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Shark Meshing (Bather Protection) Program 2017/18 Annual Performance Report

Prepared in accordance with the 2017 Joint Management
Agreement and associated Management Plan

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Executive Summary

Between the 2009/10 and 2016/17 meshing seasons, the Shark Meshing (Bather Protection) Program (SMP) operated in accordance with Joint Management Agreements (JMAs) and an associated Management Plan authorised by the *Fisheries Management Act 1994* (FM Act) and the *Threatened Species Conservation Act 1995* (TSC Act).

A new, single JMA under the FM Act was prepared in 2017 and the 2017/18 meshing season marks the beginning of SMP operations under the 2017 JMA. Some of the key changes to the JMA were refined trigger points and a reduction in the number of target species from 12 to three (White Shark, Bull Shark and Tiger Shark).

The objectives of the JMA are to: minimise the impact of the SMP on threatened and protected species; and ensure that the SMP does not jeopardise the survival or conservation status of threatened species or cause species that are not currently threatened to become threatened.

The JMA and the Management Plan require an annual performance report to be prepared and submitted to the parties to the JMA and relevant scientific committees convened under the FM Act and *Biodiversity Conservation Act 2016* (BC Act) by 31 July each year.

A total of 403 marine animals were caught in the SMP during the 2017/18 meshing season, comprised of 34 target sharks and 369 non-target animals. One hundred and eighty animals (45%) were released alive.

The 34 target sharks comprised 26 White Sharks, 6 Bull Sharks, and 2 Tiger Sharks.

The 369 interactions with non-target animals consisted of:

- 176 non-target sharks, including Grey Nurse Sharks, Great Hammerheads, Smooth Hammerheads, Angel Sharks, Port Jackson Sharks, Thresher Sharks, *Broadnose Sevengill Sharks, *Bronze Whalers, *Dusky Whalers, *Shortfin Makos, *Silky Sharks, *Spinner Sharks, *Common Blacktips, and some *unidentified whalers (* reported as target sharks prior to 2017).
- 172 rays including: a Manta Ray; Southern Eagle Rays; Australian Cownose Rays; Black Stingrays; White Spotted Eagle Ray; Smooth Stingrays; and some unidentified rays.
- 7 marine mammals including: Indo-Pacific Bottlenose Dolphins; and Common Dolphins.
- 14 marine reptiles comprised of: Green Turtles; Leatherback Sea Turtles, Hawksbill Turtles; and an Olive Ridley Turtle.

Sixty (15%) of the interactions were with threatened species comprised of: 26 White Sharks; 20 Grey Nurse Sharks; 9 Green Turtles; 3 Great Hammerheads; and 2 Leatherback Sea Turtles. Ten (2.5%) of the interactions were with protected species comprised of: 4 Common Dolphins; 3 Indo-Pacific Bottlenose Dolphins; 2 Hawksbill Turtles; and an Olive Ridley Turtle.

The trigger point for the objective of '*minimising the impact on non-target species and threatened species*' was tripped in 2017/18 for Grey Nurse Sharks, Great Hammerheads, and Hawksbill Turtles.

The observer program was implemented with observers present on 44% of all net checks (hauls) undertaken by contractors. Observers continued to focus on ensuring collection of biological samples in accordance with the Strategic Research and Monitoring Program. Biological samples (or whole animals) were taken from 179 of the 223 animals found dead in the nets in 2017/18.

In the 2017/18 financial year there were nine (9) shark-human interactions reported in NSW waters. Two interactions were recorded within the SMP region, but only one of those was at a netted beach. Both interactions were determined by DPI as involving White Sharks, with the interaction at the netted beach (Avoca Beach) resulting in a surfer suffering minor injuries to his right shoulder. A surfer was also bumped off his board by an unknown species of shark at Avoca Beach during 2016/17. The other 2017/18 interaction occurred at Congwong Beach, Botany Bay, in which a swimmer suffered serious injuries to her lower right leg. These incidents did not trip the trigger point related to '*reducing the risk to humans from shark attacks at beaches of the SMP*' for the 2017/18 reporting period.

The Management Plan trigger points related to the other objectives of '*minimise OHS risks associated with implementing the SMP*' and '*transparent monitoring and reporting*' were not tripped in 2017/18.

In 2017/18, DPI met all requirements of the JMA and associated Management Plan.

This Annual Performance Report has not identified a need for any amendments to the Management Plan or JMA. A trigger point review report for non-target and threatened species needs to be prepared by DPI within six (6) months of this Annual Performance Report.

Introduction

The Shark Meshing (Bather Protection) Program (SMP) is a public safety measure introduced in 1937 to reduce the risk of shark attack at the State's most popular public bathing beaches. Surf Life Saving NSW figures indicate that an average of almost 3.9 million people annually swam at those beaches over the last six years. Under the current program, 51 beaches between Wollongong and Newcastle (Table 1, Map 1) are netted by contractors using specially designed mesh nets.

The aim of the SMP is to reduce the threat of shark attack within the area of the SMP whilst minimising impacts on non-target species. The only fatality at a meshed beach occurred over 60 years ago, but the nets are not a guarantee that shark encounters will not occur at meshed beaches. Thirty-three (33) shark encounters have reportedly occurred at meshed beaches, eight (8) of which involved target sharks: six with White Sharks and one with each of a Tiger and Bull Shark. Other encounters at meshed beaches were with unknown species (12), Wobbegongs (9), and unidentified whalers (4). Some of the White Shark bites have caused serious injuries, however the shark bite data for the SMP and similar programs in other jurisdictions indicate that those programs have reduced the rate of interactions (Dudley, 1997).

Traditional shark bite mitigation programs such as the SMP invariably affect non-target species, and the SMP is listed as a key threatening process in the *Fisheries Management Act 1994* and the *Biodiversity Conservation Act 2016* as it adversely affects threatened species, populations or ecological communities, and could cause species, populations or ecological communities that are not threatened to become threatened.

The operation and environmental impacts of the SMP were reviewed in 2009, and between 2009/10 and 2016/17 it operated in accordance with Joint Management Agreements (JMAs) and an associated Management Plan authorised under the *Fisheries Management Act 1994* (FM Act) and the *Threatened Species Conservation Act 1995* (repealed by the *Biodiversity Conservation Act 2016*). The purpose of a JMA is to manage, regulate or restrict an action that is jeopardising the survival of a threatened species, population or ecological community.

The JMAs included provisions for 5-yearly reviews, and those reviews gave rise to a single 2017 JMA between the Minister for Primary Industries and the Chief Executive of the Office of Environment and Heritage in accordance with section 221W(3) of the FM Act. This Annual Performance Report was prepared in accordance with the 2017 JMA and the 2017 Management Plan for the SMP (<https://www.dpi.nsw.gov.au/fishing/sharks/management/shark-meshing-bather-protection-program>).

The objectives of the JMA are to:

1. Minimise the impact of shark meshing on fish and marine vegetation which are a threatened species, population or ecological community, and on marine mammals, marine birds and marine reptiles which are protected fauna or a threatened species, population or ecological community.
2. Ensure that shark meshing does not jeopardise the survival or conservation status of threatened species, populations or ecological communities, or cause species that are not threatened to become threatened.

To achieve the objectives of the JMA, the DPI will:

- only carry out shark meshing in accordance with the JMA and the associated Management Plan.
- only carry out shark meshing during the meshing season (1 September - 30 April of the following year).
- ensure that nets are fitted with acoustic warning devices for cetaceans.
- require that contractors comply with by-catch reduction protocols and release protocols contained in the Management Plan and any release plans.

- continue research into methods of minimising by-catch of non-target species through implementation of the Strategic Research and Monitoring Program contained in the Management Plan.
- provide comprehensive release plans to the parties to the JMA as required.

The objectives of the Management Plan are to:

1. Reduce the risk to humans from shark attack at beaches subject to the SMP, and, consistent with that objective:
2. Minimise the impact on non-target species and to ensure that the SMP does not jeopardise the survival or conservation status of threatened species, populations and ecological communities, or cause species that are not threatened to become threatened.
3. Minimise occupational health and safety risks to contractors and agency personnel associated with implementing the SMP.
4. Ensure that monitoring and reporting on the SMP is undertaken in a transparent manner.

Table 1 The 7 regions and 51 beaches of the SMP meshed in the 2017/18 season.

Hunter	Central Coast North	Central Coast South	Sydney North	Sydney Central	Sydney South	Illawarra
Stockton	Blacksmiths*	Terrigal	Palm	North Narrabeen	Bondi	Wattamolla
Nobbys	Caves	North Avoca	Whale	Narrabeen	Bronte	Garie
Newcastle	Catherine Hill	Avoca	Avalon	Dee Why	Coogee	Coledale
Bar	Lakes	Copacabana	Bilgola	Curl Curl	Maroubra	Austinmer
Dixon Park	Soldiers	MacMasters	Newport	Harbord	Wanda	Thirroul
Merewether	The Entrance	Killcare	Mona Vale	Queenscliff	Elouera	North Wollongong
Redhead	Shelly	Umina	Warriewood	North Steyne	North Cronulla	South Wollongong
				Manly	Cronulla	

* Denotes that Blacksmiths was historically called Swansea-Blacksmiths

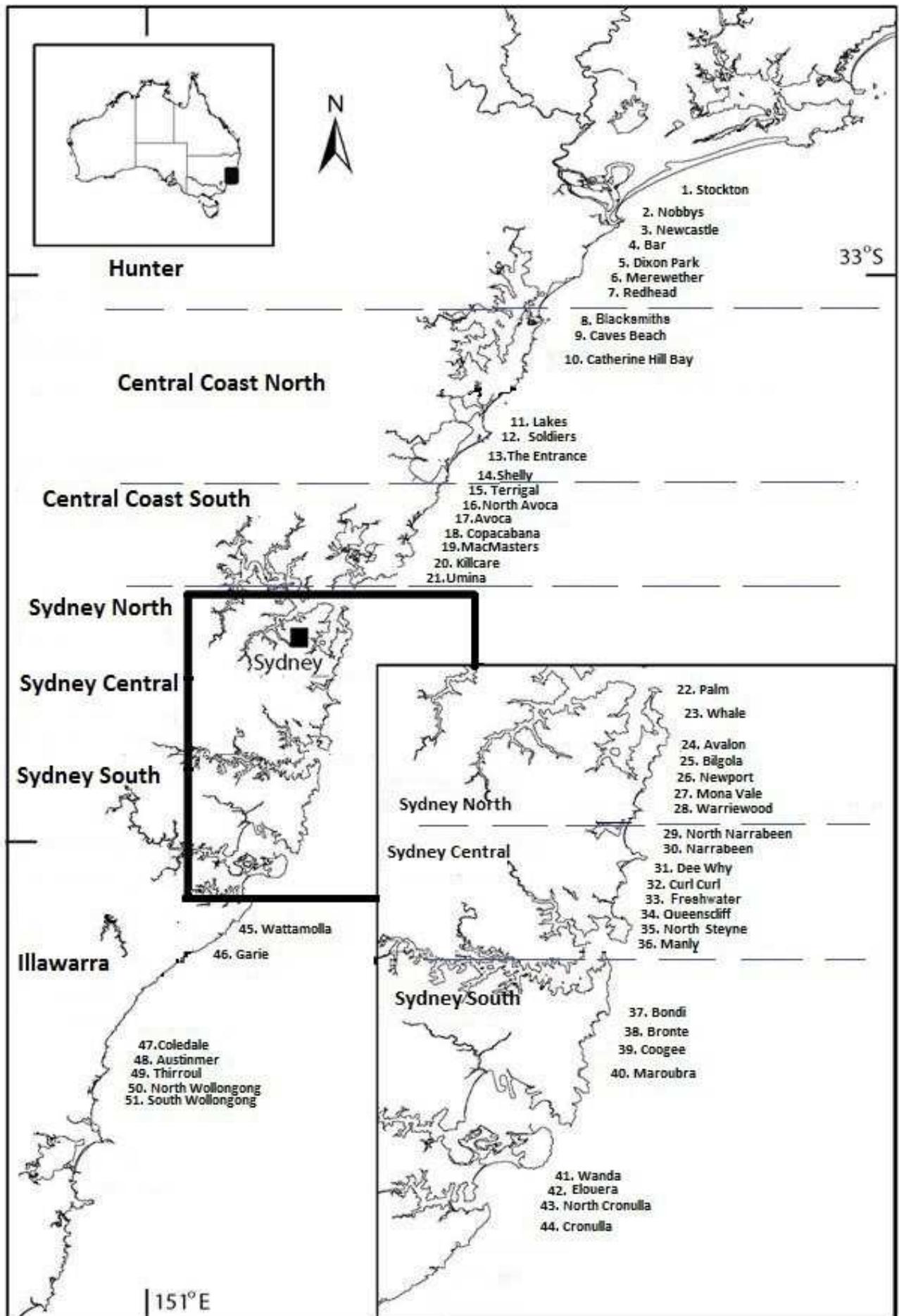


Figure 1 Location of Shark Meshing (Bather Protection) Program beaches.

1 SMP Management Plan Performance Assessment

In accordance with the requirements of the JMA and the Management Plan, this Annual Performance Report has been prepared for the Fisheries Scientific Committee (FSC) and the Scientific Committee (SC) to inform their annual review of the performance of all parties to the JMA. The FSC and SC will advise the Minister for Primary Industries and the Chief Executive Officer of OEH, respectively, of any deficiencies in implementation of the JMA by either party. This report and the advice of the FSC and SC are also publicly available.

1.1 Controls on the activity

The Management Plan sets out the controls on the activity by specifying the operational parameters of the program including: contract management, restrictions on waters, timing, gear and methods, and environmental protection provisions.

- Nets and equipment were inspected prior to the commencement of the season to ensure all contractors were complying with current contract conditions.
- All other aspects of the program related to contract management, restrictions on waters, timing, gear and methods, and environment protection provisions remained in line with the contract as per previous years.
- The 51 nets are now distributed across 7 meshing regions instead of 6, with net numbers and geographic size of regions more even, where possible.
- All contractor vessels are required to operate a Vessel Monitoring System (VMS) whilst undertaking meshing activities. The VMS units are owned by the Department, and live monitoring of vessels is conducted by the DPI shark meshing supervisor.
- All vessels are required to carry at least two spare nets before going to sea.
- Contractors are required to own and have inspected a minimum number of nets, depending on the number of nets in their respective region.
- More rigorous auditing processes through cross referencing of VMS data, contractor catch reports, observer reports, and compliance reports.

The following lost or damaged nets were reported during the 2017/18 season, and represents the highest number of damaged nets attributed to whales since accurate records were first kept in 2009/10. Note that these reports include those where there was apparent interference with nets:

- 8 September 2017, Sydney Central contractor reported that the net at North Narrabeen had been vandalised, with the head rope and approximately 15m of mesh being cut.
- 29 September 2017, Central Coast South contractor reported that the North Avoca net had been vandalised, with approximately 35m of mesh being cut.
- 29 September 2017, Central Coast North contractor reported that the net at Shelly Beach had been damaged; believed to be from a whale. All net mesh and ropes were recovered.
- 2 October 2017, Hunter contractor reported that the net at Nobbys Beach had been damaged; believed to be from a whale*. All net mesh and ropes were recovered.
- 3 October 2017, Sydney North contractor reported that the Palm Beach net had been vandalised, with approximately 30m of mesh being cut.
- 4 October 2017, Hunter contractor reported that the net at Newcastle Beach had been damaged, believed to be from a whale*. All net mesh and ropes were recovered.
- 5 October 2017, Central Coast North contractor reported that the net at The Entrance Beach had been damaged, believed to be from a whale*. All net mesh and ropes were recovered.

- 6 October 2017, Central Coast South contractor reported that the net at Avoca Beach had been damaged, believed to be from a whale*. All net mesh and ropes were recovered.
- 16 October 2017, Sydney Central contractor reported that the Narrabeen net had a large amount of damage with over 30m of net being torn. Suspected whale damage*, but unsure. All net mesh and ropes were recovered.
- 20 October 2017, Central Coast North contractor reported that the net at The Entrance Beach had been damaged, believed to be from a whale*. All net mesh and ropes were recovered.
- 25 October 2017, Central Coast North contractor reported that the net at Lakes Beach had been torn in half, with the damage believed to be from a whale*. All net mesh and ropes were recovered.
- 28 October 2017, Central Coast North contractor reported that the net at Blacksmiths Beach was found approximately 900m south of where it was set. The net was found to have torn mesh (over 10m wide in the middle of the net), and it was suspected that a whale had dragged and damaged the net*. All net mesh and ropes were recovered.
- 30 October 2017, Central Coast North contractor reported that nets at Caves, Shelly and Lakes Beaches all had suspected whale damage*. All net mesh and ropes were recovered.
- 3 November 2017, Hunter contractor reported that the net at Newcastle Beach had been damaged (suspected whale damage*) and approximately 5m of the net mesh was missing from the northern end of the net; remainder of mesh and ropes were recovered.
- 20 November 2017, Sydney North contractor reported that the net at Palm Beach had suspected whale damage*. All net mesh and ropes were recovered.

* Contractors report 'suspected whale damage' to nets when it is obvious that the net mesh and/or ropes have been torn, snapped or broken under strain, as opposed to being cut. These reports also coincide with the whale migration season.

1.2 Observer Program

The Management Plan requires an Observer Program to operate as part of the SMP.

Employment of Observers

To satisfy the Observer Program requirements, a recruitment process was conducted before the beginning of the 2017/18 season to employ two full-time employees dedicated to the SMP (one full-time permanent and one full-time temporary). These two full-time positions were supported by the engagement of an additional two observers employed on a casual basis for the eight months of the SMP. Two of the observers conducted their duties predominantly in the Hunter, Central Coast North and Central Coast South regions, with the other two observers focusing efforts in the Sydney North, Sydney Central, Sydney South and Illawarra regions; however, observers were not restricted to specific regions and were utilized across all regions as required and when available. Observers also assisted the Shark Scientist with collation of data, dissections and cataloguing of collected biological samples, purchasing and maintaining acoustic alarms and other duties associated with the SMP.

Training of Observers

The duties of the observers require that they have a good general knowledge of the meshing operations as specified in the Tender Specification and are proficient at shark identification. Most importantly, observers require training and equipment to undertake the work safely, particularly with regard to seagoing skills, assisting in the release of entangled animals and performing animal dissections and tissue sampling.

To ensure the observers were competent and resourced to safely undertake the duties prescribed in the Observer Program for the 2017/18 meshing season, DPI conducted a training day on 9 August 2017 at the Sydney Institute of Marine Sciences, Mosman. This day is a

refresher for the observers who each have over four years experience conducting these duties, while allowing for an introduction to any new technologies that may be used in the upcoming season. Both the observers and contractors attended this day. The day broadly covered management changes; contract management; administration; threatened species; new technologies; and research requirements. Observers participate in necropsies of sharks collected for research purposes and enhance their dissection skills whilst overseen by DPI Shark Scientists. Any specialized sample collection techniques for new collaborative research projects are highlighted and practiced during these necropsies.

Number of Observer Days

Observers were present for 44% of all net inspections by contractors during the 2017/18 season, a 30% increase on coverage during the 2016/17 season. A breakdown by region of observer coverage is provided in Table 2.

Table 2 Total net inspections by region during 2017/18 meshing season.

Meshing Region	Total No. of net Inspections	No. of net inspections with observer present	% of net inspections observed
Hunter	726	328	45%
Central Coast North	726	315	43%
Central Coast South	728	357	49%
Sydney North	728	301	41%
Sydney Central	833	368	44%
Sydney South	832	368	44%
Illawarra	728	322	44%
Total	5301	2359	44%

Outcomes of Observer Program

Outcomes of the Observer Program for the 2017/18 meshing season include:

1. Catches of target and non-target species taken in nets were certified by the observer where they were present at the time and included in monthly catch data sheets (records held by DPI Fisheries, Ourimbah).
2. The observers provided accurate details for all witnessed net inspections using iPhones equipped with a customised data recording application. All the data are uploaded and stored on the Fisheries Compliance Database. Figure 2 shows the catch numbers recorded by the contractors when an observer was present or absent.
3. Details for all marine mammals and reptiles captured in nets were reported to DPI and OEHL via a monthly report.
4. Collection of 179 biological samples and 35 whole animals.

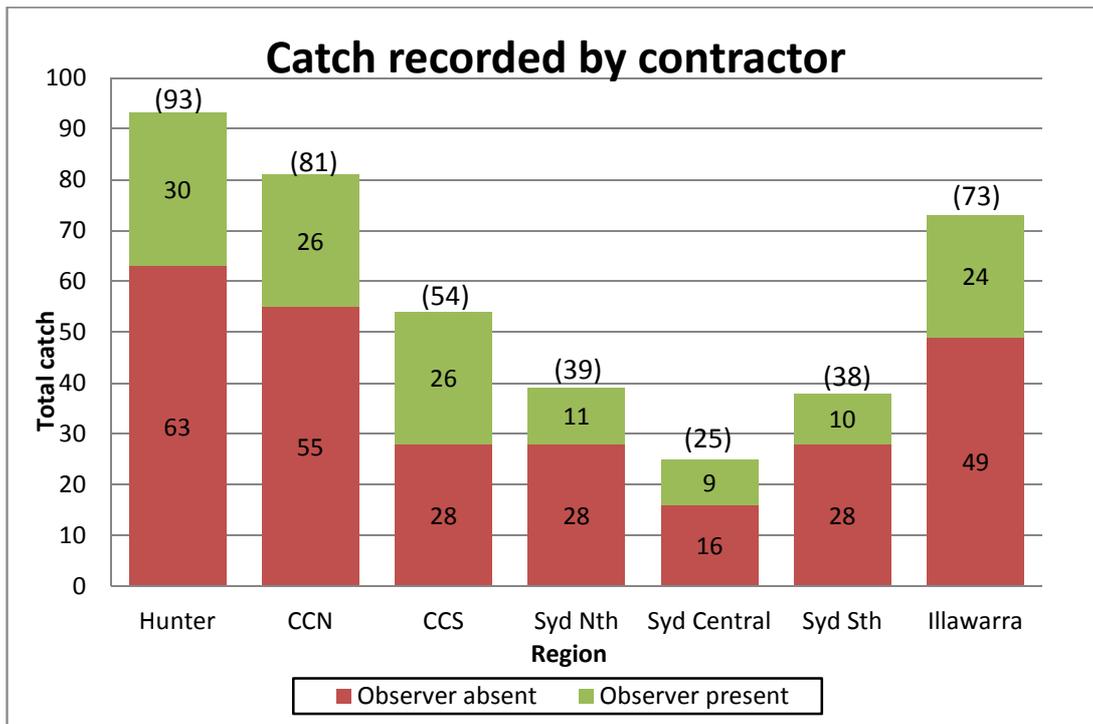


Figure 2 Catch recorded by contractor when observer present or absent during 2017/18 meshing season.

1.3 Compliance Plan

The Management Plan requires a Compliance Plan to be implemented as part of the SMP.

Audit and Compliance Checks in 2017/18

Compliance inspections were undertaken prior to and during the 2017/18 meshing season.

- Pre-season checks of the contractors' nets were conducted by the DPI Shark Meshing Program Supervisor and/or DPI Fisheries Officers. A small number of minor issues were detected during these inspections with some being rectified on the spot, and others requiring reinspection of the nets. All nets complied with current contract conditions prior to the commencement of the 2017/18 meshing season.
- Fisheries Officers physically inspected mesh nets off 39 of the 51 SMP beaches from offshore patrol vessels or on board the contractor's vessels.
- Fisheries Officers and the Shark Meshing Program Supervisor conducted numerous overt and covert inspections of the contractors' operations throughout the meshing season. Fisheries Officers were also encouraged throughout the season to carrying out random, thorough inspections of the mesh nets during their routine offshore patrol work. All inspections were recorded on smart devices utilising a customised data recording application. All the data are then uploaded and stored on the Fisheries Compliance Database.

Table 3 displays the number of inspections by Fisheries Officers per region and whether the outcome was a 'comply' or 'non-comply' for the contracts.

Table 3 Counts of compliance inspections and percentage compliance by region undertaken during 2017/18.

Region	Inspection Count	Comply	Non-comply		% Comply
			pre-season	meshing season	
Hunter	5	5	-	-	100%
Central Coast North	6	6	-	-	100%
Central Coast South	24	23	-	1	96%
Sydney North	32	32	-	-	100%
Sydney Central	44	44	-	-	100%
Sydney South	15	15	-	-	100%
Illawarra	4	4	-	-	100%
Total	130	129	0	1	99%

Contractors are required to check their set nets every 72 hours weather permitting. This commitment was met on the majority of occasions with 94% of set net inspections taking place within the 72 hour timeframe. The occasions where this requirement was not met was mostly due to severe weather conditions with four other occasions due to vessel breakdowns. These breakdowns were fixed or a replacement vessel used to inspect the set nets on the next day. The intention of the 72 hour inspection timeframes is to potentially increase the chances of survival of any marine life caught in the nets.

Overall compliance

Compliance with contractual arrangements must be greater than 80% under the Compliance Plan.

Compliance by all contractors exceeded 80% for the following tasks:

- The compliance rate for the size, length and marking of nets was 100%. Minor issues detected and rectified on the spot during the preseason inspections of the contractors' nets, were not recorded as non-compliance issues by Fisheries Officers. The only non-compliance issues reported by Fisheries Officers during the meshing season was one instance of a hole in a net; which was observed prior to the contractor servicing the net on the same day. The net was repaired on the day to the satisfaction of the observer on board.
- The compliance rate for dolphin pinger and whale alarms presence and placement on nets was 100%.
- The overall compliance rate by contractors was 99% in accordance with the Shark Meshing (Bather Protection) Program Compliance Plan, which specifies that the rate of compliance will be calculated on a per/100 basis (e.g. if there is non-compliance detected in one of every ten inspections the compliance rate will be recorded at 90%).
- The 99% compliance rate includes pre-season 'on land' net inspections, before the nets were set. As mentioned earlier, a small number of minor issues were detected and immediately rectified during the pre-season inspections, and therefore not reported as non-compliance issues by Fisheries Officers.
- The contractors are required to comply with a range of specifications under the contract outside of routine overt and covert inspections. During the 2017/18 meshing season all contractual requirements were met by all contractors, with no instances of non-compliance detected.

All non-compliance issues in 2017/18 were resolved to the satisfaction of the DPI Shark Meshing Supervisor.

1.4 Strategic Research and Monitoring Program

The Management Plan requires a Strategic Research and Monitoring Program to be implemented as part of the SMP. The purpose of the Strategic Research and Monitoring Program (SRMP) is to provide information that will lead to continuous improvement in the operation of the SMP and in achieving the objectives of the Management Plan.

- Table 4 provides details of the SRMP research topics and their current status.
- Table 5 provides the outcomes of the SMP Monitoring Program for 2017/18.

Table 4 SRMP Research Topics and Current Status.

Level 1: Identify information gaps and research needs	
Level and Topic	Status and Comment
1.1 Review and report on research and information needs, funding requirements and possible sources of funding.	<p>Status: Complete</p> <p>Activities in 2017/18: none</p> <p>Reported in the 2010/11 Report.</p>
Level 2: Data collection and review of existing data	
Level and Topic	Status and Comment
2.1 Review and refine data collection methods	<p>Status: Ongoing.</p> <p>2.1.1: Review data collection methods used in the SMP.</p> <p>Activities in 2017/18: no change to data collection methods as onboard photography for species confirmation has proved efficient and effective.</p> <p>2.1.2: Develop refined catch data forms and identification resources.</p> <p>Activities in 2017/18: Sea Turtle identification resources were updated. NSW DPI Threatened Species Unit developed a new Hammerhead shark identification guide in collaboration with the DPI Shark Scientist.</p> <p>2.1.3: Identify associated training programs for observers and contractors.</p> <p>Activities in 2017/18: The most prominent training required for the 2017/18 meshing season for observers and contractors was reiterating tagging procedures for nominated shark species and disentanglement procedures for non-target species from OEH. The successful release of 45% of animals alive from the SMP nets highlights the relevance and importance of these protocol reviews.</p>

Level 2: Data collection and review of existing data	
<p>2.2 Review genetic samples to compare with reported species identification.</p>	<p>Status: Ongoing.</p> <p>2.2.1: Review shark genetic samples held by DPI and cross-reference with reported species identification.</p> <p>Activities in 2017/18: 58 genetic samples from hammerhead sharks caught in the 2016/17 shark meshing season were provided to the Australian Centre for Wildlife Genomics at the Australian Museum. Three of these samples were unable to be analysed due to failing quality control. All 55 samples that were successfully tested returned a DNA-based species identification that matched the morphological species identification provided (1x Scalloped Hammerhead Shark; 1x Great Hammerhead Shark; 53x Smooth Hammerhead Shark – Frankham 2017 – Australian Centre for Wildlife Genomics Results Report for Case AM238).</p> <p>2.2.2: Identify associated training programs/resources for observers and contractors.</p> <p>Activities in 2017/18: Although training of observers and contractors reiterated shark and ray identification accuracy, as per previous years, the training day for the 2017/18 shark meshing season particularly focused on turtle species and sex identification training.</p>
<p>2.3 Review data on temporal and spatial factors affecting the operation of the SMP.</p>	<p>Status: Ongoing.</p> <p>2.3.1: Review research being conducted on White Shark movements.</p> <p>Activities in 2017/18: The RAAP Post Doctoral scientist working with the DPI Shark Scientists has been analyzing White Shark movement data for CSIRO. These analyses will be incorporated in the analysis of White Sharks acoustically tagged and released from SMART Drumline trials as part of the NSW Shark Management Strategy (SMS). Over 250 White Sharks have been tagged since August 2015 as part of the NSW SMS. The success of external deployment of acoustic tags by contractors on White Sharks released from the SMART Drumlines has led to development of similar tags and tagging procedures to implement in the SMP during 2018/19.</p>
<p>2.3 Review data on temporal and spatial factors affecting the operation of the SMP.</p>	<p>2.3.2: Review existing data on other species (e.g. Tiger Shark, Bull Shark).</p> <p>Activities in 2017/18: There have been no substantial increases in knowledge or research on Tiger Sharks occurring in NSW in 2017-18 that would affect the operations of the SMP. However, 37 Tiger Sharks have been tagged with acoustic tags as part of the NSW SMS. Four of these are also equipped with satellite tags. Their movement tracks are publically available at http://www.seaturtle.org/tracking/?project_id=1141. Once more Tiger Sharks are tagged, this data will provide better understanding of Tiger Shark movements and potential risk to bathers in NSW waters. Tiger Sharks released alive from the SMP will be externally tagged with acoustic tags, as per procedures used by SMART Drumline contractors in northern NSW.</p> <p>Bull Shark movement research continued in 2017/18 with 61 individuals acoustically tagged since August 2015. A new manuscript for publication in a scientific journal detailing movement patterns of Bull Sharks in Sydney Harbour is in preparation, as is a manuscript examining environmental factors affecting Bull Shark movements and abundance.</p> <p>A manuscript examining environmental effects on shark catches in the SMP has been prepared and submitted to the scientific journal Marine Ecology Progress Series, with an anticipated publication date of mid-July 2018 (Lee, <i>et al.</i> 2018).</p>

Level 2: Data collection and review of existing data**2.3.3: Review existing data on spatial and temporal movements of non-target species.**

Activities in 2017/18: No new data on non-target species spatial and temporal movements on the east coast of Australia were published.

2.4 Review data on shark interactions and beach usage.

Status: **Ongoing.**

2.4.1: Access / review data collection by various organisations

Activities in 2017/18: The DPI Shark Scientist cross-references data held by the Australian Shark Attack File and the International Shark Attack File to report on any incidents associated with meshed beaches.

Number of sharks sighted by Surf Life Saving (SLS) NSW.

The reduced number of shark sightings in the SLS NSW database for the current reporting period (2017/18) reflects a change in the way SLS NSW records shark sightings on patrolled beaches since 2016/17. This was brought about as the number of reported sightings reached a level where it impacted upon the incident management process within the State Operations Centre (SOC).

Patrollers and the general public, presumably following heightened awareness from media focus, were communicating several **unconfirmed** sightings daily. As a result, SLS NSW started recording only sightings where a lifesaver or lifeguard was able to confirm the presence of a shark by a second sighting.

Shark sightings

Region	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Hunter	21	33	60	28	8	1
Central Coast	12	38	29	24	1	3
Sydney	46	46	46	58	8	1
Illawarra	3	7	4	7	0	1
Total	82	124	139	117	17	6

2.4.2: Review data on beach usage rates and future usage predictions.

From 2006 to 2036 the population of NSW is projected to grow by over 2.3 million as natural increase and net overseas migration drive growth, while Sydney's population is projected to grow by 1.7 million people during this period (DECCW, 2009). An ongoing increase in beach usage in the area of the SMP can be expected into the foreseeable future given these predictions and recent data collected by SLSNSW.

Visitations

Region	2013-14	2014-15	2015-16	2016-17	2017-18
Hunter	741,444	690,343	728,803	764,529	729,592
Central Coast	1,260,034	1,241,243	1,145,309	1,173,890	736,021
Sydney	3,488,837	3,897,491	3,681,255	3,743,419	3,526,008
Illawarra	304,703	392,447	363,194	380,299	343,473

	Total	5,795,018	6,221,524	5,918,561	6,062,137	5,335,094*
* Patrol period for 2017-2018 was between the 23 Sept to 29 April						
<p>SLS NSW provided the following beach visitation figures for the past nine years for the beaches listed. The recorded beach visitation is the combined total of attendance as assessed in the morning at the start of each patrol, the mid patrol point (1pm) and in the evening at the end of each patrol for the period 25 September to 25 April of the next consecutive year. The average summer beach visitation within the area of the SMP over the last eight years has increased to over 6 million people per annum.</p> <p>Beaches included in SLS NSW beach visitation data</p> <p>Hunter: Birubi Point, Catherine Hill Bay, Caves Beach, Cooks Hill, Dixon Park, Fingal Beach, Merewether, Newcastle, Nobbys, Redhead, Stockton, Swansea Belmont, Tea Gardens/ Hawks Nest.</p> <p>Central Coast: Avoca Beach, Copacabana, Killcare, MacMasters, North Avoca, North Entrance, Ocean Beach, Shelly Beach, Soldiers Beach, Terrigal, The Entrance, The Lakes, Toowoong Bay, Umina, Wamberal.</p> <p>Sydney: Avalon Beach, Bilgola Beach, Bondi, Bronte, Bungan Beach, Burning Palms, Clovelly, Collaroy, Coogee, Cronulla, Dee Why, Elouera, Era, Freshwater, Garie, Long Reef, Manly, Maroubra, Mona Vale, Narrabeen, Newport, North Bondi, North Cronulla, North Curl Curl, , North Narrabeen, North Palm Beach, North Steyne, Palm Beach, Queenscliff, South Curl Curl, South Maroubra, South Narrabeen, Tamarama, Warriewood, Wanda, Whale Beach.</p> <p>Illawarra: Austinmer, Bellambi, Bulli, Coalcliff, Coledale, Corrimal, Fairy Meadows, Helensburgh Stanwell, North Wollongong, Port Kembla (NSW), Sandon Point, Scarborough Wombarra, Thirroul, Towradgi, Windang, Wollongong City, Woonona.</p> <p>Data obtained to date on shark interactions/sightings and beach usage has not indicated that any changes are required to the operation of the SMP</p> <p>2.4.3: Develop better links between agencies and develop systems to optimise collection and use data.</p> <p>Activities in 2017/18: None</p>						

<p>2.5 Review effectiveness of fishing operations used in shark control programs</p>	<p>Status: Ongoing.</p> <p>2.5.1: Review NSW shark meshing net configurations. Activities in 2017/18: Standard shark net configurations (e.g. mesh size, twine materials, vertical fishing height) have been modified during the SMS shark net trials on the NSW north coast. Once the catch data have been analysed results will be considered for potential inclusion for trials in the SMP shark nets.</p> <p>2.5.2: Review the application of other shark control measures for use in NSW (e.g. drum lines). Activities in 2017/18: The NSW SMS has been trialling several alternative non-lethal shark bite mitigation measures, including SMART Drumlines which are designed to alert contractors as soon as a shark is captured on the gear (https://www.dpi.nsw.gov.au/fishing/sharks/management/smart-drumlines) and thereby reduce marine wildlife mortalities whilst still providing bather protection. Results have been very positive, with only two mortalities (both White Sharks) for the 266 target sharks caught to date (https://www.dpi.nsw.gov.au/fishing/sharks/management/smart-drumlines/1-31-may-2018). Similarly, non-target species mortalities have been very low.</p> <p>2.5.3: Use the outcomes of those reviews to trial gear-related modifications of the SMP. Activities in 2017/18: None</p>
<p>2.6 Develop methodologies for standardising fishing effort and analysing comparative CPUE data.</p>	<p>Status: Completed</p> <p>2.6.1: Investigate the feasibility of standardising soak-times for shark nets. Activities in 2017/18: Soak times were standardised in 2014/15 as part of the season contracts with contractors required to check their set nets every 72 hours weather permitting. These standardised procedures were continued throughout the 2017/18 season.</p> <p>2.6.2: Develop alternative approaches to standardised soak-times. Activities in 2017/18: No alternative approaches were developed.</p>

Level 3 Establish/support collaborative research (e.g. CSIRO, other government agencies and universities)

Level and Topic	Status and Comment
3.1 Research needs identified (e.g. environmental impacts of shark meshing).	<p>Status: Ongoing</p> <p>3.1.1: Distribution, abundance, biology and ecology of target species affected by the SMP.</p> <p>Activities in 2017/18: The first estimate of the total White Shark population size was published in collaboration with the CSIRO using genetic samples from the SMP (Hillary <i>et al.</i>, 2018. Genetic relatedness reveals total population size of White Sharks in eastern Australia and New Zealand. <i>Scientific Reports</i> (2018) 8: 2661. Doi:10.1038/s41598-018-20593-w).</p> <p>The NSW Research Attraction & Acceleration Program (RAAP) funding to NSW IMOS is allowing several analyses to determine environmental factors driving abundance, distribution and movements of target shark species in NSW coastal waters. The first of these is published as Lee <i>et al.</i>, 2018.</p> <p>A new PhD on White Shark foraging ecology was started in 2018 and is already seeing results disseminated in the scientific literature (Grainger <i>et al.</i>, 2018).</p> <p>Population genetics for White Sharks has recently been boosted by the new innovative techniques of close-kin genetics developed by CSIRO and in which samples obtained through the SMP have played a key role ((Hillary <i>et al.</i>, 2018. Genetic relatedness reveals total population size of White Sharks in eastern Australia and New Zealand. <i>Scientific Reports</i> (2018) 8: 2661. Doi:10.1038/s41598-018-20593-w). This study is currently the world's leading effort to ascertain population size for this species. These CSIRO-led studies will now continue further to attempt using next-of-kin genetics (cousins and aunts/uncles) in efforts to determine whether the population is stable, increasing or decreasing.</p> <p>A collaborative project to determine White Shark foraging behaviour has been initiated in collaboration with University of Sydney in an attempt to understand the drivers behind their occasional interactions with humans. Specially designed animal-borne cameras will be deployed on the sharks to record their nearshore behaviour.</p> <p>Aerial survey data on shark and prey abundance and distribution are currently being analysed for preparation of a publication within the second half of 2018 as part of the RAAP Post-doc (see above). It is anticipated that this will link back to DPI messaging about bather safety and thereby inform various media and community engagement messaging.</p> <p>An analysis of environmental, spatial and temporal influences on the occurrence of White Sharks along the NSW coast using tagged animal data collected from VR4G listening stations as part of the NSW SMS was presented at the Sharks International Conference in 2018 (Spaet <i>et al.</i>, 2018).</p>

Level 3 Establish/support collaborative research (e.g. CSIRO, other government agencies and universities)

3.1.1 : *Distribution, abundance, biology and ecology of target species affected by the SMP.*

Activities in 2017/18: None

3.1.2 *Distribution, abundance, biology and ecology of non-target species affected by the SMP.*

Activities in 2017/18: Research into better understanding processes involved in growth of sharks and the laying down of cartilage during this process continued during the past year using samples obtained from the SMP (Raoult *et al.*, 2018).

Research into Smooth Hammerhead Shark (*Sphyrna zygaena*) biology and distributional ecology using samples from the SMP concluded with the awarding of an M.Phil degree from University of Newcastle to one of the SMP observers (Wray-Barnes, 2017).

Genetic samples of Smooth Hammerhead Sharks (*Sphyrna zygaena*) caught in the SMP contributed to a study of the global genetic population structure of this species (da Silva Ferrette, *et al.*, 2018 - Poster presentation ID69 at Sharks International 2018, 3-8 June 2018, João Peso, Brazil).

Samples for the Great Hammerhead Sharks (*Sphyrna mokarran*) caught in the SMP are contributing to a new research program through Newcastle University investigating the trophic ecology and geographic patterns of this species.

Genetic samples from Dusky Whaler Sharks (*Carcharhinus obscurus*) caught in the SMP have contributed to a national-scale comparative study of population genomics of Sandbar and Dusky Whaler Sharks caught in Australian fisheries. Junge *et al.*, submitted to *Marine Biology*. MABI-D-18-00101)

Research into Australian Cownose Rays (*Rhinoptera neglecta*) and Southern Eagle Rays (*Myliobatis australis*) was initiated through Macquarie University, however low sample numbers due to the high release of live animals caught in the SMP led to postponement of this Masters degree.

All deceased Grey Nurse Sharks are retrieved whole and contribute to the ongoing DPI Fisheries research program on this species.

Catch data for marine mammals has contributed to the National Assessment of Cetacean Entanglements in Fishery Gear in Australia (Tulloch *et al.*, 2017).

Level 3 Establish/support collaborative research (e.g. CSIRO, other government agencies and universities)

Previous: Although non-target species have not formed the focus of DPI research efforts to date, research into Wobbegong Shark distribution, ecology and movements has been conducted in collaboration with Macquarie University, Sydney Aquarium and NSW OEH. Two Wobbegong Shark collaborative manuscripts were published in 2014-15 (Lee *et al.* 2014; Lee *et al.* 2015).

Research has been initiated through Newcastle University investigating Smooth Hammerhead (*Sphyrna zygaena*) biology and fishery interactions as this species represents one of the highest shark catch species in the SMP. The catch data were presented at the scientific conference 'Sharks International', held in South Africa in 2014. An M.Phil dissertation has been submitted and chapters are being prepared for publication.

Dusky Shark tissue samples from the SMP have been included in genetic research into the effective population size of Dusky Sharks as part of NSW DPI investigations into the NSW large shark commercial fishery through support of the FRDC on behalf of the Australian Government.

Research into the fishery, biology and ecology of Australian Angelsharks through Macquarie University has provided new information for Australian Angelsharks in NSW that will be of direct relevance to the SMP (Raoult *et al.* 2016: doi. 10.1071/MF15369).

The DPI Shark Scientist has been involved in advising on some of Macquarie University cetacean research initiatives and, in collaboration with Macquarie University and OEH, has been involved in research into the efficacy of whale alarms on shark nets (Harcourt *et al.* 2014; Pirota *et al.* 2016). As an international expert on acoustic dolphin deterrents (ADDs) popularly known as 'pingers' and member of the international World Wildlife Fund (WWF) Cetacean Bycatch Task Force, the DPI Shark Scientist has assisted in reviewing the efficacy of pingers in reducing dolphin bycatch in the South African shark nets in collaboration with the KwaZulu-Natal Sharks Board. The results of this work have been reviewed with respect to implications for the SMP leading to the deployment of alternative (70kHz) pingers in the NSW shark nets. These 'new' pingers have recently been designed to be more targeted to the hearing range of dolphins, rather than the historically available 10kHz pingers that were originally designed for porpoises. Additionally, the DPI Shark Scientist has assisted in trials of an alternative active acoustic device, the DDD pinger, in the experimental shark nets off the NSW north coast. Results from these trials will be assessed for potential transfer to the SMP.

Level 3 Establish/support collaborative research (e.g. CSIRO, other government agencies and universities)

3.2 Establish DNA library of shark species taken in the SMP to improve accuracy of identification.

Status: **Ongoing**

3.2.1: *Conduct collaborative research with relevant research institutions.*

Activities in 2017/18: Genetic samples of Smooth Hammerhead Sharks (*Sphyrna zygaena*) caught in the SMP contributed to a study of the global genetic population structure of this species (da Silva Ferrette, *et al.*, 2018 - Poster presentation ID69 at Sharks International 2018, 3-8 June 2018, João Peso, Brazil).

Genetic samples from Dusky Whaler Sharks (*Carcharhinus obscurus*) caught in the SMP have contributed to a national-scale comparative study of population genomics of Sandbar and Dusky whaler sharks caught in Australian fisheries. Junge *et al.*, submitted to *Marine Biology*. MABI-D-18-00101).

The world's first population assessment for White Sharks using close-kin genetics was published in collaboration with CSIRO (Hillary *et al.*, 2018). Genetic relatedness reveals total population size of White Sharks in eastern Australia and New Zealand. *Scientific Reports* (2018) **8**: 2661. Doi:10.1038/s41598-018-20593-w). These CSIRO-led studies will now continue further to attempt using next-of-kin genetics (cousins and aunts/uncles) in efforts to determine whether the population is stable, increasing or decreasing.

An analysis of Hammerhead Shark (*Sphyrna* spp.) genetic samples was undertaken by the Australian Centre for Wildlife Genomics and confirmed that all supplied samples had been correctly identified through morphological features (Frankham, 2017).

3.2.2: *Develop SMP DNA library.*

A shark DNA library incorporating material from the SMP has been developed by DPI and currently contains over 850 samples. Accessioning of new material from the SMP is ongoing.

3.3 Conduct scientifically- based shark attack risk assessment.

Status: **Ongoing**

3.3.1: *Compile data from research relating to identified high-risk elements.*

Activities in 2017/18: The SMS has initiated substantial research effort into better understanding factors influencing shark attacks (<https://www.dpi.nsw.gov.au/fishing/sharks>). Data streams include aerial survey data on marine wildlife abundance and distribution, beach user data, tagged target shark movements (acoustic tags and satellite tags), target shark behavioural studies especially with respect to their foraging, shark behaviour and movements in relation to beached whales and numerous community surveys. All these studies and data streams are being collected to identify high-risk elements and will be analysed during the life of the SMS.

A review of alternative systems to shark nets has been conducted as part of the SMS (Cardno, 2015) and prepared for publication in a peer-reviewed scientific journal (McPhee *et al.*, submitted).

3.3.2: *Apply standard risk assessment model (i.e. AS/NZ: 4360).*

Activities in 2017/18: More data has been collected to assist in this application.

Level 3 Establish/support collaborative research (e.g. CSIRO, other government agencies and universities)

<p>3.4 Conduct morphometrics on sharks and other species caught in the SMP.</p>	<p>Status: Ongoing</p> <p>3.4.1: Identify need for morphometrics in meeting the needs of the SMP. Quality morphometric data is needed to understand the efficacy of the shark nets in reducing interactions with potentially dangerous sharks. Also, the data provides information on the size classes and any possible size-based stock structuring of sharks off NSW. Morphometric data are included in ongoing assessments of shark bite to determine species and size of shark involved in the interaction, and contribute to data collected during research activities linked to the management of NSW commercial shark fisheries. All catches are measured, plus a full set of 52 morphometrics recorded for all whole carcasses collected.</p> <p>3.4.2: Include in research priorities document (1.1) if considered appropriate. All research priorities are detailed in the Strategic Research and Monitoring Plan.</p>
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Table 5 SMP Monitoring Program – Outcomes for 2017-18.

SMP Monitoring Program – Outcomes for 2017-18	
<p>1. Shark Meshing Contractor Catch Report</p>	<p>All contractors provided daily reports of catches by email and/or telephone and submit a monthly catch data summary sheet with all details of meshing operations and catch during that reporting period.</p>
<p>2. Shark Meshing DPI Catch Summary Report</p>	<p>Monthly catch summary reports were submitted to the Fisheries Scientific Committee, the NSW Scientific Committee and OEH (Appendix 1)</p>
<p>3. Tagging program.</p>	<p>The tagging program continued in 2017/18, with 35 sharks being released alive from the SMP nets. The sharks associated with the tagging program that were tagged included; 11 White Sharks; 2 Bull Sharks; 1 Dusky Whaler; 3 Bronze Whalers; and 1 Smooth Hammerhead. As per DPI Fisheries protocols, the 10 Grey Nurse Sharks released alive were not tagged. No marine turtles were tagged in 2017/18. For further details refer to Appendix 1.</p>
<p>4. Routine DNA sampling and verification.</p>	<p>Routine DNA sampling of all dead animals was undertaken in 2017/18. This included 179 genetic samples of which 35 comprised collection of the entire animal (for further details refer to 'monitoring parameter 5' below and Table 7). Sampling DNA from live sharks was not undertaken in 2017/18. Genetic samples for 58 Hammerhead Sharks caught in the SMP during 2016/17 were submitted for species verification to the Australian Centre for Genomics at the Australian Museum Research Institute. PCR amplification was used to sequence one mitochondrial (mtDNA) gene region from each sample to compare to published data for species identification. Three of the samples did not pass quality control, resulting in 55 samples being compared to the species identification provided using morphological features as recorded in the SMP 2016/17 Annual Performance Report (Dalton <i>et al.</i>, 2017). 100% of the species identifications for these Hammerhead Shark samples were confirmed as correct using this genetic technique (Frankham, 2017).</p>

5. Shark vertebral and other tissue samples. Historically no samples have been taken from Skates and Rays

Biological samples were taken from 179 (all dead) of the 223 animals deceased in the 2017/18 season, and are listed below:

Common Name	Sample Type and Number	Total Number Dead
Broadnose Sevengill Shark	Genetics & vertebrae = 7	7
Bronze Whaler	Genetics & vertebrae = 11	13
Common Blacktip	Genetics & vertebrae = 12	12
Dusky Whaler	Genetics & vertebrae = 7	8
Grey nurse Shark	Whole = 9	10
Shortfin Mako	Genetics & vertebrae = 5	5
Smooth Hammerhead	Genetics & vertebrae = 73	77
Great Hammerhead	Genetics & vertebrae = 3	3
Spinner Shark	Genetics & vertebrae = 3	4
Silky Shark	Genetics & vertebrae = 4	4
White Shark	Genetics & vertebrae = 5 ; Whole = 8	14
Thresher Shark	Genetics & vertebrae = 4	4
Indo-Pacific Bottlenose Dolphin	Genetics & vertebrae = 1; Whole = 2	3
Green Turtle	Whole = 6	7
Common Dolphin	Genetics & vertebrae = 1; Whole = 3	4
Hawksbill Turtle	Whole = 1	2
Olive Ridley Turtle	Whole = 1	1
Eastern Angel Shark	Genetics & vertebrae = 3	5
Bull Shark	Whole = 4	4
Tiger Shark	Genetics & vertebrae = 2	2
Southern Eagle Ray	Genetics & vertebrae = 3; Whole = 1	16

6. Monitoring of all shark attacks.

When an attack occurs in NSW the DPI Shark Scientist or delegate interviews the victims, where they are willing to cooperate, and seeks as much information and evidence of shark identification as can be attained. This includes scale-bar photography of wounds requested from surgeons, examination of wounds and damage to surf craft or clothing/diving materials that show evidence of bite marks and collection of any tooth fragments for analysis to help determine shark species.

The DPI Shark Scientist also provides key media support following shark attacks in NSW providing balanced information to the community on the reasonable level of threat.

There were no shark-inflicted fatalities in the past year in NSW waters, but there was one serious injury where a female swimmer suffered injuries to her lower leg while swimming at a non-netted beach in Botany Bay within the SMP region.

A total of 9 shark attacks were reported and investigated in NSW waters during the 2017/18 financial year. These interactions were comprised of: Five interactions with White Sharks (Iluka, Avoca Beach, Martin Island, La Perouse, Flat Rock); one with an unidentified whaler species (Kiama); two with Wobbegong Sharks (Birubi, Arrawarra); and one with a Grey nurse Shark (Birubi). An incident reported to have occurred at North Solitary Island on 12 January 2018 could not be confirmed as the victim refused an interview.

Two of these interactions were recorded within the SMP region; one at a netted beach and one at a non-netted beach.

<p>7. Monitor technological advances in shark control measures.</p>	<p>Under the SMS, several studies have been initiated to investigate alternative measures to mitigate against shark bite. As the SMP is an ‘area-based’ methodology, only initiatives addressing area-protection will be discussed in this Annual Report.</p> <p>A project investigating the efficacy of sonar technology to detect and accurately assess potential shark threat (based on size of the shark) was completed by NSW DPI and the University of Technology, Sydney, during 2016-17. The experiment provided additional useful understanding of the capabilities of the Clever Buoy (CB) system developed by Shark Mitigation Systems. Overall, the experiment showed that the CB was able to detect White Sharks and the length estimates were not significantly different from the lengths independently estimated by BRUVS (https://www.dpi.nsw.gov.au/_data/assets/pdf_file/0007/815866/evaluation-of-clever-buoy-shark-detection-system-summary.pdf). Sharks were not detected further than 28m from the CB, however, this may have been due to the sonar configuration not being appropriate or calibrated for the water depth used. Almost two-thirds of CB ‘detections’ were deemed to be false positives when checked against BRUVS video. The presence of BRUVS and schools of fish appeared to influence incorrect identification of an object. It is likely that sharks travelling within 1.5m of the seabed were not detected due to being below the CB beam.</p> <p>Several experiments and trials using Unmanned Aerial Vehicles (UAVs popularly known as ‘drones’) have been conducted by NSW DPI and Southern Cross University. Preliminary results indicate that this technology may provide aerial support suitable for detection of sharks in clear waters. A review of the potential for UAVs to conduct marine fauna surveys has been published as part of this research (Colefax <i>et al.</i>, 2017. doi:10.1093/icesjms/fsx100).</p> <p>Drumlines have been used in shark management strategies in Queensland and South Africa for many decades (Cliff and Dudley, 2011; Sumpton <i>et al.</i>, 2011). Although these passively fishing baited hooks are more selective and reduce mortalities of bycatch, they still impact several species particularly threatened or protected species (Sumpton <i>et al.</i>, 2010). A new improvement to classical drumlines that incorporates a real-time ‘Catch Alert System’ using satellite communication has been invented in Reunion Island, with the aim of increasing chances of survival of catch (Perry <i>et al.</i>, 2014). These new drumlines have been trialled in NSW and the term SMART Drumlines has now been coined (<u>Shark Management Alert in Real Time</u>). To date, all three target shark species have been caught and successfully tagged and released, with extremely limited bycatch during operational deployment on the NSW coast (https://www.dpi.nsw.gov.au/fishing/sharks/management/smart-drumlines). Survivorship has been exceptionally high as all White Sharks released have subsequently been detected through telemetry, with only one White Shark dying during capture (after entangling itself in the gear), and one White Shark washing up after apparently succumbing to post-release stress.</p> <p>A review of alternative, non-lethal, shark management technologies has been prepared and submitted for publication in a peer-reviewed scientific journal (McPhee <i>et al.</i>, submitted).</p>
<p>8. Patterns of movements of non-target marine animals.</p>	<p>DPI has continued working with relevant agencies and reviewed available information during 2017/18 and is not aware of any new information that would necessitate any changes to the SMP.</p>
<p>9. Population trends and patterns of movements of dangerous sharks and attack behaviour.</p>	<p>DPI has sourced information from relevant agencies during 2017/18 and is continuing collaborative research into trends and patterns of movements of target sharks (refer to Table 4 section 2.3). Information available to date does not necessitate any changes to the SMP.</p> <p>The only species for which a population estimate now exists is the White Shark. Close-kin genetic techniques were used by CSIRO to estimate adult White Shark abundance for the eastern Australasian population to be 750 individuals in 2017 (uncertainty range of 470 to 1,030) with a high survivorship of approximately 93% (Bruce <i>et al.</i>, 2018). The trend in abundance was not significantly different from zero (i.e. no trend so an apparently stable population where births = deaths, on average). Trends in the juvenile portion of the population were not able to be calculated at this stage, but acoustic tagging data suggest that juvenile survival probabilities are about 73% (Bruce <i>et al.</i>, 2018). Total population size was estimated at 5,460 individuals (uncertainty range 2,909-12,802) in 2017 (Bruce <i>et al.</i>, 2018).</p>

10. Patterns of recreational water contact activities in marine waters.	DPI has reviewed the information that is available from relevant agencies for 2017/18 (refer to Table 4 section 2.4). DPI also collected some data on recreational water contact activities at SMP beaches during aerial surveys conducted during 2017/18. Information collected to date does not necessitate any changes to the SMP.
11. Threatened Species recovery plan reviews.	No new threatened species recovery plans were reviewed in 2017/18 and DPI is not aware of any new information that would necessitate any changes to the SMP.
12. Contractor compliance.	Only one non-compliance issue was reported during the 2017/18 season, relating to a hole in a net found by a Fisheries Officers while conducting a random inspection. All non-compliance issues in 2017/18 were resolved to the satisfaction of the DPI Shark Meshing Supervisor (for further details refer to section 1.3 Compliance Plan).
13. Monitor net locations by GPS.	GPS location of nets was completed during the 2017/18 meshing season and all nets were in similar positions to those reported in previous years.
14. Shark Meshing Program Annual Performance Evaluation.	The 2017/18 Annual Performance Report provides an evaluation of the performance of the SMP under the Management Plan. No modifications to the SMP are recommended.

1.5 Performance Indicators

Performance indicators and trigger points from the Management Plan are assessed below to determine the extent to which the SMP met its four objectives in 2017/18.

1.5.1 Objective 1 - reduce the risk to humans from shark attack at beaches of the SMP

The trigger point for this objective is: *one fatality or serious injury per meshing season on a meshed beach*. Serious injuries are those that result in a threat to life or limb.

The trigger point was not tripped during the 2017/18 season (Table 6).

Table 6: Shark interactions in the SMP Region 2008/09 to 2017/18

Meshing Period	Fatal	Serious	Minor	No injury	Total Fatal / Serious	Total interactions in SMP region
2008-09 (pre-JMA)	0	3	0	0	3	3
2009-10	0	0	2	0	0	2
2010-11	0	0	0	0	0	0
2011-12	0	1	2	1	1	4
2012-13	0	0	0	1	0	1
2013-14	0	0	1	0	0	1
2014-15	0	0	3	0	0	3
2015-16	0	0	2	2	0	4
2016-17	0	0	0	1	0	1
2017-18	0	1	1	0	1	2

Note: Shark attack information was cross-referenced with shark log records held by SLS NSW (Surf Life Saving Manager) and the Australian Shark Attack File (Curator: John West). These enquiries showed that no other attacks resulting in fatality or serious injury were recorded in the area of operation during the reporting period.

A total of nine (9) shark attacks were reported and investigated in NSW waters during the 2017/18 financial year. One of these interactions at an unmeshed beach resulted in serious injuries.

Two of the shark interactions were recorded within the SMP region, but only one was at a netted beach. The interaction at the netted beach (Avoca Beach) occurred approximately 400m north-west of the shark net and resulted in a surfer suffering minor injuries to his right shoulder after an interaction with what was suspected to be a White Shark. The other injury occurred at Congwong Beach at Botany Bay, in which a female swimmer suffered serious injuries to her lower right leg inflicted by a White Shark. The nearest netted beach to this location is Maroubra Beach; approximately 5km north of this location.

1.5.2 Objective 2 - minimise the impact on non-target and threatened species.

The trigger point for this objective is: *entanglements of non-target species and threatened species over two consecutive meshing seasons exceed twice the annual average catch of the preceding 10 years for those species.*

Catch records indicate that 403 animals were reported entangled in the nets during the period from 1 September 2017 to 30 April 2018 (Table 7), and that 369 (92%) were non-target animals (Tables 7 and 8).

Seventy of those 403 interactions were with threatened or protected species, including:

- 26 White Sharks (14 dead; 12 released alive);
- 20 Grey Nurse Sharks (10 dead; 10 released alive);
- 9 Green Turtles (7 dead, 2 released alive);
- 4 Common Dolphins (dead);
- 3 Great Hammerheads (dead);
- 3 Indo-Pacific Bottlenose Dolphins (dead);
- 2 Hawksbill Turtles (dead);
- 2 Leatherback Sea Turtles (released alive);
- 1 Olive Ridley Turtle (dead)

In addition, there were 325 interactions with other non-target species, including:

- 172 Rays (31 dead, 141 released alive);
- 78 Smooth Hammerheads (77 dead, 1 released alive);
- 16 Bronze Whalers* (13 dead, 3 released alive);
- 12 Common Blacktips* (dead);
- 9 Dusky Whalers* (8 dead, 1 released alive);
- 7 Broadnose Sevengill Sharks* (dead);
- 7 Angelsharks (5 dead; 2 released alive);
- 6 Shortfin Mako* (5 dead, 1 released alive)
- 4 Thresher Sharks (dead);
- 4 Silky Sharks* (dead);
- 4 Spinner Sharks* (dead);
- 3 Port Jackson Sharks (1 dead, 2 released alive);
- 3 unknown whaler* sp. (2 dead, 1 released alive);

* prior to 2017/18 meshing season, these species were reported as 'target species'

Batoids (rays and skates) continue to comprise the highest proportion of catches with the SMP at 43%, followed by Smooth Hammerheads at 19%, the collective group of 'target sharks' (Bull Sharks, White Sharks, and Tiger Sharks) accounted for approximately 8%, and Grey Nurse Sharks accounted for 5%.

The trigger point for the objective of '*minimising the impact on non-target species and threatened species*' was tripped in 2017/18 for Grey Nurse Sharks, Great Hammerheads, and Hawksbill Turtles (Table 8).

A review report for tripped trigger points will be prepared within six months of the publication of the Annual Performance Report in accordance with clause 8.4 of the JMA and Part 7 of the Management Plan for the SMP.

Although not a formal trigger point or performance indicator, an increase in the number of animals released alive (albeit with fate unknown) since the JMAs were implemented in 2009-10 could provide some indication of the effectiveness of the reduced net checking times from 96 to 72 hours. Table 9 compares the proportion of animals released alive pre - JMA (5 years before) and post – JMA (9 years after) for some major faunal groups and the total numbers of releases and captures. The data suggest that since the JMAs were implemented in 2009, that there has been a 60% increase in the total number of animals released alive, increasing from 27% before the JMA to 45% in 2017/18. It is important to note, however, that many of these animals are caught in very low numbers, and small changes can be reflected in high percentages.

Table 7 Total SMP entanglements for the 2017/18 meshing season.

Scientific Name	Common Name	Hunter	Central Coast North	Central Coast South	Sydney North	Sydney Central	Sydney South	Illawarra	Released alive/fate unknown	Dead	Total	% of Total Catch
Target Sharks												
<i>Galeocerdo cuvier</i>	Tiger Shark				1	1			0	2	2	0.5%
<i>Carcharodon carcharias</i>	White Shark	9	6	5	1		1	4	12	14	26	6.5%
<i>Carcharhinus leucas</i>	Bull Shark		1				1	4	2	4	6	1.5%
Non-Target Sharks and Rays												
<i>Notorynchus cepedianus</i>	Broadnose Sevengill Shark				1			6	0	7	7	1.7%
<i>Carcharhinus brachyurus</i>	Bronze Whaler	3	2	1	1		3	6	3	13	16	4.0%
<i>Carcharhinus obscurus</i>	Dusky Whaler		2	4	1		1	1	1	8	9	2.2%
<i>Isurus oxyrinchus</i>	Shortfin Mako		1	1		1	2	1	1	5	6	1.5%
<i>Carcharhinus falciformis</i>	Silky Shark	2	2						0	4	4	1.0%
<i>Carcharhinus brevipinna</i>	Spinner Shark	4							0	4	4	1.0%
<i>Carcharhinus sp.</i>	unidentified whaler sp.			1				2	1	2	3	0.7%
<i>Carcharhinus limbatus</i>	Common Blacktip	1	1	3	1		1	5	0	12	12	3.0%
<i>Squatina albipunctata</i>	Eastern Angel Shark	2			2	3			2	5	7	1.7%
<i>Heterodontus portusjacksoni</i>	Port Jackson Shark	1			1	1			2	1	3	0.7%
<i>Sphyrna zygaena</i>	Smooth Hammerhead	13	18	25	5	5	4	8	1	77	78	19.4%
<i>Sphyrna mokarran</i>	Great Hammerhead	1	2						0	3	3	0.7%
<i>Alopias vulpinus</i>	Thresher Shark	1			1	1	1		0	4	4	1.0%
<i>Carcharias taurus</i>	Grey nurse Shark	8	1	4	1		5	1	10	10	20	5.0%
<i>Manta birostris</i>	Manta Ray	1							1	0	1	0.2%
<i>Myliobatis australis</i>	Southern Eagle Ray	25	9	5	13	2	5	25	68	16	84	20.8%
<i>Rhinoptera neglecta</i>	Australian Cownose Ray	18	35		3	2	10	4	60	12	72	17.9%
<i>Dasyatis thetidis</i>	Black Stingray					2	1	6	7	2	9	2.2%
<i>Dasyatis brevicaudata</i>	Smooth Stingray				3				3	0	3	0.7%
<i>Aetobatus ocellatus</i>	Whitespotted Eagle Ray				1		1		2	0	2	0.5%
	unidentified rays					1			0	1	1	0.2%
Non-Target Marine Mammals, Reptiles and Birds												
<i>Delphinus delphis</i>	Common Dolphin			1	1	1	1		0	4	4	1.0%
<i>Tursiops aduncus</i>	Indo-Pacific Bottlenose Dolphin	1	1		1				0	3	3	0.7%
<i>Chelonia mydas</i>	Green Turtle	2		1	1	4	1		2	7	9	2.2%
<i>Eretmochelys imbricata</i>	Hawksbill Turtle	1				1			0	2	2	0.5%
<i>Dermochelys coriacea</i>	Leatherback Sea Turtle			2					2	0	2	0.5%
<i>Lepidochelys olivacea</i>	Olive Ridley Turtle			1					0	1	1	0.2%
	TOTAL	93	81	54	39	25	38	73	180	223	403	100%

Table 8 Non-target and threatened species entanglements¹ for 2007/08 to 2017/18 and trigger point analysis for 2017/18.

Scientific Name	Common Name	Preceding 10 years catch data										Current reporting year	Endangered 10 Year Annual Average + 2 Std Devs	Vulnerable 10 Year Annual Average + 3 Std Devs	Other species 2 x 10 Year Annual Avg in 2 consecutive years	Trigger tripped (True/False)
		07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18				
Endangered																
<i>Carcharias taurus</i>	Grey nurse Shark	2	1	2	3	4	9	4	4	19	17	20	19.4	-	-	TRUE
<i>Sphyrna lewini</i>	Scalloped Hammerhead ²	0	1	0	0	0	1	0	0	0	1	0	1.3	-	-	FALSE
<i>Dermochelys coriacea</i>	Leatherback Turtle	0	0	0	0	0	0	2	0	2	1	2	2.2	-	-	FALSE
<i>Caretta caretta</i>	Loggerhead Turtle	0	0	0	0	0	1	0	0	4	1	0	3.1	-	-	FALSE
<i>Dugong dugon</i>	Dugong	0	0	1	0	0	0	0	0	0	0	0	0.7	-	-	FALSE
<i>Eudyptula minor</i>	Little Penguin	0	0	0	0	0	0	0	0	1	0	0	0.7	-	-	FALSE
Vulnerable																
<i>Sphyrna mokarran</i>	Great Hammerhead	0	0	0	0	0	0	0	0	1	1	3	-	1.5	-	TRUE
<i>Carcharodon carcharias</i>	White Shark	7	8	5	6	15	3	6	10	31	22	26	-	38.0	-	FALSE
<i>Chelonia mydas</i>	Green Turtle	0	0	0	5	1	0	10	4	13	6	9	-	17.9	-	FALSE
<i>Megaptera novaeangliae</i>	Humpback Whale	0	0	0	0	0	2	1	0	0	0	0	-	2.3	-	FALSE
Pinnipedia	Seals	2	1	1	0	0	0	0	0	0	1	0	-	2.6	-	FALSE
Procellariidae	Shearwater	0	0	0	0	0	0	0	0	1	0	0	-	1.0	-	FALSE
Other Protected or Non-Target Species																
<i>Pseudorca crassidens</i>	False Killer Whale	0	0	0	0	0	0	0	0	0	0	0	-	-	0.0	FALSE
<i>Balaenoptera acutorostrata</i>	Minke Whale	0	0	0	0	0	0	0	0	0	0	0	-	-	0.0	FALSE
<i>Tursiops aduncus</i>	Indo-Pacific Bottlenose Dolphin	2	0	1	2	0	0	1	0	9	2	3	-	-	3.4	FALSE
<i>Delphinus delphis</i>	Common Dolphin	1	3	1	0	0	0	4	3	4	2	4	-	-	3.6	FALSE
<i>Squatina spp</i>	Angelshark sp	16	12	12	19	14	3	6	1	9	5	7	-	-	19.4	FALSE
<i>Heterodontus portusjacksoni</i>	Port Jackson Shark	2	2	6	0	4	4	2	0	2	2	3	-	-	4.8	FALSE
<i>Sphyrna zygaena</i>	Smooth Hammerhead ^{2,3}	18	13	16	18	36	22	22	42	112	71	78	-	-	74.0	FALSE
<i>Alopias vulpinus</i>	Thresher Shark	3	3	7	3	0	0	0	1	2	1	4	-	-	4.0	FALSE
<i>Eretmochelys imbricate</i>	Hawksbill Turtle	0	0	0	0	0	0	0	1	5	2	2	-	-	1.6	TRUE
<i>Lepidochelys olivacea</i>	Olive Ridley Turtle	0	0	0	0	0	0	0	0	0	0	1	-	-	0.0	FALSE
	Rays - combined	46	30	44	60	42	35	90	86	425	166	172	-	-	204.8	FALSE
	Finfish - combined	4	1	0	0	0	0	1	0	6	1	0	-	-	2.6	FALSE
	Pre 2017 JMA 'target species' ⁴	45	52	22	35	33	26	30	30	96	66	61	-	-	87.0	FALSE

1: 'entanglements' includes mortalities and animals released alive.

2: There are low levels of confidence in hammerhead species identification prior to implementation of the JMAs in the 2009-10 season.

3: "Smooth Hammerhead" includes unidentified hammerheads.

4: 'Pre 2017 JMA 'target species'' include: broadnose seven-gill shark, bronze whaler, dusky whaler, unknown whaler, shortfin mako, silky shark, and common blacktip

Table 9 Percentage of major faunal groups released alive from the SMP pre-JMA and post-JMA.

Target sharks*	5%	9%	17%	13%	13%	8%	9%	17%	17%	25%	14%
White Shark	11%	0%	0%	40%	0%	17%	0%	32%	36%	46%	30%
Grey Nurse Shark	25%	0%	67%	25%	33%	50%	0%	73%	65%	50%	52%
All hammerheads	0%	0%	6%	0%	0%	0%	2%	2%	0%	1%	1%
Other non-target sharks**	48%	36%	27%	44%	33%	25%	0%	54%	75%	13%	28%
All rays	62%	75%	68%	79%	77%	72%	78%	77%	73%	82%	76%
All dolphins	0%	0%	0%	0%	NC	0%	0%	0%	0%	0%	0%
All turtles	24%	50%	29%	0%	0%	25%	33%	21%	40%	29%	27%
Released/Interactions	223/826	44/120	59/157	56/158	34/108	76/191	73/189	385/749	162/373	180/403	1069/2448
Total % released alive	27%	37%	38%	35%	31%	40%	39%	51%	43%	45%	44%

* 'Target sharks' normally includes White Sharks, but as a threatened species they are separated for the purpose of this analysis.

** 'Other non-target sharks' now includes whaler sharks (dusky, bronze, blacktip and spinner), shortfin mako, and broadnose sevengill sharks, following the implementation of new 2017 JMA.
NC = none caught that year

1.5.3 Objective 3 - Minimise OHS risks associated with implementing the SMP.

The trigger point for this objective is: *one major or two minor OHS incidents.*

A major incident is one that results in 5 or more compensable days off work, and a minor incident is one that is reportable to NSW WorkCover or results in between 2 – 4 days off work.

The trigger point was not tripped during the 2017/18 season however there was one reportable minor incident, whereby a contractor reported a minor muscle strain caused when moving a large shark species caught in his meshing net.

1.5.4 Objective 4 - Transparent monitoring and reporting.

The trigger point for this objective is: *Annual performance report submitted to the Scientific Committee, the Fisheries Scientific Committee, OEH and parties to the JMA by 31 July each year.*

This requirement was met in 2017/18 in accordance with clause 8.3 of the JMA.

1.6 Summary of Reviews and Actions

This section summarises the trigger points which have been tripped and the status of any actions since the 2017 JMA and Management Plan came into effect in the 2017/18 meshing season.

2017-18: The trigger point for the objective of 'Minimise the impact on non-target species and to ensure that the SMP does not jeopardise the survival or conservation status of threatened species' was tripped for three species during 2017/18 following the entanglement of twenty Grey Nurse Sharks, three Great Hammerheads, and two Hawksbill Turtles. **DPI will prepare the review report for those trigger points within six months of the publication of this Annual Performance Report.**

2 Changes to the Management Plan

This Annual Performance Report has not identified a need for any amendments to the Management Plan or JMA, but noting that trigger point review reports for threatened species

need to be prepared by DPI within six months of the publication of this Annual Performance Report.

3 Other Programs Complementing the SMP

3.1 Aerial Surveys

As in previous years, a series of aerial surveys were flown along the coast over the SMP region from Wollongong to Stockton. All surveys were flown by helicopter.

United Aero Helicopters were contracted through an open tender process to conduct one flight a week, plus over each weekend and all public holidays during NSW School holidays in September/October (hereafter termed 'spring'), December/January ('summer'), the Easter 4-day period, and April ('autumn') for one year.

All aircraft were required to have a trained observer on board to collect data via the purpose-built SharkSmart PRO (SSPRO) application for onboard iPads. Using SSPRO, all sightings of marine wildlife are immediately submitted to a linked database, whilst sightings of target species (White, Bull and Tiger, unidentifiable or Whaler Sharks larger than 2m total length) were tweeted and submitted to public via alerts on the SharkSmart App for iOS and Android mobile devices directly from the helicopter in real time. The charter company was required to provide a photographer who was able to take high resolution digital photographs. The specified duties of the aerial surveillance observer were to:

- Use the supplied iPad loaded with the purpose-built SharkSmart PRO App to record all sightings.
- Record all sightings and environmental conditions on the supplied Dictaphone using local beach names to record position of the sightings/change in conditions.
- Record weather and environmental conditions for each flight, including recording the positions where these may have changed.
- If problems are experienced with the SharkSmart PRO App, log all sightings using the supplied hand-held GPS and record all sightings data, including the GPS waypoint, using the Dictaphone.
- Provide timely and adequate records of sightings to DPI, SLS NSW and the Australian Professional Ocean Lifeguards Association (APOLA).
- Report all sightings of potentially dangerous situations using the supplied radios preloaded with SLS NSW channels, or by mobile phone if no response using the radio, to the relevant surf lifesaving groups (SLS NSW and APOLA) and DPI contact person.
- Report any sightings of shark meshing contractor vessels or nets out of alignment following storms and heavy seas.

3.1.1 2017/2018 Results

In an effort to maximize observer focus on searching during transect, a world-first data recording application for iOS was built which allowed all sightings to be recorded in real time, including geolocation using the iPad GPS. Observers send sightings of marine wildlife directly into the database or, in the case of large, target shark species, submit in real time as alerts to the NSW SharkSmart App (iOS and Android) and Twitter. Analysis of environmental parameters affecting shark and prey abundance and distribution along the NSW coast will be completed by the RAAP Postdoc position at the Sydney Institute for Marine Science. However, as the SMP Annual Performance Report is focused on assessing the ability of this program to provide bather safety, all shark sightings have been assessed independently.

A total of 1,071 wildlife sightings were recorded in SSPRO (01 July 2017 to 29 April 2018). A total of 42 target sharks were seen during these flights, 26% of which were during winter and most of those were White Shark sightings. Twelve White Sharks were seen with only two sightings in Summer and all others in Winter (July/August). Only one sighting of six Bull Sharks was identified from the air, plus another 28 Whaler Sharks. Furthermore, a total of four unidentified sharks were observed, plus one Greynurse Shark.

The council area with highest sighting rates was the stretch of beach between Swansea and Redhead, Lake Macquarie City Council, where 21% of all target sharks were seen, including the single sighting of identified Bull Sharks and 67% of the White Shark sightings. Three of the four water evacuations initiated by the helicopter crew were implemented in this region.

3.1.2 Conclusions

Although these results again highlighted the low sighting rates of target sharks from aircraft within the SMP region, the clustered nature of the sightings and the number of water evacuations implemented by the helicopter crew imply that the aerial surveys have potentially assisted in improved bather safety in the Lake Macquarie City Council region. Analysis of shark and prey abundance and distribution in relation to biotic and abiotic conditions at the sightings will provide a unique ability to investigate the impact of inter-annual and seasonal variation in environmental conditions on potential risk to bathers due to nearshore shark presence.

3.2 SharkSmart Public Awareness and Education Program

DPI continued ongoing work during 2017/18 on the SharkSmart public awareness and education program including releases of updated versions of the SharkSmart App for iPhone and Android.

Further information can be found on the DPI website at:

<https://www.dpi.nsw.gov.au/fishing/sharks/sharksmart>

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Appendix 1 – Monthly catch summaries for the 2017/18 meshing season

Appendix 1 Table 1: Detailed Catch Report - 1 September 2017 to 28 September 2017

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
Hunter	Redhead	07/09/17	<i>Carcharodon carcharias</i>	White Shark	Dead	Whole	No	2.43	M
	Merewether	15/09/17	<i>Carcharodon carcharias</i>	White Shark	Dead	Whole	No	1.98	F
	Stockton	15/09/17	<i>Carcharodon carcharias</i>	White Shark	Dead	Whole	No	2.41	F
	Redhead	21/09/17	<i>Carcharhinus brachyurus</i>	Bronze Whaler	Alive & Released	No	Yes	3	M
	Stockton	25/09/17	<i>Heterodontus portusjacksoni</i>	Port Jackson Shark	Dead and decomposed	No	No	1.1	?
	Stockton	27/09/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.6	F
	Stockton	27/09/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.6	F
	Stockton	27/09/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.6	M
	Stockton	27/09/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.6	M
Central Coast North	Shelly	12/09/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.2	M
	Catherine Hill Bay	15/09/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.82	F
Central Coast South	Umina	05/09/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1	F
	Umina	08/09/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.69	F
	Umina	15/09/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.8	F
	Copacabana	18/09/17	<i>Carcharhinus sp.</i>	Whaler shark (unknown species)	Dead and decomposed	No	No	1.2	?
	Umina	18/09/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.7	F
	Umina	18/09/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.2	F
	Umina	19/09/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.95	F
	McMasters	24/09/17	<i>Carcharhinus brachyurus</i>	Bronze Whaler	Dead	Yes	No	2.2	F
	Umina	24/09/17	<i>Carcharias taurus</i>	Grey nurse Shark	Alive & Released	No	No	2.1	F
Sydney North	Avalon	03/09/17	<i>Carcharhinus brachyurus</i>	Bronze Whaler	Dead	Yes	No	2.35	M
	Bilgola	11/09/17	<i>Dasyatis brevicaudata</i>	Smooth Stingray	Alive & Released	No	No	1.2	M
	Bilgola	13/09/17	<i>Dasyatis brevicaudata</i>	Smooth Stingray	Alive & Released	No	No	1.2	F
	Bilgola	15/09/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.6	F
	Avalon	16/09/17	<i>Heterodontus portusjacksoni</i>	Port Jackson Shark	Alive & Released	No	No	0.6	M
	Newport	16/09/17	<i>Alopias vulpinus</i>	Thresher Shark	Dead	Yes	No	1.45	M
	Newport	16/09/17	<i>Notorynchus cepedianus</i>	Broadnose Sevengill Shark	Dead	Yes	No	1.56	F
	Avalon	19/09/17	<i>Carcharias taurus</i>	Grey nurse Shark	Dead	Whole	No	2.24	F
	Bilgola	22/09/17	<i>Dasyatis brevicaudata</i>	Smooth Stingray	Alive & Released	No	No	1.2	F
	Whale	28/09/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.3	M
Sydney Central	North Narrabeen	12/09/17	<i>Chelonia mydas</i>	Green Turtle	Dead	Whole	No	0.58	M
	Manly	15/09/17	<i>Heterodontus portusjacksoni</i>	Port Jackson Shark	Alive & Released	No	No	0.9	M
	Manly	22/09/17	<i>Squatina albipunctata</i>	Eastern Angel Shark	Alive & Released	No	No	0.9	M
	Manly	24/09/17	<i>Delphinus delphis</i>	Common Dolphin	Dead	Whole	No	2.3	F
	Manly	24/09/17	<i>Squatina albipunctata</i>	Eastern Angel Shark	Dead	No	No	1	M
	Manly	24/09/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Dead	No	No	1.2	F

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
Sydney South	Cronulla	13/09/17	<i>Carcharhinus brachyurus</i>	Bronze Whaler	Alive & Released	No	Yes	2.8	F
	Maroubra	13/09/17	<i>Carcharhinus brachyurus</i>	Bronze Whaler	Dead	Yes	No	2.55	F
	Coogee	15/09/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.3	F
	Maroubra	15/09/17	<i>Carcharhinus brachyurus</i>	Bronze Whaler	Dead	Yes	No	1.532	F
	Elouera	26/09/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.85	M
Illawarra	Wattamolla	11/09/17	<i>Carcharhinus brachyurus</i>	Bronze Whaler	Dead	Yes	No	2.312	M
	Wattamolla	11/09/17	<i>Carcharhinus brachyurus</i>	Bronze Whaler	Dead	Yes	No	1.953	M
	Austinmer	15/09/17	<i>Dasyatis thetidis</i>	Black Stingray	Alive & Released	No	No	0.9	?
	Austinmer	18/09/17	<i>Notorynchus cepedianus</i>	Broadnose Sevengill Shark	Dead	Yes	No	1.75	M
	Austinmer	18/09/17	<i>Notorynchus cepedianus</i>	Broadnose Sevengill Shark	Dead	Yes	No	1.6	M
	Austinmer	18/09/17	<i>Notorynchus cepedianus</i>	Broadnose Sevengill Shark	Dead	Yes	No	1.595	M
	Austinmer	18/09/17	<i>Notorynchus cepedianus</i>	Broadnose Sevengill Shark	Dead	Yes	No	1.64	M
	Thirroul	18/09/17	<i>Notorynchus cepedianus</i>	Broadnose Sevengill Shark	Dead	Yes	No	1.48	M
	Thirroul	18/09/17	<i>Dasyatis thetidis</i>	Black Stingray	Dead	No	No	1.06	F
	Wattamolla	20/09/17	<i>Carcharhinus brachyurus</i>	Bronze Whaler	Dead	Yes	No	2.04	F
	Wattamolla	20/09/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.06	F
	North Wollongong	22/09/17	<i>Dasyatis thetidis</i>	Black Stingray	Alive & Released	No	No	0.96	M
	North Wollongong	25/09/17	<i>Dasyatis thetidis</i>	Black Stingray	Alive & Released	No	No	1.05	M
	North Wollongong	25/09/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.1	F

Appendix 1 Table 2: Detailed Catch Report - 29 September 2017 to 26 October 2017

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
Hunter	Newcastle	04/10/17	<i>Alopias vulpinus</i>	Thresher Shark	Dead	Yes	No	1.94	M
	Stockton	16/10/17	<i>Carcharodon carcharias</i>	White Shark	Alive & Released	No	Yes	2.8	F
	Stockton	17/10/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.65	F
	Stockton	17/10/17	<i>Carcharodon carcharias</i>	White Shark	Alive & Released	No	Yes	1.6	M
	Stockton	20/10/17	<i>Carcharias taurus</i>	Greynurse Shark	Alive & Released	No	No	1.6	F
	Stockton	20/10/17	<i>Carcharias taurus</i>	Greynurse Shark	Dead	Whole	No	0.92	F
	Stockton	20/10/17	<i>Carcharodon carcharias</i>	White Shark	Dead	Whole	No	1.51	M
	Stockton	23/10/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.6	F
	Stockton	23/10/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.6	F
	Stockton	23/10/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Dead	No	No	0.7	M
Central Coast North	Lakes	05/10/17	<i>Carcharodon carcharias</i>	White Shark	Alive & Released	No	Yes	1.7	F
	Soldiers	12/10/17	<i>Tursiops aduncus</i>	Indo-Pacific Bottlenose Dolphin	Dead	Whole	No	1.5	M
	The Entrance	16/10/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.76	M
	Blacksmiths	20/10/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.85	F
	Caves Beach	23/10/17	<i>Carcharodon carcharias</i>	White Shark	Alive & Released	No	Yes	2.7	M
Catherine Hill Bay	25/10/17	<i>Carcharhinus brachyurus</i>	Bronze Whaler	Dead	Yes	No	2.13	F	

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
	Catherine Hill Bay	25/10/17	<i>Carcharodon carcharias</i>	White Shark	Alive & Released	No	Yes	2.23	F
	Lakes	25/10/17	<i>Carcharodon carcharias</i>	White Shark	Alive & Released	No	Yes	1.65	F
	Blacksmiths	25/10/17	<i>Carcharodon carcharias</i>	White Shark	Alive & Released	No	Yes	1.62	F
Central Coast South	Umina	29/09/17	<i>Dermochelys coriacea</i>	Leatherback Turtle	Alive & Released	No	No	3.1	M
	Kilcare	06/10/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.94	M
	Kilcare	11/10/17	<i>Carcharodon carcharias</i>	White Shark	Dead	Whole	No	2.25	M
	McMasters	13/10/17	<i>Carcharodon carcharias</i>	White Shark	Dead	Whole	No	2.55	M
	Umina	16/10/17	<i>Carcharhinus obscurus</i>	Dusky Whaler	Dead	Yes	No	1.18	M
	Umina	20/10/17	<i>Carcharias taurus</i>	Greynurse Shark	Dead	Whole	No	2.39	F
Sydney North	Palm	09/10/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1	F
	Whale	23/10/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.4	F
Sydney Central	Narrabeen	29/09/17	<i>Alopias vulpinus</i>	Thresher Shark	Dead	Yes	No	1.4	M
	North Steyne	04/10/17	<i>Dasyatis thetidis</i>	Black Stingray	Alive & Released	No	No	1.5	M
	North Narrabeen	16/10/17	<i>Dasyatis thetidis</i>	Black Stingray	Dead and decomposed	No	No	1.2	M
	North Narrabeen	16/10/17	unidentified ray	unidentified ray	Dead and decomposed	No	No	-	?
Sydney South	Bronte	29/09/17	<i>Alopias vulpinus</i>	Thresher Shark	Dead	Yes	No	1	F
	Bondi	02/10/17	<i>Carcharias taurus</i>	Greynurse Shark	Dead	Whole	No	2.2	F
	Cronulla	16/10/17	<i>Dasyatis thetidis</i>	Black Stingray	Alive & Released	No	No	0.8	M
	Wanda	18/10/17	<i>Isurus oxyrinchus</i>	Shortfin Mako	Dead	Yes	No	1.62	F
	Bondi	20/10/17	<i>Carcharias taurus</i>	Greynurse Shark	Dead	Whole	No	2.5	F
Illawarra	Austinmer	09/10/17	<i>Dasyatis thetidis</i>	Black Stingray	Alive & Released	No	No	1.2	F
	Austinmer	09/10/17	<i>Carcharhinus sp</i>	Whaler shark (unknown species)	Dead and decomposed	No	No	-	?
	Austinmer	09/10/17	<i>Carcharhinus brachyurus</i>	Bronze Whaler	Dead	Yes	No	1.89	F
	Austinmer	09/10/17	<i>Carcharodon carcharias</i>	White Shark	Dead	Yes	No	1.65	?
	South Wollongong	11/10/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.35	F
	Austinmer	16/10/17	<i>Carcharhinus obscurus</i>	Dusky Whaler	Dead	Yes	No	2.45	F

Appendix 1 Table 3: Detailed Catch Report - 27 October 2017 to 23 November 2017

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
Hunter	Stockton	27/10/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.6	M
	Stockton	27/10/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.75	M
	Bar	30/10/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.5	F
	Bar	30/10/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.5	M
	Stockton	03/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.65	M
	Stockton	06/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.5	F
	Stockton	06/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.6	M
	Nobbys	09/11/17	<i>Chelonia mydas</i>	Green Turtle	Alive & Released	No	No	0.41	F
	Redhead	10/11/17	<i>Carcharias taurus</i>	Greynurse Shark	Alive & Released	No	No	2.5	F
	Merewether	13/11/17	<i>Carcharhinus brachyurus</i>	Bronze Whaler	Dead and decomposed	No	No	2.1	F

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
	Merewether	13/11/17	<i>Carcharhinus brachyurus</i>	Bronze Whaler	Dead and decomposed	No	No	1.9	F
	Stockton	13/11/17	<i>Carcharodon carcharias</i>	White Shark	Alive & Released	No	Yes	2.8	F
	Stockton	13/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.55	F
	Stockton	13/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.55	F
	Stockton	13/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.55	F
	Bar	13/11/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.5	M
	Stockton	13/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.55	M
	Stockton	13/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.55	M
	Nobbys	15/11/17	<i>Squatina albipunctata</i>	Eastern Angel Shark	Dead	Yes	No	0.96	F
	Stockton	15/11/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.5	F
	Stockton	15/11/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.5	M
	Stockton	15/11/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.5	M
	Stockton	17/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.5	M
	Stockton	17/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.5	M
	Stockton	20/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.55	M
	Dixon Park	21/11/17	<i>Carcharodon carcharias</i>	White Shark	Dead and decomposed	No	No	2.8	?
	Dixon Park	21/11/17	<i>Carcharias taurus</i>	Greynurse Shark	Dead and decomposed	No	No	2.3	F
	Stockton	21/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.55	F
	Stockton	21/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.55	F
Central Coast North	The Entrance	28/10/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1	F
	Catherine Hill Bay	09/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Dead	No	No	1.26	F
	Lakes	09/11/17	<i>Carcharodon carcharias</i>	White Shark	Alive & Released	No	No	2	F
	Blacksmiths	13/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.87	M
	Shelly	19/11/17	<i>Carcharias taurus</i>	Greynurse Shark	Alive & Released	No	No	2.5	F
Central Coast South	Kilcare	27/10/17	<i>Isurus oxyrinchus</i>	Shortfin Mako	Alive & Released	No	No	1.05	F
	Umina	27/10/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.94	F
	Umina	27/10/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.02	M
	Umina	27/10/17	<i>Carcharodon carcharias</i>	White Shark	Dead	Whole	No	2	M
	Terrigal	30/10/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Dead	No	No	0.85	M
	Terrigal	30/10/17	<i>Carcharhinus obscurus</i>	Dusky Whaler	Dead	Yes	No	1.7	M
	Umina	03/11/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.74	M
	Terrigal	09/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.7	M
	Terrigal	21/11/17	<i>Carcharias taurus</i>	Greynurse Shark	Alive & Released	No	No	2	F
	Kilcare	21/11/17	<i>Carcharodon carcharias</i>	White Shark	Alive & Released	No	Yes	2.05	M
Sydney North	Newport	29/10/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.8	F
	Palm	29/10/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.27	F
	Palm	29/10/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.1	F
	Bilgola	03/11/17	<i>Tursiops aduncus</i>	Indo-Pacific Bottlenose Dolphin	Dead	Yes	No	1.4	F
	Palm	10/11/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Alive & Released	No	Yes	1.4	M
Whale	13/11/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.8	F	

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
	Palm	14/11/17	<i>Carcharhinus obscurus</i>	Dusky Whaler	Dead	Yes	No	0.94	F
	Bilgola	14/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.2	M
	Avalon	20/11/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	1.2	?
	Avalon	23/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Dead	No	No	1.25	F
Sydney Central	Dee Why	14/11/17	<i>Squatina albipunctata</i>	Eastern Angel Shark	Dead	Yes	No	1.03	F
Sydney South	Wanda	30/10/17	<i>Isurus oxyrinchus</i>	Shortfin Mako	Dead	Yes	No	1.3	M
	Coogee	09/11/17	<i>Carcharias taurus</i>	Greynurse Shark	Alive & Released	No	No	3.5	F
	Maroubra	20/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.9	M
Illawarra	Austinmer	06/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.2	F
	Garie	06/11/17	<i>Isurus oxyrinchus</i>	Shortfin Mako	Dead	Yes	No	1.6	F
	Coledale	13/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.18	F
	Garie	13/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.6	F
	North Wollongong	21/11/17	<i>Notorynchus cepedianus</i>	Broadnose Sevengill Shark	Dead	Yes	No	1.4	M
	Austinmer	22/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.21	F
	North Wollongong	22/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Dead	Yes	No	1.1	F

Appendix 1 Table 4: Detailed Catch Report - 24 November 2017 to 21 December 2017

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
Hunter	Redhead	27/11/17	<i>Chelonia mydas</i>	Green Turtle	Dead and decomposed	No	No	0.41	M
	Stockton	08/12/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.8	F
	Stockton	18/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.26	F
	Merewether	19/12/17	<i>Carcharhinus brevipinna</i>	Spinner Shark	Dead	Yes	No	1.31	M
Central Coast North	The Entrance	29/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.78	M
	Blacksmiths	04/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.965	F
	Blacksmiths	04/12/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Dead	No	No	0.468	M
	Blacksmiths	10/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.3	M
	Blacksmiths	10/12/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.958	M
	Blacksmiths	16/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.145	M
	Shelly	18/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.43	F
	Blacksmiths	18/12/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.89	M
	Blacksmiths	18/12/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.91	M
	Blacksmiths	18/12/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.91	M
Central Coast South	Terrigal	24/11/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.3	M
	Terrigal	24/11/17	<i>Carcharhinus obscurus</i>	Dusky Whaler	Dead	Yes	No	1.32	F
	Umina	01/12/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Dead	No	No	1.15	F
	Avoca	04/12/17	<i>Delphinus delphis</i>	Common Dolphin	Dead	Whole	No	1.45	F
	Umina	13/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1	F
	Kilcare	15/12/17	<i>Dermochelys coriacea</i>	Leatherback Turtle	Alive & Released	No	No	1.2	M

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
Sydney North	Bilgola	11/12/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.4	F
	Warriewood	11/12/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1	F
	Bilgola	14/12/17	<i>Squatina albigunctata</i>	Eastern Angel Shark	Alive & Released	No	No	1.1	M
	Bilgola	14/12/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.4	M
	Whale	14/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.485	M
	Whale	14/12/17	<i>Carcharodon carcharias</i>	White Shark	Alive & Released	No	Yes	2	M
	Palm	19/12/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.6	M
Sydney Central	Dee Why	13/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.5	M
	Manly	18/12/17	<i>Isurus oxyrinchus</i>	Shortfin Mako	Dead	Yes	No	1.3	M
	Manly	18/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.5	M
	Curl Curl	19/12/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.5	F
	Dee Why	19/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.35	F
Sydney South	Maroubra	29/11/17	<i>Carcharias taurus</i>	Greynurse Shark	Dead	Whole	No	2	F
	Maroubra	11/12/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.7	F
	Maroubra	11/12/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.65	F
	Maroubra	18/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.36	F
	North Cronulla	20/12/17	<i>Carcharodon carcharias</i>	White Shark	Dead and decomposed	Yes	No	1.86	M
Illawarra	Thirroul	27/11/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.4	F
	Austinmer	01/12/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.4	F
	Wattamolla	01/12/17	<i>Carcharhinus sp.</i>	Whaler shark (unknown species)	Alive & Released	No	No	1.8	M
	Wattamolla	06/12/17	<i>Carcharodon carcharias</i>	White Shark	Dead and decomposed	Yes	No	1.93	M
	Wattamolla	06/12/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Dead	No	No	0.79	F
	Thirroul	12/12/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.2	F
	Wattamolla	19/12/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.15	F

Appendix 1 Table 5: Detailed Catch Report - 22 December 2017 to 18 January 2018

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
Hunter	Stockton	12/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.7	M
	Stockton	12/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.7	M
Central Coast North	Blacksmiths	22/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.34	F
	Blacksmiths	22/12/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Dead	No	No	0.92	M
	Blacksmiths	22/12/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Dead	No	No	0.94	M
	Blacksmiths	22/12/17	<i>Carcharhinus obscurus</i>	Dusky Whaler	Dead	Yes	No	2.91	F
	Blacksmiths	24/12/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.94	F
	Blacksmiths	24/12/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	1.02	F
	Blacksmiths	24/12/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.95	F
	Blacksmiths	24/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.99	M
	Blacksmiths	27/12/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.94	M

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
	Blacksmiths	27/12/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.94	M
	Blacksmiths	27/12/17	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.98	M
	Blacksmiths	29/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.56	F
	Blacksmiths	05/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.912	F
	Catherine Hill Bay	06/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.945	M
	Catherine Hill Bay	06/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.95	M
	Blacksmiths	11/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.9	M
	Blacksmiths	11/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.95	M
	Catherine Hill Bay	11/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Dead and decomposed	No	No	1.07	F
	Catherine Hill Bay	11/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Dead and decomposed	No	No	0.88	M
	Catherine Hill Bay	11/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Dead and decomposed	No	No	0.9	M
	Catherine Hill Bay	11/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Dead and decomposed	No	No	0.9	M
	Catherine Hill Bay	11/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Dead and decomposed	No	No	0.95	M
	Catherine Hill Bay	11/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Dead and decomposed	No	No	0.96	M
	Catherine Hill Bay	11/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Dead and decomposed	No	No	0.99	M
	Catherine Hill Bay	11/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Dead and decomposed	No	No	1.01	M
Central Coast South	Avoca	22/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.33	F
	McMasters	22/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.4	F
	McMasters	30/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.35	F
	North Avoca	09/01/18	<i>Carcharias taurus</i>	Greynurse Shark	Alive & Released	No	No	1.8	F
	McMasters	12/01/18	<i>Carcharhinus limbatus</i>	Common Blacktip	Dead	Yes	No	1.9	M
	Kilcare	18/01/18	<i>Carcharodon carcharias</i>	White Shark	Dead	Whole	No	2.75	M
Sydney North	Bilgola	24/12/17	<i>Galeocerdo cuvier</i>	Tiger shark	Dead	Yes	No	2.49	F
	Bilgola	05/01/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Dead	Yes	No	1	F
Sydney Central	Curl Curl	22/12/17	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.3	F
	Narrabeen	27/12/17	<i>Galeocerdo cuvier</i>	Tiger shark	Dead	Yes	No	3.4	F
	Dee Why	02/01/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.8	M
	Curl Curl	02/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Dead	No	No	0.5	F
	Narrabeen	18/01/18	<i>Eretmochelys imbricata</i>	Hawksbill Turtle	Dead	Whole	No	0.45	F
Illawarra	Coledale	22/12/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1	F
	South Wollongong	24/12/17	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.4	F
	Austinmer	29/12/17	<i>Dasyatis thetidis</i>	Black Stingray	Alive & Released	No	No	1	F
	Garie	02/01/18	<i>Carcharhinus limbatus</i>	Common Blacktip	Dead	Yes	No	1.8	M
	Coledale	05/01/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.42	F
	Wattamolla	05/01/18	<i>Carcharias taurus</i>	Greynurse Shark	Dead	Whole	No	2.05	M
	Wattamolla	05/01/18	<i>Carcharhinus limbatus</i>	Common Blacktip	Dead	Yes	No	1.9	M
	Wattamolla	05/01/18	<i>Carcharhinus limbatus</i>	Common Blacktip	Dead	Yes	No	1.87	M
	Wattamolla	05/01/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.42	M
	South Wollongong	05/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.77	F
	Garie	18/01/18	<i>Carcharodon carcharias</i>	White Shark	Dead and decomposed	Yes	No	1.82	M

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
	Garie	18/01/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead and decomposed	No	No	1.1	?

Appendix 1 Table 6: Detailed Catch Report - 19 January 2018 to 15 February 2018

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
Hunter	Merewether	22/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.92	M
	Stockton	22/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.7	M
	Stockton	22/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.7	M
	Stockton	22/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.7	F
	Stockton	22/01/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.99	F
	Stockton	24/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.7	M
	Stockton	24/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.7	M
	Stockton	24/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.7	F
	Stockton	24/01/18	<i>Carcharhinus brevipinna</i>	Spinner Shark	Dead	No	No	1.32	F
	Stockton	24/01/18	<i>Carcharhinus brevipinna</i>	Spinner Shark	Dead	Yes	No	1.64	F
	Stockton	24/01/18	<i>Carcharhinus limbatus</i>	Common Blacktip	Dead	Yes	No	1.17	M
	Stockton	25/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.7	M
	Stockton	25/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.7	F
	Stockton	29/01/18	<i>Carcharhinus brevipinna</i>	Spinner Shark	Dead	Yes	No	1.17	F
	Redhead	05/02/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.75	M
	Redhead	05/02/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.75	M
	Stockton	05/02/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead and decomposed	No	No	1	?
	Stockton	08/02/18	<i>Eretmochelys imbricata</i>	Hawksbill Turtle	Dead and decomposed	No	No	0.37	M
	Newcastle	09/02/18	<i>Tursiops aduncus</i>	Indo-Pacific Bottlenose Dolphin	Dead	Whole	No	2.2	F
	Central Coast North	Catherine Hill Bay	22/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	1.03
Soldiers		22/01/18	<i>Carcharhinus leucas</i>	Bull Shark	Dead	Whole	No	1.95	M
Blacksmiths		22/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.91	M
Blacksmiths		22/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.93	M
Lakes		25/01/18	<i>Carcharhinus limbatus</i>	Common Blacktip	Dead	Yes	No	2.29	F
Blacksmiths		25/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.9	M
Blacksmiths		29/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.92	M
Catherine Hill Bay		30/01/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Dead and decomposed	No	No	0.7	M
Caves Beach		08/02/18	<i>Sphyrna mokarran</i>	Great Hammerhead	Dead	Yes	No	2.47	M
Caves Beach		08/02/18	<i>Carcharhinus falciformis</i>	Silky Shark	Dead	Yes	No	1.05	M
Blacksmiths		09/02/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.1	F
Blacksmiths		09/02/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.03	F
Blacksmiths		11/02/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.96	M
Blacksmiths		13/02/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	No	No	-	F
Central Coast	Avoca	19/01/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.31	F

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
South	Terrigal	23/01/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Dead	Yes	No	0.66	M
	Umina	25/01/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.845	M
	Avoca	29/01/18	<i>Lepidochelys olivacea</i>	Olive Ridley Turtle	Dead	Whole	No	0.54	F
	Kilcare	07/02/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.05	M
	Umina	09/02/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.85	F
	Umina	13/02/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.87	M
Sydney Central	Narrabeen	19/01/18	<i>Chelonia mydas</i>	Green Turtle	Dead	Whole	No	0.75	M
	Queenscliff	19/01/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Dead	No	No	1.2	F
	Queenscliff	30/01/18	<i>Chelonia mydas</i>	Green Turtle	Dead	Whole	No	0.6	F
Sydney South	Maroubra	21/01/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.85	F
	Coogee	02/02/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Dead	No	No	0.6	F
	Elouera	14/02/18	<i>Carcharhinus leucas</i>	Bull Shark	Alive & Released	No	Yes	2.4	F
Illawarra	Thirroul	30/01/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.66	F
	Thirroul	05/02/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.27	F
	Coledale	07/02/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.95	F

Appendix 1 Table 7: Detailed Catch Report – 16 February 2018 to 15 March 2018

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
Hunter	Newcastle	28/02/18	<i>Squatina albipunctata</i>	Eastern Angel Shark	Dead	No	No	0.82	F
	Newcastle	28/02/18	<i>Carcharias taurus</i>	Greynurse Shark	Dead	Whole	No	2.3	F
	Stockton	02/03/18	<i>Carcharias taurus</i>	Greynurse Shark	Alive & Released	No	No	2.2	F
	Stockton	02/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.1	F
	Stockton	13/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.93	F
	Stockton	14/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.82	F
Central Coast North	Shelly	16/02/18	<i>Carcharhinus obscurus</i>	Dusky Whaler	Dead	No	No	4	F
	Lakes	16/02/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.43	M
	Blacksmiths	12/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.25	M
	Blacksmiths	15/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.15	F
	Blacksmiths	15/03/18	<i>Carcharhinus falciformis</i>	Silky Shark	Dead	Yes	No	0.85	F
	Blacksmiths	15/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.05	M
Central Coast South	Umina	17/02/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead and decomposed	No	No	-	?
	Umina	09/03/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.05	F
Sydney North	Whale	14/03/18	<i>Chelonia mydas</i>	Green Turtle	Alive & Released	No	No	1	F
Sydney South	Bronte	19/02/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.1	M
	Cronulla	12/03/18	<i>Carcharhinus obscurus</i>	Dusky Whaler	Alive & Released	No	Yes	2.8	F
	Cronulla	14/03/18	<i>Aetobatus ocellatus</i>	White Spotted Eagle Ray	Alive & Released	No	No	1.1	F
Illawarra	North Wollongong	27/02/18	<i>Carcharhinus leucas</i>	Bull Shark	Alive & Released	No	Yes	2	M
	North Wollongong	02/03/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.18	M

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
	North Wollongong	02/03/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.2	M
	North Wollongong	02/03/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.15	M

Appendix 1 Table 8: Detailed Catch Report – 16 March 2018 to 12 April 2018

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
Hunter	Stockton	19/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.14	F
	Newcastle	27/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.07	M
	Nobbys	27/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.89	F
	Nobbys	27/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.12	F
	Stockton	02/04/18	<i>Carcharias taurus</i>	Grey Nurse Shark	Alive & Released	No	No	2.3	F
	Stockton	04/04/18	<i>Carcharias taurus</i>	Grey Nurse Shark	Alive & Released	No	No	2.1	F
	Merewether	06/04/18	<i>Sphyrna mokarran</i>	Great Hammerhead	Dead	Yes	No	1.97	F
	Redhead	09/04/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.83	F
Central Coast North	Lakes	19/03/18	<i>Isurus oxyrinchus</i>	Shortfin Mako	Dead	Yes	No	1.54	M
	Soldiers	26/03/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.95	M
	Lakes	26/03/18	<i>Sphyrna mokarran</i>	Great Hammerhead	Dead	Yes	No	3.62	M
	The Entrance	26/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.98	M
	Caves Beach	05/04/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.875	M
	Blacksmiths	10/04/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.94	F
Central Coast South	McMasters	24/03/18	<i>Carcharhinus limbatus</i>	Common Blacktip	Dead	Yes	No	2	M
	Terrigal	29/03/18	<i>Chelonia mydas</i>	Green Turtle	Dead	Whole	No	0.78	F
	Umina	29/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.99	F
	Umina	29/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.88	M
	Umina	29/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.12	F
	Umina	05/04/18	<i>Carcharhinus obscurus</i>	Dusky Whaler	Dead	Yes	No	2.85	F
Sydney North	Palm	27/03/18	<i>Aetobatus ocellatus</i>	White Spotted Eagle Ray	Alive & Released	No	No	1.2	M
	Palm	09/04/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Dead	Whole	No	0.93	M
	Warriewood	12/04/18	<i>Squatina albipunctata</i>	Eastern Angel Shark	Dead	Yes	No	0.94	F
	Palm	12/04/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.83	F
Sydney Central	Manly	08/04/18	<i>Chelonia mydas</i>	Green Turtle	Dead	Whole	No	1.2	F
Sydney South	Maroubra	16/03/18	<i>Chelonia mydas</i>	Green Turtle	Dead	Whole	No	0.71	F
	Maroubra	28/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.17	M
	Cronulla	09/04/18	<i>Delphinus delphis</i>	Common Dolphin	Dead	Whole	No	2.25	F
Illawarra	Wattamolla	19/03/18	<i>Carcharhinus leucas</i>	Bull Shark	Dead	Whole	No	2.2	F
	Wattamolla	19/03/18	<i>Carcharhinus leucas</i>	Bull Shark	Dead	Whole	No	2.1	F
	Wattamolla	19/03/18	<i>Carcharhinus leucas</i>	Bull Shark	Dead	Whole	No	2.1	M
	South Wollongong	19/03/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.08	F
	Thirroul	26/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.97	F

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
	Austinmer	26/03/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.08	F
	South Wollongong	28/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.22	M
	South Wollongong	28/03/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.33	M
	North Wollongong	28/03/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.2	F

Appendix 1 Table 9: Detailed Catch Report – 13 April 2018 to 30 April 2018

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
Hunter	Stockton	16/04/18	<i>Carcharhinus falciformis</i>	Silky Shark	Dead	Yes	No	0.78	F
	Stockton	16/04/18	<i>Carcharhinus falciformis</i>	Silky Shark	Dead	Yes	No	0.8	F
	Newcastle	19/04/18	<i>Carcharodon carcharias</i>	White Shark	Alive & Released	No	Yes	3	F
	Merewether	20/04/18	<i>Manta birostris</i>	Manta Ray	Alive & Released	No	No	1.6	F
	Merewether	23/04/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.06	M
	Merewether	23/04/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	0.87	F
Central Coast North	Catherine Hill Bay	16/04/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.93	M
	Soldiers	19/04/18	<i>Carcharhinus brachyurus</i>	Bronze Whaler	Alive & Released	No	Yes	1.93	M
	Blacksmiths	20/04/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	0.43	F
	Shelly	24/04/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.35	M
Central Coast South	McMasters	18/04/18	<i>Carcharhinus limbatus</i>	Common Blacktip	Dead	Yes	No	1.7	M
	Copacabana	20/04/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.49	F
Sydney North	Mona Vale	23/04/18	<i>Carcharhinus limbatus</i>	Common Blacktip	Dead	Yes	No	1.93	M
	Avalon	24/04/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Alive & Released	No	No	1.2	M
	Bilgola	24/04/18	<i>Delphinus delphis</i>	Common Dolphin	Dead	Yes	No	2.15	F
Sydney South	Coogee	16/04/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Dead and decomposed	No	No	1.1	F
	Maroubra	20/04/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.75	F
	Maroubra	20/04/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.75	F
	North Cronulla	20/04/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.8	F
	Coogee	21/04/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.7	F
	Coogee	21/04/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.7	F
	Coogee	21/04/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.55	M
	Coogee	21/04/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.55	M
	Coogee	21/04/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.55	M
	Maroubra	23/04/18	<i>Carcharhinus limbatus</i>	Common Blacktip	Dead	Yes	No	1.82	M
	Cronulla	27/04/18	<i>Carcharias taurus</i>	Greynurse Shark	Dead	Whole	No	2.3	F
Illawarra	Wattamolla	16/04/18	<i>Carcharhinus limbatus</i>	Common Blacktip	Dead	Yes	No	1.84	M
	Garie	18/04/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.75	M
	Garie	18/04/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.75	M
	North Wollongong	18/04/18	<i>Myliobatis australis</i>	Southern Eagle Ray	Dead and decomposed	No	No	0.9	?
	Coledale	20/04/18	<i>Carcharhinus limbatus</i>	Common Blacktip	Dead	Yes	No	1.65	M

Region	Beach	Date	Scientific Name	Common Name	Status	Samples taken (yes/no/whole)	Tagged	Size (m) FL	Sex
	South Wollongong	23/04/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.15	M
	Wattamolla	23/04/18	<i>Rhinoptera neglecta</i>	Australian Cownose Ray	Alive & Released	No	No	0.91	M
	South Wollongong	25/04/18	<i>Sphyrna zygaena</i>	Smooth Hammerhead	Dead	Yes	No	1.06	M
	Thirroul	30/04/18	<i>Carcharhinus brachyurus</i>	Bronze Whaler	Dead	Yes	No	2.3	F
	Thirroul	30/04/18	<i>Carcharhinus brachyurus</i>	Bronze Whaler	Dead	Yes	No	1.9	M
	Wattamolla	30/04/18	<i>Carcharodon carcharias</i>	White Shark	Dead and decomposed	Yes	No	2.1	M