frequently caught north of Mackay is the Irrawaddy River dolphin, while those caught in Southern QLD include the Bottlenose, Common and Indo-pacific humpback (Paterson, 1989). Between 2001 and 2013, 20 Indo-pacific humpback dolphins were captured, with only 3 of these released alive (QLD GOV Catch in Control Nets 2001-2013). 32 Bottlenose dolphins were captured in QLD SCP's with less than a third released alive. After 2001, 152 common dolphins were recorded captured on nets in QLD. Only 16 of these were released alive. This makes an annual average catch of 12.6 animals, impacting a population that there is limited information on.

There has generally been insufficient data on dolphin populations in Australia and in the past bycatch in both the NSW and QLD SCP's, as a result it is difficult to make clear conclusions as to the impact SCP's have on these species. However, given the acknowledged vulnerability of the Irrawaddy River Dolphin and the Indo-Pacific Dolphin and the suspected vulnerability of the Bottlenose dolphin the precautionary management practices should be employed when we are assessing the impact of the program on the species and its sub-populations.

In NSW we refer to the by-catch data prior to 1995/96 that is available, for the period 1965/66-1980/81 in the Newcastle region. At this time an annual average of 6 dolphins were caught, none being released alive. Unfortunately this data was not differentiated along species lines. (Krogh and Reid, 1992). There were a total of 94 dolphins and porpoises caught between 1950 and 1993. Krogh and Reid have speculated that the majority of the cetaceans caught in NSW are Bottlenose and Common dolphins. (Krogh and Reid, 1996). For these two, grouped together in recent by-catch data between 1995/96 – 00/01, 22 individuals were caught and died, none were released alive. In years 2009 – 2012 at least three dolphin individuals died in nets. These numbers are concerning as again it more likely represents a decrease in population size of animals, rather than nets being more effective against non-target catches.

Dugong (Dugong dugon)

- Vulnerable ~QLD ~ Nature Conservation Act 1992
- Vulnerable ~ NSW ~ Threatened Species Conservation Act 1995
- Vulnerable ~Worldwide ~IUCN Red Book 2000
- Listed Marine Species ~ Commonwealth ~ EPBC Act, 1999

Dugongs are susceptible to anthropogenic influences due to their life history and their dependency on seagrasses that are restricted to habitats in coastal areas (Allen et al. 2004). Dugong populations are

under pressure from human activities, and shark control programs are a serious threat to dugong mortality (Allen et al. 2004). Data from the QLD shark control program has been used to analyse dugong population trends. It is estimated the dugong population south of Cooktown has experienced such a dramatic decline over the last four decades that the current population is estimated at approximately 3% of the level it was at the beginning of the shark control program (Marsh et al. 2001). Dugongs are highly vulnerable to long-term losses as the population of this species does not increase by more than five percent per annum, even in optimal conditions (Marsh, 1998). Such a dramatically depressed population combined with a poor ability to recover from a sustained reduction in numbers calls for immediate action.

The recognition of this species as a listed Marine Species and Migratory Species under the EPBC Act, 1999 and under State law, as well as the international obligations that Australia faces with the species listed under Appendix II of the Convention on Migratory Species, clearly illustrates the high sensitivity of this species and the resulting need for a proactive and vigorous management approach. For this reason, in 2002 HSI submitted a nomination to have the dugong (Dugong dugon) listed as a vulnerable species under the EPBC Act.

The Great Barrier Reef Marine Authority (GBRMPA) puts dugong populations at around 3% of their population size in the 1960's and dugongs have been caught in all areas where the QLD shark control program operates. In the first 15 years of the program, almost 32 dugongs were being killed annually as a result of the QLD SCP, a high number of these occurring within the GBRMPA. That number is now down to around 1.2 individuals a year. In the 2001 study by Marsh et al., they found that the reduction of numbers of dugongs captured in the QLD SCP coincides with a decline in dugong populations, the study also suggest that to enable population increase of dugongs a significant reduction in the mortality of the species in the QLD SCP needs to occur.

The data available shows most dugongs have historically been caught in Townsville. There were attempts to reduce the catch in Townsville by relocating the nets to other areas but this was only partially successful (Paterson, 1989). Similarly, the reforms in 1992 had little effect on lowering dugong mortality. Between 2000 and 2013 16 dugongs were captured in nets, and only one of these was released alive (DAFF Bycatch of species 2001-2010). The annual average catch-rate for the years 2000-2013 was measured at 1.2 individuals.

These low catch numbers more likely reflect the severe population decrease of dugongs since the 1960's, rather than as a result of a significant reduction in the impact of the meshing program (Marsh et al. 2001). And a highly contributing factor to the great decline in dugong numbers is SCP's (Allen et al. 2004).

Between 2000 and 2013 the percentage of dugongs released from nets in QLD dropped to 6.25%, meaning more than 93% of dugongs caught in the nets were killed (DAFF QLD 2001-2010). Additionally, there is no data available on post release mortality, so overall death tolls could be far higher, and lower catch numbers are a strong indication of low population numbers. Six dugongs have been caught in the NSW shark meshing program between 1950 and 2008. While these numbers may appear to be small they are not irrelevant as the dugong is very rarely found south of Moreton Bay in Queensland. This catch-rate is therefore likely to represent a high proportion of the dugongs in the waters off NSW and is further evidence of the significant threat nets pose to dugongs in the wild (Krogh and Reid, 1996).

While any gains in survival rates are encouraging the fact remains that the shark control programs have had and continue to have an ongoing impact on dugong populations in NSW and QLD. Considering this species critically depressed numbers and limited ability to recover from such a small population base, the dugong could become listed with shark control programs being a major contributor.

7. ECOLOGICAL COMMUNITIES THAT COULD BECOME ELIGIBLE FOR LISTING AND JUSTIFICATION

Provide details and justification of non-EPBC Act listed ecological communities that, due to the impact of the key threatening process, could become eligible for listing in any category. For each ecological community please include:

a. the complete title (published or otherwise generally accepted), category it could become eligible for listing in;
b. data on the current status in relation to the criteria for listing;
c. specific information on how the threatening process threatens this ecological community; and
d. information on the extent to which the threat could change the status of the ecological community in relation to the criteria for listing.

Criterion B: Listing in a higher threat category

8. SPECIES THAT COULD BECOME ELIGIBLE FOR LISTING IN A HIGHER THREAT CATEGORY AND JUSTIFICATION

Provide details and justification of EPBC Act listed threatened species that, due to the impacts of the threatening process, could become eligible for listing in another category representing a higher degree of endangerment. For each species please include:

a. the scientific name, common name (if appropriate), category that the item is currently listed in and the category it could become eligible for listing in;
b. data on the current status in relation to the criteria for listing (at least one criterion for the current listed category has been previously met);
c. specific information on how the threatening process significantly threatens this species; and
d. information on the extent to which the threat could change the status of the species in relation to the criteria for listing. This does not have to be the same criterion under which the species was previously listed.

The impact of Shark Control Programs (SCP) affects a range of marine species. Vulnerable species such as the White Shark and the critically endangered Grey Nurse Shark along with marine species such as turtles and whales are recognised as being impacted upon in Australia's Draft National Plan of Action for the Conservation and Management of Sharks (2002). As well as this the Recovery Plans for White Sharks, Grey Nurse Sharks, and Marine Turtles list shark control programs as impacting upon these populations.

A report on the New South Wales beach-meshing program reveals that the number of sharks caught in nets has decreased, reflecting a general population decline. Therefore the following species are not only adversely affected by shark control programs but could as a result of capture and mortality become eligible in a higher threat category.

*Please refer to the following species as eligible for both Part 8 (Criteria B) and Part 10 (Criteria C).

Grey Nurse Shark (Carcharias taurus)

- EPBC Act: Listed as Critically Endangered
- NSW: Listed as Critically Endangered (Fisheries Management Act 1994
- QLD: Listed as Endangered (Nature Conservation Act 1992
- VIC: Listed as Threatened (Flora and Fauna Guarantee Act 1988)

The population decline of the grey nurse shark over the last several decades has been recognised in law in every Australian state, by the Commonwealth and internationally, with its Critically endangered listing on the IUCN Red List. The grey nurse was the first shark to be protected in the world. Recognition of a significant population decline and the critically endangered status of the species in Australia once again calls for a very cautious management approach.

The grey nurse, displaying similar life-history characteristics to the White shark is highly vulnerable to non-natural sources of mortality and slow to recover from any population decline (DRPGNS 2001). It has

a late reproductive maturity- between 4-6 years; it has only two pups per litter and reproduces once every two years. There is no evidence to show populations of grey nurse sharks in NSW and Queensland waters have recovered since their protection in 1984 (RPGNS, 2014). On the contrary, there are concerns that the numbers have fallen to such a depressed level it is now difficult for individuals to find mates with which to reproduce (RPGNS, 2014).

Although the population size is unknown, scientists estimate there could be as few as 500 - 1500 individuals on the east coast of Australia (RPGNS 2014; Cardno Ecology Lab 2011). No more than 313 individuals have been surveyed at any one time during simultaneous surveys up and down the Australian east coast (NSW Fisheries 2003; Cardno Ecology Lab 2011).

The grey nurse shark was upgraded to Critically Endangered in 2001 under the Environment Protection and Biodiversity Conservation Act, 1999. This listing means the species is 'facing an extremely high risk of extinction in the wild in the immediate future' (EPBC Act, 1999).

The coastal distribution of the grey nurse shark and the high degree of site loyalty shown by the species make it vulnerable to capture in the coastal nets. The QLD and NSW shark control programs have been recognised as one of the main historical causes of decline in Grey Nurse numbers; "*The beach meshing program has been responsible for the capture of substantial numbers of Grey Nurse sharks from the 1950's through to the 1970's*."(RPGNS, 2001). The threat of shark control programs has not subsided and these methods are today acknowledged to be one of the current major threats to recovery of the grey nurse shark (RPGNS 2014).

In 2014 the Commonwealth Recovery Plan for the Grey Nurse Shark (2014) makes a number of statements regarding the continued use of the Shark Control Programs including:

- the New South Wales and Queensland shark control programs are a significant and ongoing source of mortality for the east coast grey nurse shark population
- Review appropriateness of current shark control activities (beach meshing and drumlines) with a view to reducing impacts on grey nurse sharks
- The Commonwealth Recovery Plan for the Grey Nurse Shark considers the take of one individual could constitute a significant impact on the species, due to the critical conservation status that the species holds.

In NSW, shark nets caught up to 36 Grey Nurse sharks per year in the early 1950's. By the 1980's the annual catch had fallen to an average of 3 or less. Since 2012, 17 grey nurse sharks have been killed in NSW nets out of a total of 36 caught, including 5 fatalities in the 2015/2016 season. This level of mortality cannot be sustained. As of March 2017 no grey nurse had been captured in the 4 months of the trial of nets on the NSW north coast even though there are known grey nurse critical habitats in this area and so the nets in this location present a high risk

In QLD a similar fall in catches has been witnessed with a total of 90 grey nurse sharks caught between 1962 and 72, an average of 9 per year, to 21 or 2.1 per year between 1990 and 2000 (DRPGNS, 2001). 23 grey nurse sharks were caught between 2001 and October 2013 (RPGNS 2014). The catches of grey nurse may seem an insignificant catch number, however the fact that the east coast population has shown no recovery and the latest estimates of grey nurse shark numbers are considered to be so low, shark control programs are rightly considered one of the principal threats to population recovery (RPGNS 2014, Cardno Ecology Lab, 2010). It should also be noted here that the lower catch-rates for SCP's in recent years could not be used to support the argument that the programs have little impact on the grey nurse population, but are rather an indication of a heavily depleted population.

Other identified major threats to the species are incidental catch in commercial fishing and recreational fishing. The extent of the impact both past and current commercial fisheries have had on the species is unknown. Unfortunately, increasing our understanding of current areas of impact will be slow due to poor recognition and recording of interactions with the species by fisherman. Recreational and

commercial fishing also has had a very significant impact on the population over the last few decades, and continues to be one of the greatest impediments to the recovery and survival of the species (RPGNS, 2014). As a consequence of our limited knowledge and the difficulty in monitoring these threats, attempts to both lower catches and see an increase in recording of interactions will be difficult in the short term.

Certainly if the objectives of Recovery Plans for the Grey Nurse Shark are met, the number of individuals in NSW and QLD waters will increase. However, the continuation of the Shark Control Programs will increase the risk of grey nurse sharks being killed and could potentially cause a further reduction in numbers. Seeing a reduction in take from the beach meshing program by researching non-lethal alternatives and phasing out the nets is one of the goals of the Commonwealth Grey Nurse Recovery Team (RPGNS, 2014). Given the Critically Endangered listing under the EPBC Act, and the potential further damage to population size the threat these programs pose cannot be ignored.

The Recovery Plan states that 'alternative non-lethal methods to beach meshing should be trialled in NSW and QLD… By minimising bycatch and researching alternatives to protective shark meshing nets, the Grey Nurse Shark will benefit, particularly if the population increases. Other non-target species that are captured in the shark nets such as whales, dolphins, dugongs, turtles and rays would also benefit if protective shark meshing nets were reduced. (2001)'

White Shark (Carcharodon carcharias)

- EPBC Act: Listed as Vulnerable and Migratory
- NSW: Listed as Vulnerable (Fisheries Management Act 1994)
- TAS: Listed as Vulnerable (Threatened Species Protection Act 1995)
- VIC: Listed as Threatened (Flora and Fauna Guarantee Act 1988)
- WA: Listed as Vulnerable (Wildlife Conservation Act 1950)
- IUCN: Listed as Vulnerable
- CITES Appendix II

It has been acknowledged throughout its range in Australia and at many levels of government that the survival of the species *Carcharodon carcharias* is under threat (RPGWS, 2013). The species has been listed as Vulnerable under State and federal threatened species legislation, as well as international treaties including CMS and CITES. The concern for the white shark is due to its population decline, susceptibility to non-natural sources of mortality and our limited understanding of the ecology of the species (RPGWS, 2013). This acknowledgment of a less robust population must be remembered when we assess the significance of SCP's in NSW, QLD and WA on the remainder of the species, calling for a very cautious management approach which relies heavily on the precautionary principle.

Reducing levels of white shark take is also outlined as one of the main goals of the Commonwealth White Shark Recovery Team (RPGWS, 2013) and the Commonwealth Draft Recovery Plan for the White shark (December 2001), these reports state:

- the degree to which beach meshing is impacting on White Shark populations is unknown although the decline in captures suggests it is significant.
- Considering the fact that the white shark is a target species of the shark control programs the recovery of white sharks can only be consistent with the removal of the nets and drumlines or the introduction of a non-lethal alternatives.
- The 2013 Recovery Plan for White sharks calls for relevant authorities to 'develop and trial non-lethal alternatives to beach meshing and drumlines with a view to phasing out bottom set shark netting programs of shark control.'

White sharks have a low natural mortality rate; individuals are long lived, have a late reproductive maturity (9 years for females and 11 years for males) and are therefore naturally relatively low in

abundance. These characteristics translate into a species which is not only particularly susceptible to non-natural sources of mortality but very slow to recover from any such threats (DRPGWS, 2001). There is great historical evidence of decline of white shark over the past 60 years (Reid et al 2011). This evidence suggests that even with protection, white shark numbers have not recovered. The most contributing factors for this lack of recovery are capture by commercial and recreational fishers, both accidentally and illegally, and SCP's such as those operating in NSW, QLD and the shark policy in WA (RPGWS EA 2013).

Catch data from beach meshing is one of the main sources from which assessments of white shark population size are made. The records show a dramatic decline in the species population size. In the first 20 years beach meshing records were kept in NSW there was an annual average of 13 white sharks caught. This figure has dropped to an annual average of 4 individuals over the last 10 years (NSW Fisheries). However in last year's meshing season (2015/2016) more than 20 white shark individuals were caught and killed, this sharp increase in catch rates occurred not just for white sharks but for all species captured in the NSW SMP in that year, and should not be indicative of an increase in white shark populations. There could be a number of reasons for such an increase including improper management of nets which we hope NSW DPI investigates. Generally, figures from the SMP indicate a decline in the order of 75% on 1970 levels. It should be noted here that this decline in numbers occurred as shark meshing intensity increased, suggesting the population size has fallen even more dramatically than the catch data shows.

Historical Bycatch Data

In NSW the number of catches in the three major netting areas showed a reduction to about a quarter of the 1972-73 catch by 1989-90. This trend has also been observed in QLD (DRPGW, 2000). During the first 20 years of the shark control program, 20 Great Whites were caught on average in the nets every year. This has fallen dramatically with an average of only 10 sharks having been caught between 1990 and 2000 (DRPGWS, 2001). Between 2010 and 2014, 15 white sharks were captured in nets in NSW. This makes the average number of white sharks captured drop to 3.75 a year. Significantly lower than the previous 2 decades. In Queensland, the average annual catch of white sharks was 6.35 between 2001-2014, with 89 sharks captured and euthanised.

Recreational fishing has been recognised as the major cause of decline of the white shark, however shark nets have and continue to have a greater negative impact on the species population. Between the years 1960 and 1995 recreational fishing reported a total of 183 white sharks killed, an annual average of 5.2 (DRPGWS, 2001). Over this same period the NSW shark control program caught a total of 343 white sharks, an annual average of 9.8 sharks, just under twice as many sharks (NSW Fisheries). Since the introduction of legal protection for the white shark the threat of recreational fishing has fallen, with the annual average reported take between 1980 and 1990 being 1.4 sharks. During this same period NSW beach meshing killed an annual average of 5.9 sharks, an impact four times as great as that of recreational fishing (NSW Fisheries). Therefore beach meshing, at least in NSW is and has always been one of the 'major causes' of white shark mortality, with only commercial by-catch causing more deaths.

The white shark has experienced a dramatic decline in population numbers and given its life history characteristics, the ability of the species to recover will be slow. The shark control programs have had a prolonged and sustained adverse effect on the species population. The fact that the objective of the White Shark Recovery Plan is to "recover White Shark numbers in Australian waters**,** to a level that will see the species removed from the schedules of the Environment Protection and Biodiversity Conservation Act 1999", is highly contradictory to the continued and increased use of shark meshing and drumlines.

Certainly as the actions outlined in the plan are put into place, recovery efforts will be hampered and population numbers stunted if the shark control programs continue. Under current circumstances, removal of the shark nets and drumlines presents the most expedient and effective action to promote

the recovery of the species.

Marine Turtles

Leatherback Turtle (Dermochelys coriacea)

- Vulnerable ~ Commonwealth ~ EPBC Act, 1999
- Protected ~ NSW ~ National Parks and Wildlife Act, 1974
- Vulnerable ~ NSW ~ Threatened Species Conservation Act, 1995
- Endangered ~ Worldwide ~ IUCN Red List 2000
- Endangered ~QLD ~ Nature Conservation Act, 1992
- Appendix I ~ Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Appendix I and II ~ Convention for the Protection of Migratory Species of Wild Animals (CMS)

Green Turtle (Chelonia mydas)

- Vulnerable ~ Commonwealth ~ EPBC Act, 1999
- Vulnerable ~ NSW ~ Threatened Species Conservation Act, 1995
- Endangered ~ Worldwide ~ IUCN Red List 2000
- Vulnerable ~ QLD ~ Nature Conservation Act, 1992
- Appendix I ~ Convention on International Trade in Endangered Species of Wild Fauna and
- Flora (CITES)
- Appendix I and II ~ Convention for the Protection of Migratory Species of Wild Animals (CMS)

Loggerhead Turtle (Caretta caretta)

- Listed as Endangered under the EPBC Act and under all State listings

Flatback Turtle

- Vulnerable ~ Commonwealth ~ EPBC Act, 1999
- Vulnerable (Nature Conservation Act 1992 (Queensland)
- Vulnerable (Wildlife Conservation Act 1950 (Western Australia)
- Data Deficient (Global Status: IUCN Red List of Threatened Species)

Hawksbill Turtle (Eretmochelys imbricata)

- Vulnerable ~ Commonwealth ~ EPBC Act, 1999
- Critically Endangered ~ Worldwide ~ IUCN Red List
- Protected ~ NSW ~ National Parks and Wildlife Act, 1974
- Vulnerable ~ QLD ~ Nature Conservation Act, 1992
- Appendix I ~ Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- Appendix I and II ~ Convention for the Protection of Migratory Species of Wild Animals (CMS)

Once again the above listings under various laws and conventions are indicative of the vulnerability of marine turtles and the resultant requirement that we manage them with caution. The life history characteristics of these species of marine turtle make them particularly susceptible to human induced threats and slow to recover from such threats. A marine turtle may take up to 30-50 years to mature and will not breed every year (DRPMT, 1998). Marine turtles spend most of their life in the sea, are highly migratory, occupy different habitats at different stages in their life and do not nest every year, all characteristics which make population size estimates and management of these species very difficult.

As there is no long-term data on marine turtles we are unable to be certain about the impact of the various threats, including the shark control program, on overall populations of these species.

Queensland Marine Turtle Historical Bycatch Data

Turtles are one of the largest groups of bycatch in the QLD shark control program. Over the life of the program more than 5000 turtles have been captured and killed. Marine turtles have been caught in all regions within the QLD Shark Control program, and between 2001 and 2010 more marine turtles were caught on Gold Coast drumlines than White Sharks.

In the 15 years between 2001 and 2016, 485 loggerhead turtles were captured in nets and on baited drumlines in QLD. Of these, 30 were killed and the rest released alive. However, because most turtles were not tagged, the post-release mortality rates are generally unknown. Deaths in the shark control program has been identified in the Commonwealth Recovery Plan as an issue which is of concern and should be managed with the intent of reducing mortality (DRPMT 2003). Specifically, the Recovery plan states the needs to significantly reduce the take of green turtles in SCP's and reduce the take of loggerhead turtles to zero.

While baited drumlines are supposed to reduce bycatch, this has not been the case with the marine turtles. At Point Lookout there has been a particularly high mortality rate on drumlines; Leatherbacks in particular have been hooked and subsequently drowned on the drumline in the fast flowing currents (Paterson, 1989). Baited drumlines are reported to catch loggerhead turtles in particular. This reality is very concerning in light of the fact that the Queensland Turtle Research Project, managed by Queensland Department of Environment, has sufficient evidence to conclude that East Australian Loggerhead turtle sub-population numbers are so low that the species could qualify for critically endangered status, and in 2003 noted its continued decline (DRPMT 1998; RPMTA 2003). Environment Australia acknowledged this heightened vulnerability in the Marine Turtle Draft Recovery Plan; 'The loss of small numbers of east coast loggerhead turtles is not sustainable' (DRPMT, 1998)

Defenders of the QLD program argue the above statistics are no longer reflective of the program's impact. They quote figures on catch and release rates since 1992, when amendments to the program aimed at lowering by-catch began. Indeed since 1992 the program has improved its performance with regard to the percentage of turtles released alive, which has jumped from 35% (1962-1995). Those in support of the program also quote the lower annual average catch rate since 1992, comparing the annual average of 119.4 per year between 1962-1995 with 84 per year between 1992-1996.

While the drop in numbers of turtles captured since the beginning of the program does initially appear impressive, the figures are misleading. Over the last few decades marine turtles both nationally and internationally have been subject to a range of anthropogenic threats and as a result undergone a significant decline in numbers (Heppell et al. 2002). It would therefore be expected that the number caught in the nets in recent years would be significantly lower than earlier in the program, independent of any change in practices. In addition, due to the way the data is presented there appears to have been a sudden drop in catch rates in 1992, the year reforms were initiated. However, this is artificially created as the average of the first data set is inflated by the higher catch rates in the early years of the program and would be greater than the average of any data set, which only included the recent years of the program. Furthermore, although the improved release rate is encouraging, the fact that we do not know the survival rate of the turtles after being caught and released is a concern. Most data shows that the majority of turtles released alive are not tagged, making it impossible to determine the outcome of individuals post release. Many turtles released alive have sustained serious lacerations through prolonged struggling against either nets or hooks and little is known about the impact this can have upon their survival and reproduction following release (Gribble et al, 1998).

Flatback turtles are considered Vulnerable under the EPBC and the Nature Conservation Act QLD and are endemic to the continental shelf of Australia. Between 2002 and 2007 five flatback turtles were

captured in nets off Cairns and Mackay, all were killed. An annual average of 1.9 Hawksbill turtles were also captured in Queensland nets between 2001 and 2010. Information on the population of flatback turtles and hawksbill turtles around Queensland and New South Wales is lacking, however recent studies which have assessed these species status believe them to be fragile, and that the eastern Australia populations of flatbacks are in decline (Limpus et al. 2002; Limpus 2007). Lack of data makes it difficult to determine how much of an effect SCP's are having on flatback and hawksbill populations, however there has been notable decline in population size therefore a precautionary approach to management and conservation should be undertaken.

Therefore even after the amendments to the QLD shark control program, to lower bycatch, the program still causes the known death of too many marine turtles, with almost 3 endangered Loggerhead turtles every year. Green turtle captures are also concerning. The RPMT 2003, states that a main objective should be to limit green turtle deaths in SCP's to less than 10%. However, between 2001 and 2013 28 green turtles out of a total 159 individuals caught drowned. This is an alarming 17.6% of individuals killed in nets in the past 14 years, and it could be an even higher statistic due to any unknown post-release mortality.

This sustained annual toll can undoubtedly be considered a threat to a listed species with such critically low population numbers that a 'loss of small numbers' is unsustainable. The fragility of the Loggerhead population prompted the marine turtle Recovery Team to state the following; 'the lead conservation and fisheries management agencies in each state will make every effort, care and precaution to reduce loggerhead mortality to almost zero' (RPMT 2003).

New South Wales Marine Turtle Historical Bycatch Data

Marine turtles have been caught every year in the NSW beach meshing program (Krogh and Reid, 1996). Since the 2010 NSW meshing season finished, over 50 marine turtles have been killed in the SMP and north coast nets trial. In 2015/2016 There were 24 interactions with marine turtles, which comprised of comprised of: 13 Green Turtles (2 released alive); 5 Hawksbill Turtles; 4 Loggerhead Turtles (2 released alive); and 2 Leatherback Sea Turtle (1 released alive). In the 2013-2014 netting season in NSW, 10 Green turtles were captured in nets. Only one of these was released alive. 2 leatherback turtles were captured in nets near Newcastle and the Central Coast in 2014 although they were released alive neither was tagged. The majority of turtles identified have been Green turtles, which are listed as Vulnerable under the EPBC Act, 1999. One Leatherback was identified, also listed as Vulnerable under the EPBC Act, 1999.

On the NSW north coast both loggerhead and green turtles have been captured and killed in the nets since December 2016. It is highly likely there will be further mortalities of marine turtles in this area during the continuation of the trial, and if nets are implemented permanently in this area.

The Recovery Plan for Marine Turtles 2003 urges catch rates in SCP's to be zero for loggerhead turtles and to no more than ten percent of catches for green turtles. These recommendations are so far not being met when considering the above data sets. Considering each of the marine turtle species caught in the shark control programs are listed under state/territory, national and international laws and treaties; the sheer numbers taken in QLD over the life of the program and the numbers still taken, especially of the Loggerhead turtle, leaves no doubt about the negative impact the SCP's are having on the long term conservation of these species.

Humpback Whale

- Vulnerable ~ Commonwealth ~ EPBC Act, 1999
- Vulnerable ~ NSW ~ *Threatened Species Conservation Act 1995*
- Vulnerable ~ QLD ~ *Nature Conservation Act 1992*

In QLD between 2001 and 2010, 28 humpback whales were captured on nets, with three mortalities. This figure, while at first appearing small cannot be used as evidence the program has not and does not have a detrimental effect on this vulnerable species. These catch rates are more likely to be reflective of a very heavily depleted population, slow to recover from only 500 individuals in 1962 (Paterson, 1979). Concerns for the future impact of the shark program on the species have been aired. As the population numbers increase and there are more humpbacks migrating along the coastline which is obstructed by nets and drumlines it is feared more will be caught in the QLD program (Gribble *et al,* 1998), and could impact recovery.

Larger marine mammals are susceptible to entanglement in nets and the unknown result of capture and fate post release is a concern. In the NSW 2012-2013 netting season, two humpback whales were trapped in nets. However, the National Parks and Wildlife Service did not respond in time for rescue and the whales swam off still entangled. The possibility of survival and to carry out natural behaviours while still entangled is likely very low.

In the week of the 26th August 2002, a Humpback whale was entangled in the shark control nets off one of the Gold Coast beaches (Palm Beach). Over one week later, the same animal was reported some distance south off the NSW North Coast, still entangled and towing net, ropes and green flotation buoys, as well as a 25m chain and an anchor – the equipment from the Palm Beach net. In addition to the stress that the adult whale suffered during its week long ordeal, a baby whale, believed to be the netted whales' calf was found dead near the Gold Coast on Thursday (29th August 2002). The 2013-2014 non-target species data for NSW shows humpback whale mortality due to drowning in nets on Sydney's Northern Beaches.

There is concern that SCP's are obstructing humpback whale migration routes and that with increasing population size accidental entanglements are likely to increase. Considering these mammals are currently a recovering population they are more vulnerable to cumulative impacts from anthropogenic factors (Gribble et al. 1998), and SCP's should be recognised as being a threat to humpback whale populations.

9. ECOLOGICAL COMMUNITIES THAT COULD BECOME ELIGIBLE FOR LISTING IN A HIGHER THREAT CATEGORY AND JUSTIFICATION

Provide details and justification of EPBC Act listed threatened ecological communities that, due to the impacts of the threatening process, could become eligible for listing in another category representing a higher degree of endangerment. For each ecological community please include:

a. the complete title (published or otherwise generally accepted), category that the item is currently listed in and the category it could become eligible for listing in;
b. data on the current status in relation to the criteria for listing (at least one criterion for the current listed category has been previously met);
c. specific information on how the threatening process significantly threatens this ecological community; and
d. information on the extent to which the threat could change the status of the ecological community in relation to the criteria for listing. This does not have to be the same criterion under which the ecological community was previously listed.

Criterion C: Adversely affected listed species or ecological communities

10. SPECIES ADVERSELY IMPACTED AND JUSTIFICATION

Provide a summary of species listed as threatened under the EPBC Act, which are considered to be adversely affected by the threatening process. For each species please include:

a. the scientific name, common name (if appropriate) and category of listing under the EPBC Act; and
b. justification for each species that is claimed to be affected adversely by the threatening process.

This nomination shows that death and injury to marine species due to the Shark Control (Beach Meshing) Programs, currently conducted in QLD and NSW, and the shark mitigation policy in WA state waters has adversely impacted on species populations in the past, and contributed to their listing as threatened species under various state and commonwealth legislation. The nomination shows that continuation of this process could contribute to species already listed being moved to a higher level of endangerment or hamper current efforts to recover listed endangered species such as the Grey Nurse Shark and White sharks and marine turtles such as the Loggerhead.

Therefore, please note the species listed in Part 8 (Criteria B) are also eligible for Part 10 (Criteria C), please refer to Part 8 for scientific name, common name and category of listing under the EPBC Act; and justification for each species that is claimed to be affected adversely by the threatening process.

- White shark
- Grey Nurse Shark
- Species of Marine Turtles
- Humpback Whale

11. ECOLOGICAL COMMUNITIES ADVERSELY IMPACTED AND JUSTIFICATION

Provide a summary of ecological communities listed as threatened under the EPBC Act that are considered to be adversely affected by the threatening process. For each ecological community please provide:

a. the complete title (exactly as listed) and category of listing under the EPBC Act; and
b. justification for each ecological community that is claimed to be affected adversely by the threatening process.

Threat Abatement

12. THREAT ABATEMENT

Give an overview of how threats posed by this process are being abated by current (or proposed) activities. Identify who is undertaking these activities and how successful the activities have been to date.

As previously stated, HSI successfully nominated NSW Shark Control Nets as a Key Threatening Process (KTP) under the both the NSW Fisheries Management Act and the NSW Threatened Species Conservation Act due to the threat to critically endangered marine species. This listing was approved in 2003, however as yet the NSW Government is yet to commence a Threat Abatement Plan (TAP).

Currently, the NSW Government has been trialling some non-lethal technology, but has also increased meshed net locations within NSW and may have plans for nets to become even more extensive. Thus far with all the information on alternatives to nets and drumlines, and new detection technology being explored and invested in, this has not yet led to the removal and replacement of the nets and drumlines in NSW which is needed to ensure the success of our marine populations.

The WA Government has made great progress in the use of eco-barriers at a number of beaches in Western Australia, including around popular areas such as Perth. We would recommend further use of these barriers, as they have little ecological footprint and can fully enclose a beach area, mitigating beach goers from any chance of an encounter with sharks.

In Queensland, nets and drumlines are still present in the Great Barrier Reef Marine Park and World Heritage Area. The Queensland Government has made little progress in the use of non-lethal technology as an alternative to nets and drumlines.

A KTP listing would promote the transitions from State Governments to non –lethal alternatives and bring about a response from the Federal Governments in the form of a TAP enabling the use of successful activities to prevent further population loss of marine life.

13. DEVELOPMENT OF THREAT ABATEMENT PLAN

Would the development of a threat abatement plan be a feasible, effective and efficient way to abate the process? What other measures could be undertaken?

The nominator is of the firm opinion that a TAP is an effective means by which to coordinate an appropriately strong response to the threat of the shark control programs, with the ultimate goal to be the removal of such programs (i.e. beach nets and drumlines) from all NSW, QLD and WA beaches. While we acknowledge that the fear in the community of the risk of shark attack continues, we also acknowledge that the risk of such attacks in reality is small. Allaying public fears would require an extensive education and awareness campaign, and deployment of non-lethal bather protection strategies, which could certainly be included in the TAP for the threatening process.

Both the recovery plan for white sharks and grey nurse sharks and the recovery plan for marine turtles state that alternatives to shark control programs should be considered, as the effect on marine species is too detrimental to sensitive species and populations. The nominator feels that removal of shark nets and drum lines is the most effective way to stop unnecessary mortality of threatened species.

To replace lethal measures, the nominator urges Governments to consider the full breadth of available shark mitigation and deterrence strategies, which include but are not limited to the following recommendations:

- Public education campaigns;
- Aerial spotting, such as fixed-wing aerial patrol and aerial drones;
- Shark spotting (similar to the successful program in Cape Town, South Africa);
- Improving the response times of emergency services, Council Lifeguards and Surf Life-Saving clubs;
- Involving Local Councils in emergency planning and response;
- Installing Eco-barriers;
- Use of personal shark deterrent devices, which could be promoted to ocean users who place themselves more at risk such as surfers and spear fishers
- Reviewing beach patrolling strategies along the NSW, QLD and WA coast lines; and,
- Removing shark nets and drumlines.

Until such a time that nets and drumlines can be removed wholly from Australian beaches, TAP measures such as a reduced time nets are in the water (rather than the current September – April period) and more frequent checks of the nets, would help further reduce the already unacceptable impact on non-target marine species caught and drowned. There may be options for changes to mesh size to prevent some species from being tangled, and the use of pingers as a preventative measure for dolphins and whales. Along with newer technologies such as those listed above.

Additionally, recognition of the impact (historical, current and potential), that the shark control (beach meshing) programs are having on protected marine species, and the potential for additional species to be added to the threatened species lists warrants action. A TAP for this threatening process could call for research to be conducted on developing and implementing non-lethal alternatives to the current

lethal mechanisms.

14. ELEMENTS TO BE INCLUDED IN A THREAT ABATEMENT PLAN

If the threatening process is recommended for listing under the EPBC Act, what elements could a threat abatement plan include?

- Immediate removal of nets and drum lines in NSW, QLD and WA waters
- Implementing non-lethal alternatives to the current lethal mechanisms, including eco-barriers, use of aerial drones and spotting programs
- Reduction of time of nets in water e.g. Only Summer months in both NSW and QLD as opposed to September to April, and all year round respectively.
- More frequent checks of nets in the water as opposed to every 72 hours
- Implementation of practical measures to lessen the likelihood of shark bite such as avoiding swimming at dusk and dawn, not swimming or surfing alone, and swimming between the flags.
- Integration of non-lethal shark detection technologies
- Promotion of personal deterrent devices for ocean users who place themselves at more risk

15. ADDITIONAL THREAT ABATEMENT INFORMATION

Is there other information that relates to threat abatement that you would like to provide?

Reviewers and Further Information

16. REVIEWER(S)

Has this nomination been reviewed? Have relevant experts been consulted on this nomination? If so, please include their names and current professional positions.

Nicola Beynon, Head of Campaigns, Humane Society International

17. MAJOR STUDIES

Identify major studies that might assist in the assessment of the nominated threatening process.

Cliff G and Dudley FJ (2011) Reducing the environmental impact of shark-control programs: a case study from KwaZulu-Natal, South Africa. Marine and Freshwater Research.

Gribble.N.A., McPherson.G. and Lane.B., 1998, “Effect of the Queensland Shark Control Program on non-target species: whale, dugong, turtle and dolphin: a review”, *Marine Freshwater Resources, 49, page 645-51,*CSIRO, Australia.

Paterson.R. 1979, “Shark meshing takes a heavy toll of harmless marine animals”, *Australian Fisheries, October, 1979.*

Paterson.R.A., 1989, “Effects of Long-Term Anti-shark Measures on Target and Non-Target Species in Queensland, Australia”, *Biological Conservation* ***52,*** Elsevier Science Publishers Ltd, England.

Reid DD, Robbins WD, Peddemors VM (2011) Decadal trends in shark catches and effort from the New South Wales, Australia, Shark Meshing Program 1950-2010. Australian Journal of Marine and Freshwater Research, 62, 676-693Tiger

Queensland, Department of Primary Industries (2001) *Review of the Queensland Shark Control Program: Consultation Draft, December 2001*

West JG (2011) Changing patterns of shark attacks in Australian waters. Marine and Freshwater Research, 2011, 62, 744–754

18. FURTHER INFORMATION

Identify relevant studies or management documentation that might relate to the species (e.g. research projects, national park management plans, recovery plans, conservation plans, threat abatement plans, etc.).

Action Plan for Australian Mammals 2012
Woinarski JC,. Burbidge AA., Harrison PL (2012)

AMCS-
"Australian Marine Conservation Society", Autumn 2001, Volume 2 #1, Queensland.

DAFF QLD –
Catch in Shark Control Nets Report. Department of Agriculture and Fisheries. Queensland.
Years 2001-2013

DRPGWS-
Environment Australia, Marine Group, 2001, "Draft Recovery plan for Great White Sharks" December 2001.

DRPMTA-
Environment Australia, 1998, "Draft Recovery Plan for Marine Turtles in Australia", Wildlife Management Section Biodiversity Group.

NSW SMP Report -
New South Wales Shark Meshing (Bather Protection) Program Reports
Years 2010-2014

RPGNS 2001; 2014
Environment Australia, Marine Group, "Recovery Plan for Grey Nurse Sharks".

RPGWS 2002; 2013
Recovery Plan for the White Shark (Carcharodon carcharias), Australian Government

RPMTA -
Recovery Plan for Marine Turtles in Australia. (July 2003) Marine Species Section Approvals and Wildlife Division, Environment Australia in consultation with the Marine Turtle Recovery Team.

19. REFERENCE LIST

Please list key references/documentation you have referred to in your nomination.

Allen S., Marsh H., Hodgson A. (2004) Occurrence and Conservation of the Dugong (Sirenia: Dugongidae) in New South Wales. (2004). *Proceedings of the Linnean Society of New South Wales* **125**, 211- 216.

Cliff G and Dudley FJ (2011) Reducing the environmental impact of shark-control programs: a case study from KwaZulu-Natal, South Africa. Marine and Freshwater Research.

Cardno Ecology Lab. (2010). Development and implementation of a population protocol to provide an estimate of the size of the east coast population of grey nurse sharks *(*Carcharias taurus*).* Draft Stage

Two Report for the Department of Environment, Water, Heritage and the Arts, Canberra.

Commonwealth of Australia, Environment Protection and Biodiversity Conservation Act 1999 No.91, 1999 (EPBC Act 1999)

Commonwealth of Australia, 2002, Australia's Draft National Plan of Action for the Conservation and Management of Sharks.

Ferreira L., Thums M., Meeuwig J.J, Vianna G. M. S. , Stevens J, McAuley R., Meekan M.G: Crossing Latitudes—Long-Distance Tracking of an Apex Predator. PLoS One 10(2): e0116916. doi:10.1371/journal.pone.0116916

Green M, Ganassin C and Reid DD (2009) "Report into the NSW Shark Meshing (Bather Protection) Program", NSW Department of Primary Industries and Fisheries, Conservation and Aquaculture Branch, Public Consultation Document, March 2009.

Gribble.N.A., McPherson.G. and Lane.B., 1998, "Effect of the Queensland Shark Control Program on non-target species: whale, dugong, turtle and dolphin: a review", *Marine Freshwater Resources, 49, page 645-51,*CSIRO, Australia.

Heppell SS., Snover ML,. Crowder LB. (2002) Sea Turtle Population Ecology. Volume 2: CRC Press.

Krogh.M. and Reid. D., 1992, "Assessment of catches from protective shark meshing off New South Wales beaches between 1950 and 1990", *Australian Journal of Marine and Freshwater Research, **43**, page 283-296*, Australia.

Krogh.M. and Reid.D., 1996, "Bycatch in the protective shark meshing programme off south-eastern New South Wales", *Biological Conservation,**77** pages 219-226,* Elsevier Science Limited, Great Britain.

Limpus CJ (2007) A biological review of Australian marine turtle species. 5. Flatback turtle, Natator depressus. Environmental Protection Agency.

Limpus, C. J., Parmenter, J. and Limpus, D. J. (2002). The status of the flatback turtle, Natator depressus, in Eastern Australia. NOAA Technical Memorandum NMFS-SEFSC 477: 140-142.

Marsh.H., De'ath.G.,Gribble.N. and Lane.B., 2001, "Shark Control Records Hindcast Serious Decline in Dugong Numbers off the Urban Coast of Queensland", *Research Publication No. 70,* Great Barrier Reef Marine Park Authority, Australia

Paterson.R. 1979, "Shark meshing takes a heavy toll of harmless marine animals", *Australian Fisheries, October, 1979.*

Paterson.R., 1986, "Shark prevention measures working well", *Australian Fisheries, October 1979.*

Paterson.R.A., 1989, "Effects of Long-Term Anti-shark Measures on Target and Non-Target Species in Queensland, Australia", *Biological Conservation **52,*** Elsevier Science Publishers Ltd, England.

Reid DD, Robbins WD, Peddemors VM (2011) Decadal trends in shark catches and effort from the New South Wales, Australia, Shark Meshing Program 1950-2010. Australian Journal of Marine and Freshwater Research, 62, 676-693Tiger

Queensland, Department of Primary Industries (2001) *Review of the Queensland Shark Control Program: Consultation Draft, December 2001*

World Conservation Union (2000) 2000 IUCN Redlist of Threatened Species, IUCN Gland, Switzerland and Cambridge, UK www.redlist.org

West JG (2011) Changing patterns of shark attacks in Australian waters. Marine and Freshwater Research, 2011, 62, 744–754

20. APPENDIX

Please place here any figures, tables or maps that you have referred to within your nomination. Alternatively, you can provide them as an attachment.

Nominator's details

Note: Your details are subject to the provision of the *Privacy Act* 1988 and will not be divulged to third parties if advice regarding the nomination is sought from such parties.

21. TITLE

Ms

22. FULL NAME

Jessica Morris

23. ORGANISATION OR COMPANY NAME (IF APPLICABLE)

Humane Society International

24. CONTACT DETAILS

Email: Jessica@hsi.org.au
Phone: 02 9973 1728
Postal address: PO Box 439 Avalon NSW 2107

25. DECLARATION

I declare that, to the best of my knowledge, the information in this nomination and its attachments is true and correct. I understand that any unreferenced material within this nomination will be cited as 'personal communication' (i.e. referenced in my name) and I permit the publication of this information.

Signed:

Date: 31/3/2017

** If submitting by email, please attach an electronic signature*

Prior to lodging your nomination

In order for received nominations to be eligible for consideration by the Threatened Species Scientific Committee for inclusion on the Finalised Priority Assessment List, nominations must contain all information required by Division 7.2 of the *Environment Protection and Biodiversity Conservation Regulations 2000* (the Regulations) https://www.legislation.gov.au/Series/F2000B00190.

If the required information is not available to be provided in the nomination because of a lack of scientific data or analysis it, is a requirement of the Regulations that the nomination includes an explicitly statement that the data are not available for that question.

Please check that your nomination contains the required information prior to submission

How to lodge your nomination

Completed nominations may be lodged either:

1. by email to: epbc.nominations@environment.gov.au, **or**
2. by mail to: The Director
   Species Information and Policy Section
   Protected Species and Communities Branch
   Department of the Environment and Energy
   GPO Box 787
   CANBERRA ACT 2601

*** If submitting by mail, please include an electronic copy on memory stick or CD.**

Where did you find out about nominating items?

The Committee would appreciate your feedback regarding how you found out about the nomination process. Your feedback will ensure that future calls for nominations can be advertised appropriately.

Please tick

☐ Department website

☐ *The Australian* newspaper

☐ word of mouth

☐ Journal/society/organisation web site or email? if so which one…….

☐ web search

☐ Other……..